5

A PROCEDURE FOR THE ENVIRONMENTAL EVALUATION OF ROADS IN SOUTH AFRICA

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ABSTRACT

The aim of this report is to develop a procedure for the environmental evaluation of roads in South Africa, because in the past the environmental evaluation of road projects have been on an ad hoc basis, often using different formats. The procedure is therefore to be replicable from scheme to scheme, and is to be incorporated into the existing road development procedure, while drawing on the principles of Integrated Environmental Management.

The first part of the report is a study of the environmental evaluation procedures adopted in the United Kingdom, United States of America and Ontario (Canada). The environmental evaluation of roads in these countries are compared under the following headings: contextual features of the environmental evaluation procedures; the planning, location and design stages of the environmental evaluation procedures, and the environmental evaluation documentation. In this comparative study, the common and unique steps and elements are identified in order to generate an 'Ideal'.

The second part of the report is a study on the environmental evaluation of roads in South Africa. The administrative structure, legislation, policy and planning procedures for roads in South Africa, and Integrated Environmental Management (IEM) are discussed. Although IEM is currently been developed and road authorities are committed to IEM, the procedure still needs to be incorporated into the existing road development procedure.

The third part of the report develops a procedure for the environmental evaluation of roads in South Africa. The procedure developed incorporates common and unique steps and elements generated in the 'Ideal' into the existing road development procedure. The Environmental Conservation Act and Integrated Environmental Management are also taken into account in developing the procedure.

Finally, as there is at present no formal documented procedure for the environmental evaluation of roads in South Africa, it is recommended that the procedure be considered by road and environmental authorities with a view to implementing it.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

GLOSSARY OF TERMS

APPRAISALS: The act of evaluating data in order to make judgments needed to reach a decision[1].

ARTERIAL ROAD: A road primarily for through traffic, usually a continuous route[2].

CORRIDOR: A tract of land in which the proposed road under consideration falls.

ENVIRONMENTAL ASSESSMENT (USA): A concise public document which provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact[3].

ENVIRONMENTAL ASSESSMENT (ONTARIO): Refers to the planning process in which the consequences of the project and alternatives are assessed, and to the actual report which documents that process[4].

ENVIRONMENTAL EVALUATION: The process of obtaining, organising and weighing information on the consequences, or impacts, of alternatives[1].

ENVIRONMENTAL IMPACT: An environmental change caused by some human act[1].

ENVIRONMENTAL IMPACT STATEMENT (EIS): A detailed statement of environmental impact, required by the National Environmental Policy Act, prepared for all major federal actions significantly affecting the quality of the human environment[5].

FRAMEWORK: a tabular presentation of data summarising the main likely direct and indirect impacts on people of the alternative options for a proposed highway scheme[6].

INTEGRATED ENVIRONMENTAL MANAGEMENT (IEM): a systematic approach developed in South Africa for ensuring the structured inclusion of environmental considerations in decision-making at all stages of the development process[7].

METHODOLOGY: Method of selecting, organising, evaluating and presenting information on the impact of the activity alternatives[8].

POLICY: A declaration of a course of action that an organisation intends to follow with specific reference to the method of implementation either legally or voluntarily induced[9].

PROCEDURE: One or more linked sequential steps to achieve part or all of the environmental evaluation[8].

SCOPING: A procedure for narrowing the scope of an assessment, and ensuring that the assessment remains focused on the truly significant issues or impacts[1].

SCREENING: A procedure for determining the appropriate level of assessment[1].

TRUNK ROADS: Predominantly rural roads whose main function is to facilitate regional distribution of traffic (inter-city movement)[10].

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INTRODUCTION

INTRODUCTION

MOTIVATION FOR THE REPORT

In South Africa a limited number of road projects have in the past been subject to environmental evaluation on an ad hoc basis. The evaluations, carried out either voluntarily or due to public pressure, have been recognised as an asset to the project (NTC, 1984, p195). However,

> "... most assumed a different format, often resulting in one or more aspects not being adequately covered, rendering the specific study incomplete ... . Other problems are that consultants have been appointed too late, their briefs have been to limited and economic aspects have taken priority over environmental considerations."
>
> (NTC, 1984, p195)

Thus, there is a need to develop a standard procedure for the environmental evaluation of roads in South Africa which is replicable from scheme to scheme.

Furthermore, the Council for the Environment is concerned about the impact of road building on the environment. This concern led to a meeting with the Director of Roads, Cape Provincial Administration and some of his senior staff. At the meeting members of the Council for the Environment sought the co-operation of road authorities to minimise the environmental impacts of road building. At this meeting differences in approach to this matter became apparent, and the Council for the Environment subsequently appointed a small working group to identify issues for further investigation. This group attended

two workshops on the impact of road building on the environment in December 1987 and May 1988. Resulting from these workshops, the Council for the Environment commissioned a report on minimising the impact of road building on the environment. The report, prepared by the author and the supervisor of this report, under the auspices of the Environmental Evaluation Unit at the University of Cape Town (UCT), included sections on:

- the historical development of road building in South Africa,
- the administrative and legislative structure pertaining to the planning, design and construction of roads,
- legislation, policy and standard procedures for roads, and
- the environmental evaluation of roads in South Africa.

The preliminary report was completed in March 1989 and the recommendations contained therein were discussed and prioritised at a workshop, in August 1989, which involved representatives of road authorities, interested parties, and members of the Council for the Environment (see Appendix A for the list of delegates who attended the workshop). The conclusions and recommendations of the final report, completed in September 1989, highlight the need to develop a systematic set of environmental evaluation procedures to minimise the impact of road building on the environment.

The Council for the Environment is currently developing an approach for the environmental evaluation of development projects in South Africa called Integrated Environmental Management (IEM), but this approach is not specifically for road projects.

The aim of this report is therefore to develop a procedure for the environmental evaluation of road projects in South Africa. Such a procedure should be incorporated into the existing road development procedure in South Africa and should draw on the principles and concepts of Integrated Environmental Management.

The studies, carried out in the preparation of the report for the Council for the Environment, together with the workshop organised by the Council, highlighted the need for a standard procedure to be developed for the environmental evaluation of roads in South Africa. At the workshop, representatives of the road authorities accepted the principles and concepts of Integrated Environmental Management (IEM). However, they expressed their reluctance to carry out an additional procedure, or to adopt a totally new procedure, in order to evaluate the impacts of road projects on the environment. Rather, the existing road development procedure should be used as a basis for incorporating the steps necessary for the environmental appraisal of road projects.

The advantages of this approach are three-fold, namely:

- it results in synergy, to the extent that the inter-actions between the road development and the environment can be more accurately identified than if two separate procedures are followed,
- it capitalises on the acceptability of the existing road development procedure, ie the broad acceptance of the procedure as a whole does not have to be sought, and
- it results in time and cost savings when compared with a procedure which conducts an environmental evaluation separately from other planning activities (Kennedy, 1988, p259).

A possible disadvantage of this approach is that the existing road development procedure could limit the scope of the environmental evaluation.

In order to assess whether the disadvantage would result in practice, it is necessary to:

- generate an 'Ideal' defining the optimal steps for an environmental evaluation procedure for roads,
- document both the existing road development procedure in South Africa and Integrated Environmental Management,
- compare the environmental evaluation of roads in South Africa to the 'Ideal' in order to highlight any shortcomings, and
- propose a procedure which both conforms to the 'Ideal' and takes cognisance of the South African context.

In order to generate an 'Ideal', this report makes a study of the environmental evaluation of roads in three countries. This assumes firstly, that although the procedures are different, largely due to different government structures, the basic steps and elements are comparable and secondly, that through studying three different procedures more of the ideal elements can be identified than through a study of only one procedure. These have in fact been shown to be reasonable assumptions in Chapters 4 and 5, where the basic steps are found to be comparable (see Tables 1, 2 and 3), and additional ideal elements are identified through studying three procedures as opposed to just one procedure.

The 'Ideal' consists of ideal steps and elements for the environmental evaluation of roads in general and is independent of any government structures. Therefore, the 'Ideal' can essentially be incorporated into the existing road development procedure in South Africa while drawing on the principles and concepts of IEM.

After undertaking a broad literature review, three countries, namely the United States of America (USA), Canada and the United Kingdom (UK), were chosen from which to develop an 'Ideal'.

In 1970, with the enactment of the National Environmental Policy Act (NEPA), the USA became the first country to introduce environmental legislation which required that environmental factors be taken into account in all federal decision-making. Furthermore, the Act required that all federal agencies were

obliged to submit a detailed statement on the environmental impacts of proposed major federal actions significantly affecting the quality of the environment (NTC, 1984, p158). The legislation was binding on all Federal agencies, including the Federal Highway Administration (FHWA) who subsequently developed environmental evaluation procedures specifically for road projects.

In Canada, the federal Environmental Assessment Review Process (EARP) was instituted in 1973 and became mandatory in June 1984. The EARP process is only applicable to projects that are federally funded or which involve federal property (Wall, 1986, p98). The result has been that only a few federal road projects have been subject to the EARP process. At the provincial level, the provinces have their own government, and hence have autonomous control over roads and the environment within their province. Out of all the provinces, Ontario was the first to introduce environmental legislation, namely the Environmental Assessment Act of 1975, which called for the environmental assessment of development projects. This environmental assessment procedure is considered by Jones (1984, p38) as the first legislated procedure outside of the USA. The procedure in Ontario differs from the Canadian federal EARP procedure and the FHWA procedure in the USA in that a unique procedure requiring 'Individual' and 'Class' assessments has been developed. 'Individual' assessments are carried out for major projects which have a high potential for significant environmental impacts and require two environmental assessments to be carried out (one when the route is fixed and the other near the end of design). 'Class' assessments, are carried out for less complex projects and require one environmental assessment to be prepared for a 'Class' of project (ie road widening) (Donat, 1979, pp25-26). Therefore, in the study on Canada, the emphasis is on the procedure developed in Ontario.

Following initial studies in 1975, the framework approach was developed in the United Kingdom. The framework approach which is specifically for the evaluation of road projects, was laid out in the Department of Transport's Manual of Environmental Appraisal in 1983, and the mandatory use of the framework was

incorporated into the Department of Transport's Highway Manual in 1984.

It is considered that the three countries chosen, USA, Ontario (Canada) and the UK, give a broad perspective from which to generate the 'Ideal'. They are considered appropriate in that they have all developed their own environmental evaluation procedures for roads under different circumstances. In the USA and Ontario the procedures are different although they are both entrenched in legislation. In the USA, the procedure has been developed at a federal level, while in Ontario it has been developed at a provincial level. The UK, went a different route by developing an administrative rather than a legislative procedure. Furthermore, the procedure developed in the UK is specifically for road projects, whereas in the USA the federal and in Ontario the provincial environmental legislation led to the development of procedures which were then applied to road projects.

The choice of countries on which to base the 'Ideal' was to some extent limited by the availability of literature in South Africa. The general environmental evaluation procedures were found to be well documented for the UK, USA and Ontario. In a computer literature search numerous references on environmental evaluation procedures for roads in these countries were identified. However, as only a few of these references were available in South African libraries, these references were difficult to obtain, especially for Ontario and the USA. In the UK, where the procedure was developed specifically for roads, the references were easier to acquire. References on environmental evaluation procedures for roads in other countries were also identified, and obtained, in the literature search. These included: Australia, Netherlands, Japan, Germany and France. However, these were not as well documented as the procedures in the UK, USA and Ontario. Another source of literature was from Richard Hill, my supervisor, who had collected numerous references on an overseas trip to the USA and UK in 1985.

Some may consider it inappropriate to develop a procedure for the environmental evaluation of roads in South Africa (a developing country) based on the procedures adopted in three developed countries. However, this is not the belief of the author as:

- the 'Ideal' generated by extracting ideal steps and elements from different environmental evaluation procedures for roads is not overly influenced by any government structure and the stage of development in a country, and
- by incorporating the ideal steps and elements into the existing road development procedure and taking into account IEM and the Environment Conservation Act, cognisance is taken of the South African context.

Furthermore, the road development procedure in South Africa is similar to the procedures in the UK, USA, Ontario (see Tables 2 and 5) in that they all go through similar stages (ie planning, selecting a corridor, identifying the line within the selected corridor, design and construction stages). It is also considered by South African road authorities that the country's road network system is largely developed and that most future projects will entail upgrading of existing routes (Council for the Environment, 1989). Therefore as far as the road network is concerned, South Africa can be directly compared to the situation in other developed countries. Therefore, a study of the environmental evaluation procedures for roads that have already been developed and tested in these countries, can be used to identify ideal steps and elements which, if incorporated into the existing road development procedure, can only benefit the environment in South Africa.

STRUCTURE AND CONTENT

The report is divided into three parts.

Part One is a study of environmental evaluation procedures for roads which have been developed, tested and implemented in the UK, USA, and Ontario. A comparison of these procedures is undertaken in order to identify common and unique steps and elements in the different procedures in order to generate an 'Ideal'.

Part Two focuses on the existing road development procedure in South Africa, the environmental evaluation of roads, and the recently proposed procedure of Integrated Environmental Management (IEM).

Part Three is a comparative study between the 'Ideal' procedure, generated in part one, and the existing road development procedure and IEM in South Africa, discussed in part two. In the comparison, voids in the existing road development procedure in South Africa are identified. Recommendations, which incorporate elements from the 'Ideal', are made to bring the existing road development procedure in line with that of the 'Ideal'. A procedure, taking into account IEM and the Environmental Conservation Act, is then developed for the environmental evaluation of roads in South Africa.

Finally, major conclusions and recommendations are summed up at the end of the report.

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PART ONE

ENVIRONMENTAL EVALUATION OF ROADS IN THE UNITED KINGDOM, UNITED STATES OF AMERICA AND CANADA, AND THE GENERATION OF THE IDEAL

CHAPTER ONE: UNITED KINGDOM

In the United Kingdom there are three levels of government which are responsible for roads. At the highest level is National Government which is represented by the Department of Transport, this is followed by the second level of government consisting of County Councils, with the lowest level of government consisting of Local District Councils and Borough Councils. The Department of Transport is responsible for roads of national importance and the County Councils are responsible for roads of regional importance. The roads that remain, namely non principal and unclassified roads which distribute traffic to urban and rural localities and which do not form part of the primary route network, are the responsibility of either the County Councils or the Local District and Borough Councils.

Planning procedures have been developed for each level of government appropriate to the type of road for which it is responsible. For example, at the local level many of the smaller schemes can be implemented with a decision by local authority, while major road proposals are subject to procedures similar to those required for trunk road schemes undertaken by the Department of Transport (Wootton, 1986, p11).

The Department of Transport had no procedures for evaluating environmental effects of trunk road schemes in the early 1970's. The main emphasis at this stage was predominantly on financial and economic assessments.

In 1975, the first steps were taken to introduce environmental evaluation into the planning procedure when a working party under the chairmanship of J R Jefferson was commissioned with the following brief:

"To draft guidance to Road Construction Units on the location of major inter-urban trunk road schemes with regard to noise and other environmental issues."

(Lievesley, 1985, p1)

The aim of the study was to produce a system of evaluation which would have universal application to all inter-urban road schemes. However, there were some inadequacies in the recommendations and in 1977, the Advisory Committee on Trunk Road Assessment (ACTRA) under the chairmanship of Sir George Leitch, was commissioned to carry out a review of Jefferson's report. The ACTRA report concluded that:

"... a formal appraisal procedure was desirable which should be a standard method capable of being replicated from scheme to scheme. It accordingly laid down criteria to be met by the assessment, the three key ones being that:-

(a) it should be generally comprehensible to the public and command their respect.
(b) the public should be able to identify how different groups of individuals would be affected by the scheme.
(c) it should be comprehensive in terms of different kinds of effects of the road scheme."

(Lievesley, 1985, p2 & 3)

The ACTRA report also proposed that:

"... the comparison of feasible routes should be set out in a matrix called the framework. This would contain for each group of people affected an assessment of the type and extent of the impact on them and should be comprehensive. The frameworks should be made freely available and as far as possible be written in non technical language."

(Bridle et al, 1981, p289)

In the ACTRA report, the framework showed how the scheme impacted on five specific groups of people. However, in 1978 the Standing Advisory Committee on Trunk Road Assessment (SACTRA) added a sixth group. The groups were as follows: Travellers; Occupiers; Users of Facilities; Policies for Conserving and Enhancing the Area; Transport, Development and Economic Policy, and Finance Implications (Dept of Transport, 1979, p47).

In the concluding remarks of the SACTRA report it was strongly recommended that the use of the framework became standard practice within the Department. However the Department was also advised to:

> "... avoid over rigidity in application of the framework concept, and to make it clear that the framework used for each scheme should be appropriate to its size and complexity and to the stage reached."
> (Dept of Transport, 1979, p49)

Following this, in 1983, the Manual of Environmental Appraisal (MEA) was published. The manual describes the framework approach and when and how it is to be used. Included in the manual are examples of frameworks for public consultations and public inquiries. In 1984, the mandatory use of frameworks was incorporated into the Department of Transport's Highways Manual (Lievesley, 1985, p4).

The framework approach is now well established in the United Kingdom. In England the framework is laid out in the Manual of Environmental Appraisal (MEA) and in Scotland a similar manual exists, namely the Scottish Transport Environmental Appraisal Manual (STEAM).

The procedures which require early consultation with local authorities and the public also provide for traffic, economic and environmental appraisal. The methods for these assessments are laid out in manuals and recommendations made by the Department of Transport. Of particular importance is the

Traffic Appraisal Manual, the cost benefit program COBA and the Manual for Environmental Appraisal (Wootton, 1986, p11).

Although mandatory planning procedures exist there are no specific regulations concerning or specifying a particular method for assessing environmental impacts. Thus, there is some flexibility which allows adoption of the best method to achieve a particular set of objectives.

The Commission of European Communities prepared preliminary draft and draft directives on introducing environmental impact assessment (EIA) procedures for a range of private and public sector developments. It was considered, by Clark and Bisset (1981, p95), that although the commission would probably prefer as much uniformity as possible, such a directive, when promulgated, would only specify the broad procedures to be implemented. Therefore the choice of a particular method will still be left to the discretion of the member States. The Directives were finally promulgated in 1985 and came into effect in 1988.

Even though there is some flexibility concerning the environmental impact assessment of road projects, there is a mandatory procedure which takes into account environmental factors and institutes an extensive system for public inquiry (Von Moltke, 1984, p32). For example in England the final choice of route location for major roads is the responsibility of both the Department of Transport and the Department of Environment Affairs thereby having regard for overall planning and the environment. Furthermore, widespread adherence to democratic principles in the United Kingdom facilitates approaches in which the public have an opportunity to express themselves, at a suitable time on their opinion with regard to any action which may adversely affect them. Statutory Public Inquiries, based on this democratic principle, occur at the end of route location (for major and trunk roads), thus giving the public an opportunity to express themselves (Law, 1987, p67 & p70).

In England White Papers on road transport are published which describe the government's policy and indicate the government's intentions for the future. The general policy for roads in England is reviewed and updated when necessary. This can be seen from the following publications:

Policy for Roads: England 1980 (Dept of Transport 1980)
Policy for Roads in England: 1983 (Dept of Transport 1983)
Policy for Roads in England: 1987 (Dept of Transport 1987)

These White Papers and others include sections on the Government's environmental policy, for example:

> "Wherever possible roads are kept away from protected areas such as Areas of Outstanding Natural Beauty and Sites of Special Scientific Interest, and when there is a risk ... to do as little damage to the environment as practicable. ...
>
> The Government is committed to minimising environmental intrusion in the choice of basic location and detailed alignment of road schemes."
>
> (Dept of Transport, 1987, p9 & 10)

> "A privately financed road scheme would have to comply with the same environmental requirements as a government scheme."
>
> (Dept of Transport, 1989a, §32)

> "Where new roads are built particular care is taken to fit the road and the structures into the landscape and to take all reasonable measures to minimise any adverse effects. ...
>
> Protecting and enhancing the environment will continue to be a major feature of the Government's road building plans, ..."
>
> (Dept of Transport, 1989b, §44)

These policies indicate the Government's priorities and commitment towards minimising environmental degradation and improving the quality of the environment where possible. Reflecting this commitment, examples are listed, in the 'Policy for Roads in England: 1987', where road plans have been modified in the past in response to suggestions from local, environmental and other interests from informal and formal public consultation and inquiry processes. The list of twelve projects includes examples where: a new route was proposed; two examples where a tunnel was built instead of a flyover; a relief road was abandoned in favour of a full bypass; a road was built under rather than over the Metro and British Rail lines, and a proposed flyover was redesigned (Dept of Transport, 1987, p11).

The most commonly used method for highway appraisal in England is the Evaluative Framework set out in the Manual of Environmental Appraisal (1983). Depending on the stage reached in the planning procedure for roads the framework may be simple or complex (Sampson, 1986).

The next section takes a closer look at the planning procedure for roads in England to see how environmental appraisal and public participation are integrated into the planning procedure.

1.1. PLANNING PROCEDURE FOR ROADS IN THE UNITED KINGDOM

The planning procedure for trunk roads schemes and local authority road schemes are similar in many respects. In this section the main emphasis will be on the planning procedure followed by national government for trunk road schemes. Furthermore, the main thrust will be on how the environmental aspects and public involvement are integrated into the planning procedure.

The planning procedure for trunk road schemes in urban and rural areas is shown schematically in Figure 1 (Based on papers by: Wootton, 1986; Lievesley, 1985, & Law, 1986).

The perceived problem, expressed by the public, members of parliament, councillors, local authorities, and or other groups is investigated by the Secretary of State for Transport. This is done through scheme identification studies which are generally undertaken by a consultant appointed by the Department of Transport. These studies can include the assessment of existing traffic and the prediction of future traffic conditions, accident records, economic and environmental studies, and the planning policies for the area under consideration. The aim of these studies is to investigate/determine the extent of the problem and possible alternatives to help alleviate or solve the problem. For example some of the possibilities that will need to be considered are: will the situation be solved or improved simply with better traffic management or will it be necessary to widen the road or even look for an alternative route? In some cases the public is consulted at this early stage so that their suggestions can be considered in this early review process. A report is then presented to the Secretary of State for Transport recommending possible acceptable alternatives worthy of more detailed studies. If the Secretary of State for Transport is convinced by the report that the problem cannot be easily or cheaply solved (eg by better traffic management) then the scheme enters into the trunk road programme.

Once the scheme has entered into the trunk road programme more detailed traffic, economic, and environmental appraisals of various alignments are undertaken. Traffic studies are carried out to provide more accurate traffic data and to forecast the future capacity requirements for each alternative. The alternatives are developed in more detail which enables more accurate economic appraisals to be carried out. This together with the consultation of both local authorities and the public enables a more comprehensive and accurate environmental assessment to be undertaken.

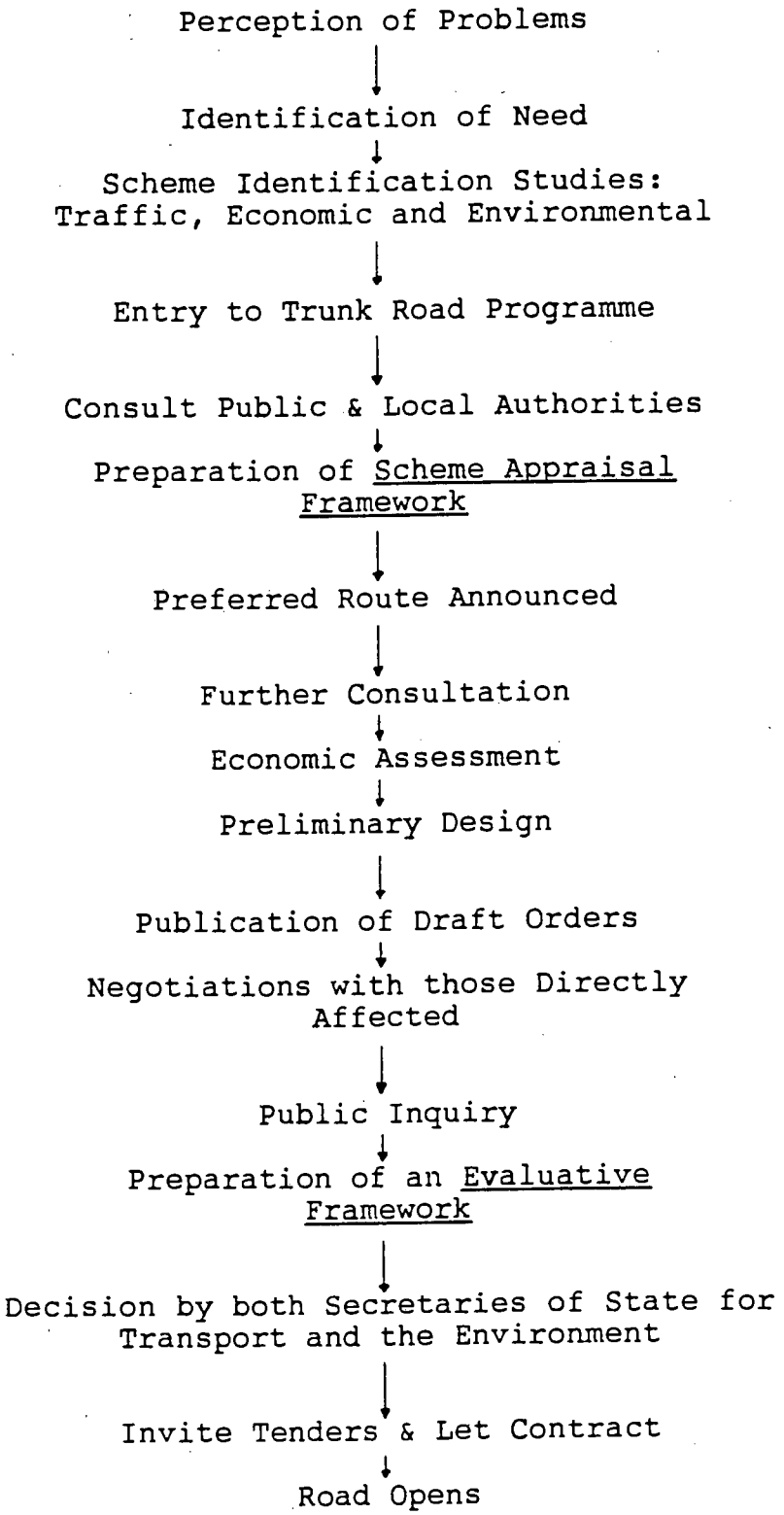

Figure 1: Stages in the Planning Procedure for Trunk Roads in the United Kingdom.

The environmental effects of the alternatives on particular groups of the community can be determined. According to Turnbull a typical Public Consultation entails:

> "... an exhibition of drawings showing design details, traffic flows, noise predictions, landscape proposals and may also include a model of the proposals."
> (Turnbull, 1984, p315)

The results of these appraisals are drawn together into a draft Scheme Appraisal Framework which allows relevant factors, data and public preferences for each of the alternatives to be reviewed. A comparative review process is undertaken to determine the Preferred Route (comparing pairs of options on a one-to-one basis). The Preferred Route, shown in comparison to the alternatives, is recommended, by the appointed consultant, in a report to the Department of Transport. If the Secretary of State for Transport approves, then the Preferred Route is announced by the Minister.

More detailed surveys, designs, technical and economic assessments are undertaken together with further, more detailed, consultations. At the end of this stage, Draft Orders are published and negotiations are held with those parties affected by the road scheme. For trunk roads, there are three statutory orders, namely:

- Line Orders : define the centre line of the new road;
- Side Road Orders : define the extent and modification to existing roads and the location of new junctions; and
- Compulsory Purchase Orders : define the area of land required for the construction of the scheme.

These orders must be published in draft to enable other authorities, the public and interested parties to object. For

Line and Side Road Orders, thirteen weeks need to be provided for, to allow those affected by the scheme to object. Compulsory Purchase Orders require an objection period of three weeks (Turnbull, 1984, p314).

Following the publication of draft orders and on receipt of objections, a Public Inquiry may be held. A Public Inquiry is only mandatory if the Department is unable to resolve the objections received through negotiation (Turnbull, 1984, p314).

A Public Inquiry is conducted by an independent Inspector nominated by the Lord Chancellor. The Inspector's main duties are:

> " - to take account of objections from people affected by the proposals;
> - to report on these objectors;
> - to make recommendations to the Minister on the proposals."
>
> (Law, 1986, p70)

Although the Inspector hears objections and representations for and against the scheme, he/she is not a judge, nor is the Public Inquiry a court of law. However, it is based on the common law principle, *audi alteram partem* - hear the other part.

At the Inquiry aspects ranging from: the need for the road, the choice of alternative, the land take and details of the impacts that the scheme is likely to have, are considered by the Inspector. A more detailed Evaluative Framework is also prepared at this stage. At the end of the Public Inquiry the Inspector

> "... reports his findings to the Secretaries of State for Transport and Environment, commenting on objections to the published route and alternatives proposed and the various assessments. He also recommends for or against the scheme with or without

modifications, occasionally suggesting that a completely different alignment be pursued."

(Wootton, 1986, p12)

The Inspectors report comprises of two parts, namely: part one, the summary of the evidence presented, focusing on the impacts likely to arise in quantitative terms while presenting qualitative judgments about their significance if they stem directly and unequivocally from the evidence, and part two, consisting of the Inspectors assessment of the significance of the impacts and the balancing of the various arguments (Hickman, p77).

The final decision then lies jointly with both the Secretaries of State for Transport and the Environment as to whether the scheme should go ahead.

After the trunk road scheme has been approved, land is purchased, tenders are invited, the contract is let and construction commences.

The next section discusses the framework approach which was mentioned at various stages in this section.

1.2. THE FRAMEWORK

The framework approach is a methodology, developed in the United Kingdom, for the environmental appraisal of road schemes, where methodology in the 'Milieu-Effect Rapportage' is defined as a:

"**Method** of selecting, organising, evaluating and presenting information on the **impact** of the **activity** alternatives."

(Ministerie van Volksgezondheid en Milieuhygiene, 1981)

As seen in the previous section, frameworks are prepared at different stages in the planning procedure for road schemes. The framework allows for the comparison of the impacts on people for the alternative options of a road scheme. It is an aid to the decision-maker providing a balanced set of comparative data (environmental and economic).

In order to standardise the approach and to have a methodology that is replicable from scheme to scheme there needs to be consistency in the grouping of both the major effects of the alternatives and the groups of people affected.

In the United Kingdom the people affected by the scheme are considered in the following groups (Law, 1986, p71 & Sampson, 1986, p85):

Travellers	:	differentiating between vehicle travellers, pedestrians and cyclists.
Occupiers	:	differentiating between types of premises ie residential, industrial, commercial, schools, hospitals, farming, open space and public buildings.
Users of Facilities	:	ie users of shops, library and community centres, sports facilities and parks.
Policies for Conserving and Enhancing the Area	:	environmental and conservation policies that express the view of the national and local authorities.
Development and Economic Policies	:	land use and economic development policies that express the view of national and local authorities.
Financial Effects	:	direct monetary expenditure, monetary benefits to Travellers and calculating the Net Present Value.

Occupiers and Users differentiate between those who are tied to an area (Occupier) and those who have a choice (User), (Lievesley, 1985, p3-4).

In the framework, the major environmental impacts that can have an effect on the above groups are considered to be (Law, 1986, p71):

- Traffic Noise
- Driver Stress
- Visual Impact
- Air Pollution
- Ecological Impact
- View from the Road
- Community Severance
- Effects on Agriculture
- Disruption Due to Construction
- Effects on Pedestrians and Cyclists
- Effects on Heritage and Conservation Areas

The techniques and standards used to assess the effect that these impacts have on the appraisal groups are provided in the Scottish Transport Environmental Appraisal Manual (STEAM) and the Manual of Environmental Appraisal (MEA).

Right at the outset of the project it is useful to start to arrange the collection of data within the Framework format. This will allow the Framework to develop as the process of refinement and selection of alternatives develops (Law, 1986, p71, & Lievesley, 1985, p4). Referring to Figure 1, there are two stages in the planning procedure for roads where a Framework is formally prepared. The first stage is for Public Consultation before the Preferred Route is announced and the second stage is for the Public Inquiry before the decision by the Secretaries of State.

The Framework is an aid to the decision-making process as the Framework itself does not generate a decision. The following extract from STEAM illustrates this:

> "Frameworks are an aid to judgement. Without judgement, applied both to the extent of the data and to their interpretation, frameworks have little value. With good judgement, frameworks can greatly assist the selection of routes in that the choice can be seen in terms of its effects on people."
>
> (Dept of Transport, 1986, para 1.2.3)

It is unlikely that the preferred choice will be superior in all respects which complicates the decision-making task where the quantitative and qualitative net costs and benefits for the alternatives are being compared. Because of this difficulty, a pair-wise comparison technique has been adopted which compares pairs of options on a one-to-one basis. At each stage of this process one of the options is discarded. The outcome of the various stages of this pair-wise comparison are recorded for future reference at the Public Inquiry (Dept of Transport, 1986, §2.4.2, Lievesley, 1985, p6 & Law, 1986, p71).

Once the Preferred Route has been selected, the detailed design commences. At the same time the routes strongly favoured locally are investigated in more detail to assure and demonstrate they are not contenders to those present at the Public Inquiry, when a second Framework is prepared (Dept of Transport, 1986, §1.4.7).

To conclude, Law (1986, p65) states that although the process has become very lengthy and complex, it does ...

> "... require the designer to carry out full and proper route option evaluation, and to demonstrate to the public that he has."

1.3. CRITICAL ASSESSMENT

According to Kennedy (1988, p258), the United Kingdom has adopted an informal-implicit approach towards environmental evaluation. This approach is primarily based on administrative controls rather than requirements specifically codified in legislation. ie formal-explicit approach. Kennedy goes on to say that although, on the surface, there is no reason to believe that either approach is more advantageous than the other,

> "experience has shown that, generally speaking, EIA is only integrated in decision making (that is, it only works) when it is applied in a formal-explicit way."
>
> (Kennedy,1988, p258)

The Department of Transport in the United Kingdom has developed the framework approach which is to some extent integrated into the road planning procedure (see Figure 1, p17). However, in a paper on urban road appraisal, Wootton outlined that there should be

> "greater integration of road planning with land use and transportation planning and environmental improvement."
>
> (Williams et al, 1987, p896)

Bridle et al (1981, p303) acknowledged that the environmental appraisal methodology was still in its infancy, and that the framework was a simple step in the right direction. Being a relatively new approach, the framework has received criticism since its introduction.

Kennedy (1988, p258) criticises the United Kingdom's approach for its vague generalisations about the impacts of roads on the environment as opposed to quantified forecasts which can be subject to verification.

The framework can also be criticised because it does not yield a decision - it is merely an aid to the decision making process. The appraisal

> "still leaves the weighting of alternatives to judgement and ultimately the quality of the judgement will depend on the skill, knowledge and humanity of those who decide."
>
> (Bridle et al, 1988, p303)

Brandt (in Bridle et al, 1982), in commenting on a paper on environmental appraisal of trunk roads, highlights the main areas for future research as the:

> "identification of critical elements in the framework to reduce the size and complexity of the framework itself, the reduction of data collection for individual schemes by relying more on nationally credible data banks, and the reduction of the areas needing subjective judgement."
>
> (Bridle et al, 1982, p499)

The point was also made that there may currently be too much emphasis on the economic evaluation to the detriment of environmental considerations (Williams et al, 1988, p 898).

The Standing Advisory Committee on Trunk Road Assessment's (SACTRA's) report on urban road appraisal and the government's response to this report concluded that:

> "changes were needed in urban road appraisal methods: changes both to the planning procedures to be adopted and, especially the issue of public involvement, as well as changes to actual techniques used in the assessment of schemes."
>
> (Williams et al, 1988, p896)

Although a number of changes have been proposed, the Department of Transport's Manual of Environmental Appraisal (1983) is considered to be a sound basis for the environmental appraisal of roads in the United Kingdom, (Williams et al, 1988, p 897).

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CHAPTER TWO: UNITED STATES OF AMERICA

There are three levels of government which are responsible for roads in the United States. At the highest level is Federal Government, represented by the Federal Highway Administration (FHWA), which falls under the United States Department of Transport. The second level consists of State highway agencies, with the last level of government consisting of local authorities.

The Federal-Aid Highway Program, administered by the FHWA, provides financial assistance to State highway agencies who in turn provides financial assistance to local authorities for the construction and improvement of efficiency in highway and traffic operations. There are four major road systems that fall under the Federal-Aid Highway Program, they are:

- the National System of Interstate and Defence Highways consisting of high-capacity roads built to the latest and safest standards to serve major population and industrial centres,
- the State Primary System consisting of rural arterials and their urban extensions in each state,
- the Secondary Road System consisting of roads that are more than local assistance but which are not primary arterials, and
- the Urban System consisting of arterial and collector roads in urban areas which are not primary or secondary roads (Office of the Federal Register, 1989, p454-455 and The Encyclopedia Americana, 1984, p565).

The fifty States in the US are each responsible for initiating, planning, designing and constructing roads within their own State. However, although the different State highway agencies each have their own road development procedures, they are similar due to the strong role played by the FHWA. The

financial arrangement that exists between Federal, State and Local government allows the FHWA, funding most road projects, to dictate what road development procedures should be followed (Cohn & McVoy, 1982, p137).

The FHWA, administering various highway transportation programs, gives consideration to the environmental impacts of highway development and travel, transportation needs, engineering and safety aspects and project costs. To ensure a balanced treatment of these factors in the project development and decision-making process, a systematic interdisciplinary approach as called for in the National Environmental Policy Act of 1969 (NEPA), has been adopted by the FHWA.

Furthermore, in accordance with Section 102(2) of the National Environmental Policy Act of 1969 (NEPA) all Federal agencies including the FHWA shall, to the fullest extent possible:

- utilise a systematic, interdisciplinary approach in project development and decision-making,
- identify and develop methods and procedures to insure that appropriate consideration is given to environmental, economic and technical aspects in the decision-making process,
- prepare a detailed statement, for major Federal actions significantly affecting the quality of the human environment, on:
  - (i) the environmental impact of the proposed action,
  - (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
  - (iii) alternatives to the proposed action,
  - (iv) the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
  - (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented,
- involve Federal, State and Local agencies, together with the public in the preparation of such a statement (NEPA, 1969).

In 1970, the Council on Environmental Quality (CEQ), being responsible for overseeing NEPA, issued guidelines confined to section 102(2)(c) of NEPA, for the preparation of environmental impact statements.

In response to NEPA and the CEQ guidelines, the FHWA set out specific mandates for change in the Federal-Aid Highways Act of 1970. However, with the FHWA delegating the responsibility of planning, designing and constructing roads to the State Agencies, the implementation of the Federal-Aid Highways Act initially proved to be a problem. This was overcome in December 1974 when the FHWA issued 'Process Guidelines (for the Development of Environmental Action Plans)' in the Federal-Aid Highway Program Manual, Volume 7, Chapter 7, Section 7 (FHPM 7-7-1): (Cohn & McVoy, 1982, p117).

These guidelines, recognising the unique situation of each State, do not prescribe specific organisations or procedures. They do however identify issues to be considered in reviewing the present organisation and processes of a highway agency as they relate to social, economic and environmental considerations, and identify issues to be considered in developing desirable improvements. The guidelines give attention to matters which include: policy; procedures; contents of Environmental Action Plans; considering alternative courses of action; involving other agencies and the public, and the decision-making process (Dept of Transport, 1974).

The FHWA's policy in the 'Process Guidelines' states that:

> "... full consideration be given to social, economic and environmental effects throughout the planning of highway projects, including the system planning, location and design; that provisions for ensuring such consideration shall be incorporated in the decision-making process; and that decisions shall be made in the best overall public interest ..."
>
> (Dept of Transport, 1974, §4)

Furthermore, to ensure that the decision-making process merits public confidence in the highway agency it is also the policy of the FHWA that:

> "(1) social, economic and environmental effects be identified and studied early enough to permit analysis and consideration while alternatives are being formulated and evaluated,
> (2) other agencies and the public be involved in system planning and project development early enough to influence technical studies and final decisions, and
> (3) appropriate consideration be given to reasonable alternatives, including the alternative of not building the project and alternative modes."
>
> (Dept of Transport, 1974, §4)

In 1978, new CEQ regulations, replacing the 1970 guidelines for the preparation of environmental impact statements, were issued and became effective as from July 1979. These regulations, binding to all Federal agencies, provide uniform standards applicable throughout the Federal government for conducting environmental reviews. In September 1979, the Department of Transport published an order on the 'Format and Context of Environment Impact Statements' (Dept of Transport, 1979). The Department of Transport order adopts procedures in accordance with the CEQ regulations. The difference between the CEQ regulations and the Department of Transports order is that the order is specific to transport while the CEQ regulations are more general.

The next section takes a closer look at the planning procedure for roads in the United States to see how environmental appraisal and public participation are integrated into the planning procedure.

2.1. PLANNING PROCEDURE FOR ROADS IN THE UNITED STATES

In the US, each of the State highway agencies have developed their own Environmental Action Plans (EAP) in terms of the FHWA's 'Process Guidelines' (FHPM 7-7-1). The EAP is in accordance with the NEPA mandate requiring that agencies use a "systematic, interdisciplinary approach" to project development. The EAPs of the State highway agencies indicate the procedures to be followed in the planning and development of highway projects.

Each of the State highway agencies EAPs have been developed to meet the needs of the particular organisational structure within the State Department of Transport (DOT). Thus there are some basic differences between the different State EAPs. However, these are related more to the organisational structure than to the development process as the FHWA's 'Process Guidelines' are quite specific and constraining to the State highway agencies (Cohn & McVoy, 1982, p136-137).

This section discusses the general planning procedure for the development of highway projects, as called for by NEPA and the FHWA's 'Process Guidelines'.

The main stages in the highway development process are the:

- systems planning stage: statewide or regional analysis of transportation needs and the identification of transportation corridors (project proposals),
- location stage: extensive public participation is involved in the selection of a particular location,
- design stage: the establishment of a precise centreline location within the already approved corridor and the development of the final construction plans,
- construction stage: the actual construction of the road, and
- operations stage: the opening and use of the road.

Provision must be made throughout the system planning, location and design stages to:

- identify potential social, economic and environmental effects, both beneficial and adverse of alternative courses of action, and
- ensure that all interested parties, including local governments and metropolitan, regional, State and Federal agencies, and the public, have an opportunity to participate and express their views (Dept of Transport, 1974, §9 & §11).

Thus, with regards to identifying potential social, economic and environmental impacts and involving interested parties, the first three stages of the development process are the most significant and are therefore discussed in more detail.

2.1.1. Systems Planning Stage

System planning involves an analysis of the transportation system to determine the needs. Once particular needs have been identified, usually as a result of the ongoing planning process, Federal requirements or public concern, a project is initiated. Opportunities are provided at this stage for outside agencies and the public to contribute to the project proposal. Emphasis is also placed on identifying the broad social, economic and environmental impacts in order to determine the sensitivity of particular impacts and possible trade-offs or compromises that may be considered necessary.

However, at this stage the study is quite technical as traffic analyses of existing conditions are carried out. Based on these analyses, forecasts simulating growth, traffic and transport needs in relation to social and economic trends are carried out for different alternatives. This aids the process whereby preferred transportation corridors are identified.

2.1.2. Location Stage

This stage involves extensive participation, from other agencies and the public, in selecting the route location. It is usually during this stage that a public hearing is held, or the opportunity for such a hearing is afforded. This is in accordance with the FHPM 'Process Guidelines' (Dept of Transport, 1974, §11).

According to Zube (1984, p54), the public hearing, organised by the highway authority, is a formally structured meeting where anyone who desires to can present a statement in public on the issue under consideration. The main purpose of the public hearings are therefore to provide a medium for free and open discussion, encouraging early and amiable resolution of controversial issues (Institute of Transport Engineers, 1976, p628).

The project can follow one of three different development processes in the location stage, ie a category I, II, or III process. This is in accordance with NEPA, CEQ regulations and the FHWA's 'Process Guidelines' which require that (highway) agencies identify:

- actions that normally meet the criteria for an environmental impact statement (EIS) to be prepared (ie category I),
- actions which normally require that an environmental assessment (EA) be prepared (ie category II), and
- actions which normally do not have a significant effect on the human environment and can then be categorically excluded from further NEPA review processes (ie category III).

The three possible development processes in the location stage are shown schematically in Figure 2 and are discussed below.

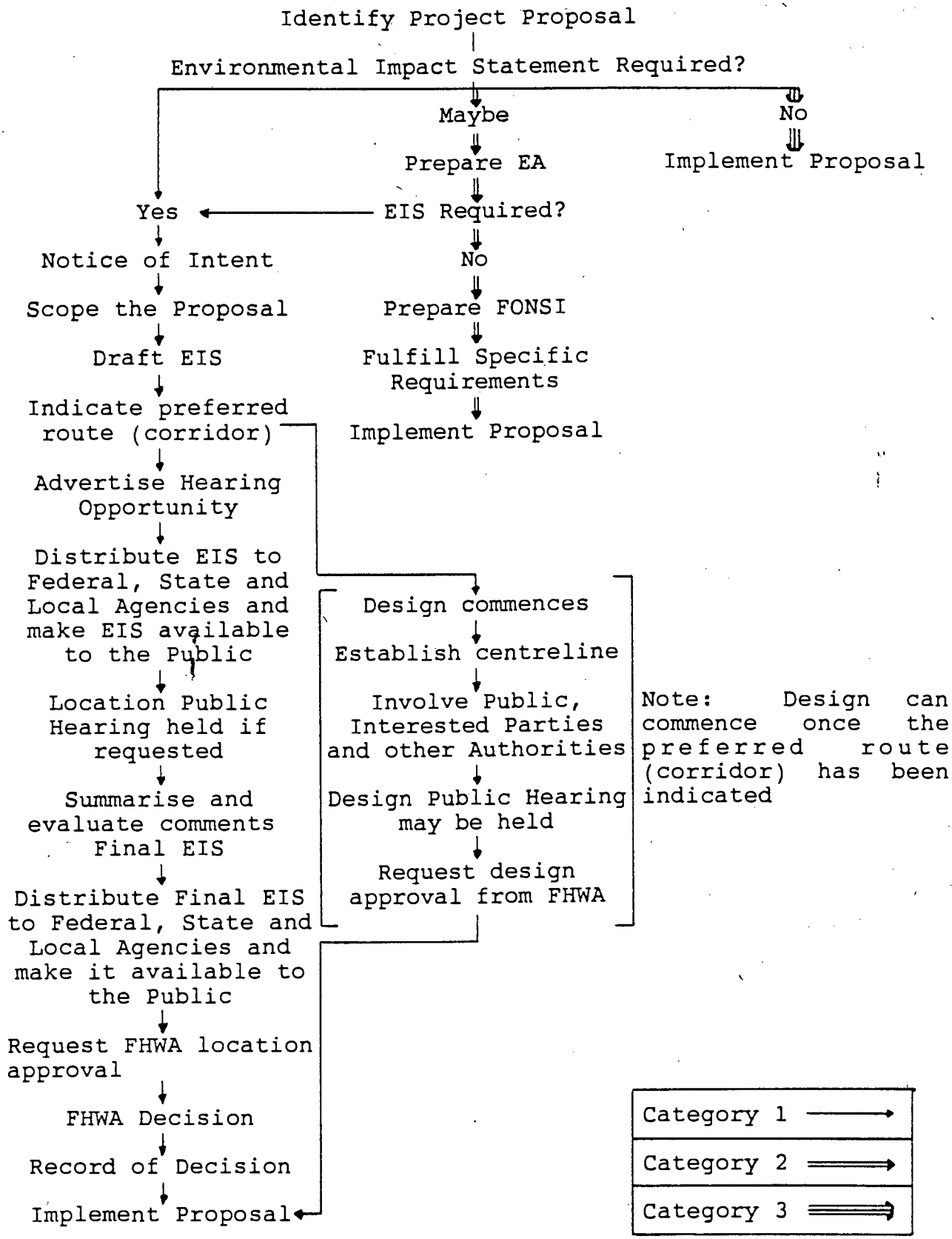

Figure 2: Stages in the Planning Procedure for Roads in the United States of America.

Category I Process - The Preparation of an EIS: Once it has been decided that an EIS is necessary, the highway agency must publish a notice to that effect in the Federal Register. The notice shall describe briefly: the proposed action and alternatives, the proposed scoping process and when and where a scoping meeting will be held, and the name and address of the person who can answer queries about the proposed action and the EIS (Council on Environmental Quality, 1978, §1508.22).

The scoping process then commences to identify the significant issues related to the highway proposal and to focus on the relevant issues to be addressed in the EIS. Scoping is conducted by a multidisciplinary team and involves other agencies at all levels of government (Federal, State and local) as well as the general public.

The draft EIS is then prepared by the highway agency or by a party contracted by the highway agency. The EIS is a detailed analysis and statement of the highway proposal and is to include: a discussion on the purpose and need of the proposed highway and alternatives, an analysis of the affected environment and the environmental consequences of the proposed highway and alternatives, and the preferred route (corridor). (The format and contents of the EIS as required by NEPA, the CEQ regulations and the FHWA's 'Process Guidelines' is discussed in more detail in the next section.)

At this stage the opportunity for a public hearing is advertised and if the public and interested parties request such a hearing then only is the public hearing held.

At the same time, the draft EIS is circulated for a minimum of 45 days and comment is invited from: the Environment Protection Agency (EPA); the Council on Environmental Quality; other Federal, State and local agencies; interested organisations and individuals, and the general public.

The comments are evaluated and a final EIS which incorporates and accommodates the comments and concerns is prepared. The comments received together with the highway agency's response are

generally attached to the final EIS. The final EIS is also distributed to other agencies and the public and the FHWA's approval is requested. The final decision is made at least 30 days after the final EIS or 90 days after the draft EIS has been made available, whichever is the later (Council on Environmental Quality, 1983, p255).

A record of the decision is then prepared and filed with the EPA. The record of decision is a concise public document which states what the decision was, the alternatives considered and the rationale for the decision. Descriptions of any mitigation measures and monitoring programme are also included.

Category II Process - The Preparation of an EA: An Environmental Assessment (EA) is public document prepared by the highway agency to help the agent decide wether or not an EIS is necessary. The EA is a brief document (10 - 15 pages) on the need for the highway proposal, alternatives considered, the environmental impacts of the proposed highway and alternatives, and a list of agencies and persons consulted. The EA is made available to other agencies and the public for comment. If the outcome of the EA found that an EIS is required, then the category I process, already mentioned, is adopted. However, if the outcome is that an EIS is not required then the highway agency will prepare a Finding of No Significant Impact (FONSI). The FONSI consists of a brief description of the proposed action, a summary of the EA and the reasons why the proposal will not have a significant effect on the human environment and hence why no EIS will be prepared. The FONSI is made available for 30 days for comment by other agencies and the public.

Category III Process - Categorical Exclusion: If the highway project does not have a significant effect (individually or cumulatively) on the human environment and is categorically excluded from further NEPA review processes in terms of NEPA and CEQ regulations, then the design stage can commence.

2.1.3. Design Stage

In the design stage the precise centreline within the approved corridor is established and the final design and construction plans are developed. As some of the activities and decisions in the design stage can be sensitive, the FHWA requires that interested parties (including other agencies and the public) have an opportunity to "participate in an open exchange of views" throughout the design stage (Dept of Transport, 1974, §11). This can be done by holding informal meetings and/or a formal design public hearing. The design public meeting, if held, occurs before the responsible authority is committed to a specific design.

The design stage can commence once the preferred route (corridor) has been indicated, ie before the location stage is complete. Due to this overlap between the location and design stages, a combined location and design public hearing can be held.

Once the design is completed, the highway agency lets the contract out to tender, awards the contract and supervises the construction. If and when required, the project will be monitored during construction to ensure that any specific requirements are fulfilled.

2.2. THE ENVIRONMENTAL IMPACT STATEMENT (EIS)

In accordance with the National Environmental Policy Act of 1969 (NEPA), an Environmental Impact Statement (EIS) must be prepared for major Federal actions significantly affecting the quality of the human environment.

The EIS is a decision-making tool which focuses on the significant aspects of the probable impact of the proposed action

and alternatives. The document is a public document and must therefore be written in a language understandable to non-technical minds, while at the same time contain enough reasoning to alert specialists to particular problems within their field of expertise (Homburger & Kell, 1986, p29-4).

The prescribed format set out in the CEQ Regulations that State highway agencies must adhere to unless there is a compelling reason to do otherwise is as follows:

- Cover Sheet
- Summary
- Table of Contents
- Purpose and Need for the Action
- Alternatives Including the Proposed Action
- Affected Environment
- Environmental Consequences
- List of Preparers
- List of Agencies, Organisations, and Persons to Whom Copies of the Statement Are Sent
- Index
- Appendices (if any)

The principle sections are briefly discussed below.

Summary: The summary (not exceeding 15 pages) shall adequately and accurately summarise the EIS stressing the major conclusions, areas of controversy and the issues to be resolved.

Purpose and Need for the Action: In this section the highway agency shall briefly specify the underlying purpose and need for the project and its alternatives.

Alternatives Including the Proposed Action: This section is to present the environmental impacts of the alternatives in comparative form and thereby provide a basis from which the decision-maker and public can make a choice. Alternatives to be

considered include: alternative types and scales of highway improvements, other transportation modes, the alternative of 'do nothing' or postponing the project pending further studies and the identification of alternatives related to different locations, designs and/or details of the proposed project which would present different environmental impacts. In carrying out a comparative evaluation of the environmental benefits, costs, and risks of each reasonable alternative the highway agency is to indicate the preferred alternative and any mitigation measures that are considered necessary.

Affected Environment: The affected environment is to be described in order to be able to understand the effects of the various alternatives on the environment. This section is to focus on the important issues while summarising, consolidating or simply referring to the less important issues.

Environmental Consequences: This section forms the scientific and analytic basis for the comparison and selection of alternatives. Based on NEPA and the CEQ regulations which broadly define the analysis to be conducted, the Department of Transport has developed more specific guidelines (Dept of Transport, 1979) as to the actual impacts to be considered in this section. Based on the NEPA, CEQ regulations and the Department of Transport guidelines, this section should include an analysis of:

- significant direct and indirect impacts, and any unavoidable adverse effects, ie:

    * impacts on community facilities and services
    * community disruption and relocation
    * undesirable land use patterns
    * the effect on employment, income and business activity
    * the impact on traffic and transportation
    * impacts on cyclists, pedestrians, handicapped and elderly
    * impacts on historic and cultural sites

  * impacts on urban quality
  * the effect on health
  * impacts on public parks and recreation areas, wildlife and waterfowl refuges
  * air pollution
  * noise
  * damage to terrestrial and aquatic life systems
  * impacts during construction;

- any irreversible and irretrievable commitments of resources, ie actions that will irreversibly curtail the potential use of both natural and cultural resources, such as the loss of wetlands, vegetation, agricultural land and historic sites;

- the relationship between short and long term use of man's environment and the maintenance and enhancement of long term productivity, ie looking at trade-offs between short-term losses and long term gains, or vice versa;

- possible conflicts between the proposal and Federal, State and local land use plans, policies and controls;

- energy, natural and depletable resource requirements and conservation potential, and

- mitigation measures not discussed in the alternatives section of the report (Baldwin, 1985, p254 & DOT Order 5610.1C, 1979 §1-16).

Some of the numerous methods that are available to the highway agencies for the assessment of environmental concerns include: matrices, indices, overlays models and system and simulation models (Wilson & Stonehouse, 1983, p760).

2.3. CRITICAL ASSESSMENT

According to Watkins (1981, p2), the United States of America has in recent years been very much in the forefront of environmental action. This has primarily been a result of the National Environmental Policy Act (NEPA, 1970), especially section 102(2), which requires an Environmental Impact Statement (EIS) to be prepared for

> "major Federal actions significantly affecting the quality of the human environment."
>
> (NEPA, 1970)

Some of the criticisms which NEPA originally received included:

> "EIS's took too long to prepare, cost too much, were too bulky, and generally lacked analytical focus"
>
> (Council for the Environment, 1985, p112)

Being at the forefront of environmental evaluation the USA had the disadvantage of having to learn from their own mistakes, rather than from another's mistakes. Thus, it was probably inevitable that there were problems in the implementation of NEPA. In 1978, Regulations for implementing the Procedural Provisions of NEPA were introduced to address initial shortcomings.

More specifically with regard to roads, the Department of Transport has established headings to be followed in the preparation of the EIS. Watkins (1981, p2) said that although this gives the indication of a comprehensive EIS which provides all the required answers,

> "this is not the case. ... the EIS can in many respects be little more than a formalised expression of ignorance; a list of headings of topics that are realised to have

environmental significance but which it is not known how to assess or even put into an order of priority."

(Watkins, 1981,p3)

In examining the biological, physiographic, social and economic predictions in past EIS's in the United States, Friesma states that:

"perhaps the kindest thing that can be said about most predictions in EIS's is that they are not clearly wrong. But the reason that they are not clearly wrong is that the predictions themselves tend to be so vague and general that it would be very difficult for them to be clearly wrong!"

(Friesma, 1987, quoted in Kennedy, 1988, p258)

Convisser (1979, p40), highlights the problem of the decision making process as it has developed under NEPA as follows:

"the lack of a consistent approach to make trade-offs between competing environmental values and between environmental and non-environmental values. ... A second related conclusion is that just as there are competing objectives, issues also are fought out in an adversary process between competing groups."

(Convisser, 1979, p40)

The external review process of EIS, in the United States, is through a formalised inter-agency review process where the Environmental Protection Agency, (EPA), plays a leading role. This review process has a disadvantage when compared to other review processes where independent panels of experts are appointed for each individual project. These panels issue guidelines for the preparation of the EIS and their review of it. Consequently, Kennedy (1988, p201) states that the review is likely to be more thorough.

However, in spite of the criticism, Convisser (1979, p41) highlights the importance of institutional structures and processes when he states that

> "the major revolution which NEPA has wrought in government decision-making and decisions arises from a procedural requirement - the requirement that there be an environmental impact statement, analysing impacts and alternatives, available to public scrutiny."
>
> (Convisser, 1979, p41)

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CHAPTER THREE: CANADA

Canada is a federation of ten provinces and two territories. The central authority is the Canadian Federal Government. Each of the provinces have their own government which have similar parliamentary systems to the federal government. The territories are administered by the federal government, although they do have locally elected councils. Therefore although the provinces have similar parliamentary systems to the federal government, there is a clear division of responsibility between the federal and provincial governments. The division of responsibility is such that the provinces have an autonomous role in many areas of jurisdiction. Both transportation and the environment are two such areas (Jones, 1984, p35 & The New Encyclopedia Britannica, 1986, p495).

With regard to roads, the federal, provincial and local governments responsibilities are as follows:

Federal Government is responsible for: interprovincial and international roads such as the Alaska Highway and the Trans-Canada Highway; roads in the national parks; roads in Yukon and Northwest Territories, and roads that are for the general advantage of Canada, ie roads to resources such as potential mines or tourist attractions (The Encyclopedia Americana, 1979, p484 & Hogg, 1985, p484).

Provincial government is responsible for the planning, design, construction and operation of all intraprovincial roads (Jones 1984, p35 & Hogg, 1985, p484).

Local government at the municipal level is exclusively the responsibility of the provinces. As there are ten provincial government systems, so there are ten distinct municipal systems in Canada, as well as variations within each system. The powers and responsibilities of the more than 4 700 municipalities are

varied according to their classification which depends on the province within which it falls, it's historical development, it's area and population density (The New Encyclopedia Britannica, 1986, p496).

In December 1973, the federal Environmental Assessment Review Process (EARP) was established by a Cabinet decision. The decision was adjusted in February 1977 and reaffirmed in the Government Organisation Act of 1979. In 1983, the Cabinet ordered an evaluation of the EARP approach. This resulted in process improvements being proclaimed in 1984 by an Order-In-Council (OIC) which replaced all the previous Cabinet decisions (FEARO, 1985, p9). The directives detailed in the Environmental Assessment Review Process Guidelines Order require each federal department or agency to assess its own activities and proposals.

Road projects that are subject to the federal Environmental Assessment Review Process (EARP) are as follows:

- road projects that are undertaken directly by federal government (usually the Federal Department of Transport or the Federal Department of Public Works),
- road projects funded by federal government,
- road projects located on federal land, and
- road projects that may have an environmental effect on an area of federal responsibility (FEARO, 1987, p1).

As the provincial governments have autonomous control over the environment, they do not need to adhere to the federal EARP approach unless the project falls into one of the above categories. The provinces have instead developed their own approaches for the environmental assessment of their activities and proposals. However, for the purpose of this study only the approach adopted by the Province of Ontario, the first province to enact any environmental legislation in Canada (even before the federal government), will be discussed.

In September 1973, a Green Paper on Environmental Assessment was published by the Ministry of the Environment in Ontario. The paper indicated the rationale for a comprehensive environmental assessment program and the different options for preparing and reviewing the environmental assessment document. Over the next two years there was extensive public and in-house discussion of the Green Paper, with comments and suggestions being received and analysed. This resulted in the drawing up of the Environmental Assessment Bill. Following a number of substantial amendments after the first reading, the Bill finally received Royal Assent in July 1975 and was enacted in October 1976 (MOE Ontario, 1979, p7; Donat, 1979, p23 & Plewes, 1981, p3). The Act applies to activities of provincial, municipal and conservation authorities in Ontario and to private sector undertakings specifically or generically defined and designated by Regulations passed under the Environmental Assessment Act.

The purpose of the Environmental Assessment Act is for:

> "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment."
>
> (Environment Assessment Act, 1975, §2)

In the Act, environmental assessment refers to both the process in which the consequences of the project and alternatives are assessed, and to the actual environmental assessment report which documents the process. The Act proposes environmental assessment as a means to achieve the following objectives:

> "(a) To identify and evaluate all significant environmental effects of proposed undertakings at a stage when alternative solutions including remedial measures and the alternative of not proceeding, are available to the decision-makers, and
>
> (b) to ensure that the proponent of an undertaking and governments and agencies required to approve

the undertaking give due consideration of the means of avoiding or mitigating any adverse environmental effects prior to granting any approval with an undertaking."

(Donat, 1979, p23)

Furthermore, the Act stipulates that the undertaking shall not proceed until:

"(a) the environmental assessment has been accepted by the Minister of Environment, and

(b) the Minister of Environment has given his approval to proceed with the undertaking."

(Environmental Assessment Act, 1975, §5).

Approval is based on a review of the environmental assessment report by appropriate Ministers, and co-ordinated by the Minister of the Environment. This is to avoid unnecessary commitments or expenditures on a project prior to the approval to proceed. Both the environmental assessment report and the review are released to the public (Jones, 1984, p45-47).

The environmental assessment process is comprehensive giving natural environmental aspects equal consideration alongside social, economic, cultural, energy-related, engineering and other project aspects. These are all integrated into the planning process and reflected in the environmental assessment report. The content of an environmental assessment report is stipulated in §5(3) of the Environmental Assessment Act. This will be discussed at a later stage.

The next section takes a closer look at the planning procedure for roads in Ontario to see how environmental assessment and public participation are integrated into the planning procedure.

3.1. PLANNING PROCEDURE FOR ROADS IN ONTARIO

In Ontario, the Environmental Assessment Act and the 'General Guidelines for the Preparation of Environmental Assessments' provide a framework for incorporating environmental considerations into the planning procedure. In terms of the Act, the environment is defined in broad terms to include biophysical, social, cultural and economic components (FEARO, 1985, p27). The planning procedure is based on narrowing down the field of alternatives and should involve constant feedback so that earlier decisions may be re-evaluated if necessary (MOE, 1979, p9).

All provincial road projects in Ontario are subject to the Environmental Assessment Act unless exempted by regulation, or by the Minister of Environment. The Ministry of Transport and Communication (MTC) has, in co-operation with the MOE, developed three different categories of road projects. The categories are based on the degree of potential for significant environmental impacts. Each category of road projects has certain requirements that must be adhered to in terms of the Environment Assessment Act. The categories are as follows:

TYPE A
A1 - New Routes
A2 - Major Realignments
A3 - Bypasses

TYPE B
B1 - Highway Widening (Rural)
B2 - Adjustments (Rural)
B3 - Widening or Adjustments (Urban)
B4 - New Interchange
B5 - Water Crossings
B6 - Freeway Upgrading
B7 - Highway Service Facilities

TYPE C
C1 - Grade Separations
C2 - Operational Improvements
C3 - Lighting and Signing
C4 - Safety Projects
C5 - Landscaping
C6 - Bus Shelters
C7 - Noise Alterations
C8 - Resurfacing
C9 - Maintenance Operations
C10- Other

(Donat, 1979, p26)

Type 'A' projects have the highest potential for significant environmental impacts and require individual environmental assessments which involve detailed consideration of environmental factors together with extensive public participation. Two environmental assessments are required by law. One, at the end of planning (fixing the route location), and the other, at the end of design (before tenders are called).

Type 'B' projects have a reduced potential for significant environmental impacts and require class environmental assessments. Generally, these projects occur frequently and have a predictable range of impacts. A single environmental assessment is prepared for the 'class' of projects (ie road widening) rather than for each individual project. The class environment assessment documents the procedures the proponent will employ to satisfy the requirements of the Environmental Assessment Act each time a project under that class is undertaken by the proponent. The approval of the class EA is based on wether or not the choice and process of the class EA approach is acceptable to the Minister of the Environment.

> "Once the undertaking dealt with in the class document has been approved, and provided that the proponent complies with the approval and any terms and conditions specified in it, projects falling within the class can proceed from planning through to implementation, with no further formal applications required under the Environmental Assessment Act."
>
> (MOE, 1979, p17)

Type 'C' projects have little potential for significant environmental impacts and are thus automatically excluded from the formal requirements of the Environmental Assessment Act. The MOE is however required to:

> "... maintain environmentally sound construction and maintenance procedures and to address any spot environmental problems should they arise."
>
> (Donat, 1979, p27-28)

The environmental assessment procedure is shown schematically in Figure 3.

The procedure starts with the identification of the project. The need for the project is established so that the goals and objectives can be specified allowing for a full range of solutions to be examined.

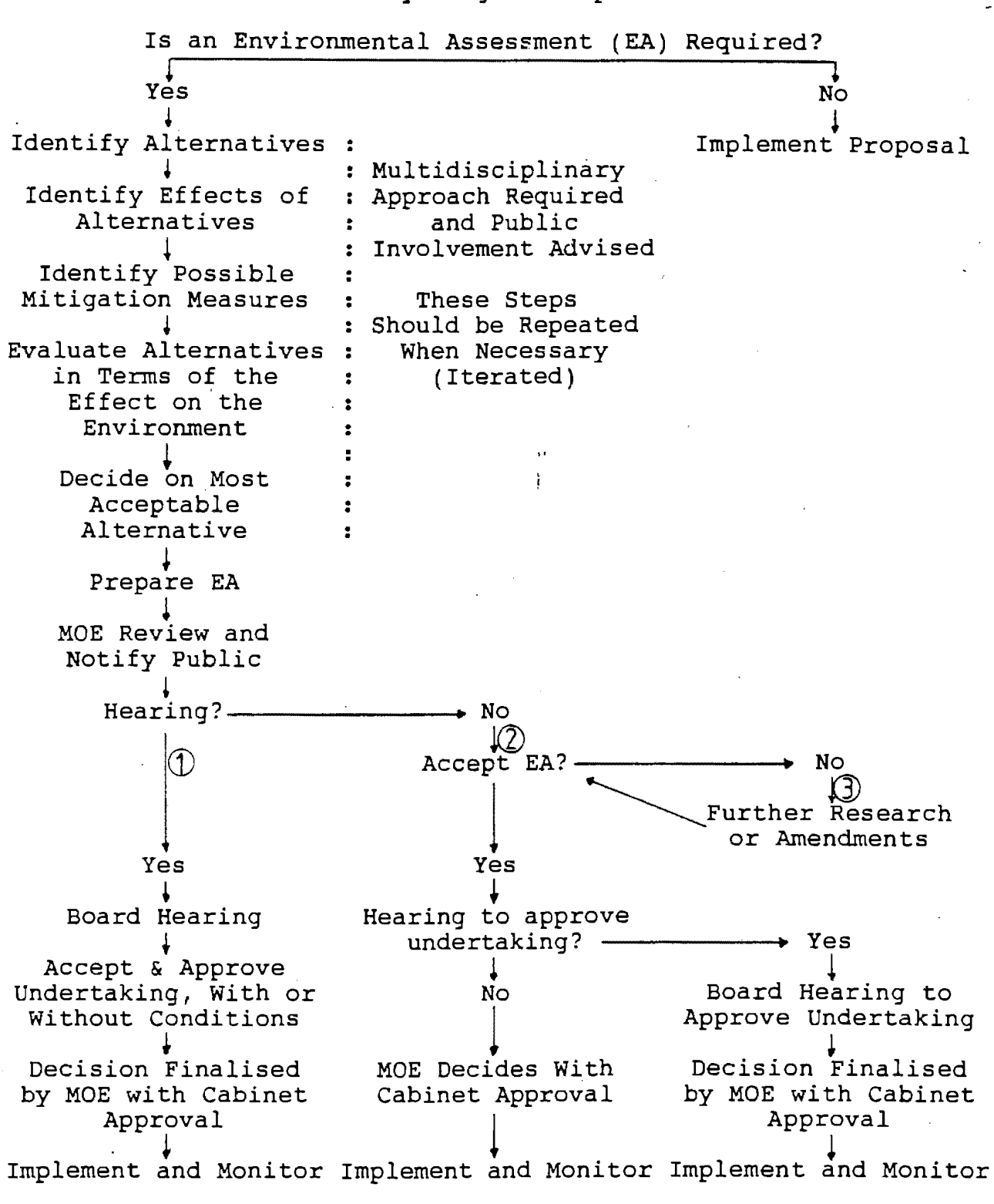
The next stage is to determine whether or not an environmental assessment is required. This depends on the degree of potential significant environmental impact and thus the category that the road project falls into. Both type 'A' and 'B' projects require environmental assessments, while type 'C' projects are exempt. While type 'A' projects require individual environmental assessments and type 'B' projects require class environmental assessments, both individual and class environmental assessments follow the same steps.

Once the need for an environmental assessment has been established, all reasonable alternatives that will achieve the specified goals and objectives should be identified, researched and evaluated. A study of the affected environment, for each alternative, is to be undertaken and documented. This study is to focus on the physical, biological, social and economic conditions and is to provide the base information for projecting future conditions (MOE, 1979, p11 & Donat, 1979, p59).

Both the positive and negative impacts in implementing each alternative should be predicted. These impacts should be determined objectively rather than subjectively and should be described under terms such as: short-term or long-term; reversible or irreversible, and commitment of resources (Donat, 1979, p60).

Possible mitigation to overcome potentially adverse impacts should be considered for each of the alternatives.

The above studies provide a base that enables the proponent to evaluate and compare the alternatives in terms of their positive and negative effects on the environment.



① EA Board decides on acceptance & approval	② No hearing held, MOE decides on acceptance & approval	③ MOE decides on acceptance & EA Board on approval

Figure 3: Stages in the Planning Procedure for Roads in Ontario.

Although the public should be involved at all stages, it is particularly desirable to involve the public at this stage to help determine what criteria and values to use in the evaluation of alternatives. The most acceptable alternative is then determined. The method used should provide:

> "... a means of comparing alternatives and, possibly for aggregating the impacts to a net total or composite impact."
>
> (Donat, 1979, p61)

At this stage, the proponent prepares an environmental assessment (EA) document.

The contents of the EA are considered in more detail in the next section. The completed EA is then submitted to the Minister of the Environment. The Minister, through the Environmental Assessment Branch, co-ordinates the review of the EA by the Environmental Assessment Branch and other interested Provincial ministries and agencies, and some selected federal departments and agencies (FEARO, 1985, p28).

The Environmental Assessment Branch then prepares a co-ordinated review based on the reviewers comments. On completion of the review, the Minister of Environment must notify the public that: the review is complete, and the place(s) where the EA and the review can be inspected.

There is then a minimum period of thirty days during which the public, reviewers or the proponent may make written submissions to the Minister of Environment on the undertaking, the EA, or the review. Furthermore, they may also by written notice require a board hearing with respect to the undertaking, the EA, or the review (Environmental Assessment Act, 1975, §7 & FEARO, 1985, p28). The board hearing, if held, is conducted by the Environmental Assessment Board, an independent tribunal established in 1976 under the Environmental Assessment Act, and is open to the public (Environment Ontario, 1989, p2).

The Environmental Assessment Act requires two major decisions to be made at this stage, namely:

> "(i) Acceptance of the EA: ie that the document is an adequate basis upon which to make a decision regarding the approval of the undertaking.
> (ii) Approval of the undertaking is granted, granted with conditions or not granted."
>
> (FEARO, 1985, p27)

The Environmental Assessment Board can be requested to make a decision with regard to the acceptance of the EA and the approval of the undertaking, or the approval alone (Environment Ontario, 1989, p2).

Therefore there are different routes that can be followed in getting the EA accepted and the undertaking approved:

Route 1 - If a hearing is considered necessary, the EA is sent to the Environmental Assessment Board for a hearing and a decision regarding both the acceptance of the EA and the approval of the undertaking. The Minister then has 28 days to alter the Board's decision (with cabinet approval).

Route 2 - If the Minister of the Environment has not received a submission requiring a board hearing, then the Minister can decide on the acceptability of the EA. If necessary, he may request further research or amendments before deciding on the acceptability of the EA. The public then has 15 days to decide whether or not a board hearing is required for the approval of the undertaking. The Minister then makes his decision on whether or not a board hearing is required. If no hearing is required the Minister, with Cabinet approval, then decides on the approval of the undertaking.

Route 3 - As in route 2, the Minister decides on the acceptability of the EA, however, the Minister or the public may require that a board hearing be conducted to approve the undertaking. The Minister then has 28 days to alter the Board's decision (with Cabinet approval).

The decision is then formalised, by the Minister of the Environment, and the project proposal is implemented and monitored.

3.2. THE ENVIRONMENTAL ASSESSMENT (EA) DOCUMENT

In accordance with the Environment Assessment Act, the proponent of an undertaking to which the Act applies, shall submit an EA of the undertaking to the Minister of the Environment.

The EA document is to serve as a mechanism for describing the environmental planning process, and the medium for reaching a decision on project implementation (Council for the Environment, 1985, p202).

The proponent is encouraged to discuss informally the requisite items to be included in an EA with the Ministry of Environment. The ministry will assist the proponent in developing an acceptable study design for the EA, and if requested, project-specific guidelines to assist in identifying the information requirements of the Environmental Assessment Act. However, the ministry will not recommend any specific environmental assessment method to be used. Instead, the proponent is advised to select a method based on the specific nature of the project and his internal way of doing business (Council for the Environment, 1985, p202).

The EA, prepared by the proponent, must conform to Section 5(3) of the Environmental Assessment Act which specifies the content requirements of an EA. In accordance with Section 5(3) of the Act, an EA shall consist of the following sections:

- a description of the purpose of the undertaking;
- a description of the statement of the rationale for the undertaking, the alternative methods of carrying out the

undertaking, and the alternatives to the undertaking;

- a description of, the environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, the effects that will be caused or that might reasonably be expected to be caused to the environment, and the actions necessary or that may reasonably be expected to be necessary to prevent, change, mitigate, or remedy the effects upon or the effects that might reasonably be expected upon the environment, by the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking, and
- an evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.

Furthermore, a Summary Form (Form 1 of Reg 836/76) presenting the major findings and recommendations must accompany a submission (MOE, 1979, p41). The requirements of each of the above sections are discussed in more detail below.

The Description of the Purpose of the Undertaking: This section defines and clarifies the problem(s) as perceived by the proponent. The specific goals and objectives are identified. This will aid the decision-making process where the alternative is identified which best achieves these goals and objectives, while weighing up the advantages and disadvantages to the environment of each alternative.

The Description of the Rationale for the Undertaking, Alternative Methods and Alternatives: In this section, the proponent should logically explain the rationale for selecting the preferred alternative. The rationale should be based on scientific evidence, objectivity and good faith. As the EA is a full disclosure document all the feasible alternatives should be presented highlighting the major findings and conclusions. This provides for an informed decision based on specific project

alternatives and their environmental effects. (MOE, 1979, p23 & Council for the Environment, 1985, p204).

The Description of the Environment: This section calls for an inventory of biophysical, socio-economic, historical, aesthetic resources and where applicable the dynamic process within and among these resources.

The Description of the Environmental Effects: In this section the environmental effects refer to: direct and indirect effects, beneficial and adverse effects, short-term and long-term effects, and reversible and irreversible effects. In describing environmental effects, attention needs to be given to the magnitude and significance of the effect. The magnitude is based on quantitative or qualitative measures while the significance is based on scientific evidence, values and preferences.

The Description of Mitigating Measures: The proponent is required to identify mitigating measures to reduce adverse effects on the environment. These can be remedial, compensatory and/or preventative measures.

The Evaluation of Advantages and Disadvantages: The evaluation is a trade-off process in which the advantages and disadvantages of alternative courses of action are weighed up in terms of their effects on the environment, both beneficial and adverse. Various techniques have been developed to aid the selection of the most acceptable alternative. These include weighting techniques, Delphi and pairwise comparisons (MOE, 1979, p29 & Donat, 1979, p135).

Some of the environmental impact assessment methodologies that can be used in the environmental evaluation process include: guidebooks, matrices, overlay methods, indices and systems modeling (Donat, 1979, p63-69).

3.3. CRITICAL ASSESSMENT

According to Curtis (Council for the Environment, 1985, p202), the environmental evaluation process in Canada has the following limitations:

> "1. This planning process, based on scientific method, conveys a notion of objectivity and comprehensiveness which is inappropriate when social, economic and political considerations are taken into account.
> 2. The planning process ignores the difficulty of searching for and identifying values, goals, and objectives for problem solving.
> 3. The planning process ignores the difficulty of searching for reasonable alternatives, and the complexity of identifying, predicting, and evaluating consequences resulting from project activities.
> 4. The planning process ignores the problem of evaluating a large amount of quantitative and qualitative information.
> 5. The planning process ignores the complexity of decision-making involving many participants.
> 6. The planning process offers no guide for structuring an iterative process."
>
> (Council for the Environment, 1985, p202)

Donat (1979, p69) also highlights similar limitations when he states that the ability to predict impacts is limited, and that there are no definite methods for the review of assessments nor criteria for accepting or rejecting a proposal on the basis of its impacts.

Plewes (1981, p364) highlights some of the inefficiencies in the EA process as follows: delays due to administrative problems, conflict between the government and the authority and a lack of policy; there are no rules and procedures for the Environmental Assessment Board, (although they are currently being developed); and there are problems associated with public disclosure. Plewes also highlights the need for iterative methodologies for

the measurement and quantification of impacts, and for the follow-up review of the EA process, documents and the implementation of undertakings.

In summary, Curtis (Council for the Environment, 1985, p202) states that despite these limitations, if the planning process is conscientiously applied it does provide the basis for evaluating and selecting an alternative. Furthermore, if there are still unresolved issues, government EA reviewers, or the public may recommend an Environmental Assessment Board hearing.

Plewes (1981, p4), in commenting on the EA process acknowledges that although there are shortcomings, these may be overcome with experience and time. Monitoring is required to assess which areas need to be addressed.

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CHAPTER 4: A COMPARATIVE STUDY OF THE ENVIRONMENTAL EVALUATION OF ROADS IN THE UNITED KINGDOM, UNITED STATES OF AMERICA AND ONTARIO (CANADA)

This chapter compares the environmental evaluation of roads in the United Kingdom, United States of America and Ontario under the following headings:

- contextual features of the environmental evaluation of roads,
- environmental evaluation procedures for roads, and
- environmental evaluation documentation.

4.1. CONTEXTUAL FEATURES OF THE ENVIRONMENTAL EVALUATION OF ROADS

Table 1 gives a summary of the contextual features of the environmental evaluation procedures for roads in the UK, USA, and Ontario.

Responsibilities of Different Levels of Government: In all three cases there are three levels of Government responsible for roads. In the UK and USA, there is a hierarchical structure which gives the National (UK) or Federal (USA) government control over the second tier of government. The second tier of government in turn has control over the lowest tier of government. This means that in the UK, National government, and in the USA, Federal government have either direct or indirect control over all roads within their respective countries. However, in Canada the Provinces have autonomous control over intra-provincial roads and the environment, within their Province.

	UNITED KINGDOM	UNITED STATES OF AMERICA	ONTARIO (CANADA)
RESPONSIBILITIES OF DIFFERENT LEVELS OF GOVERNMENT	3 Levels of Government are responsible for roads	3 Levels of Government are responsible for roads (FHWA funds most road projects & specify procedures to be used)	3 Levels of government - Provinces have autonomous control of roads within their province
MANDATORY ASSESSMENTS - STATUTORY AND ADMINISTRATIVE BASIS	1975 - Jefferson's Commission 1977 - ACTRA Report 1979 - SACTRA Report 1983 - (MEA) Manual of Environmental Appraisal 1984 - MEA incorporated into DOT's Highway Manual	1969 - NEPA 1970 - In response to NEPA, the Federal-Aid Highways Act set out mandates for change 1974 - DOT's 'Process Guidelines' 1978 - CEQ Regulations	1973 - A Green Paper on environmental assessment was published 1975 - Environmental Assessment Act 1978 - Guidelines for preparing Environmental Assessments
	Mandatory use of the framework since 1984 (set out in the MEA - UK)	Legislated procedures in NEPA & CEQ Regulations, and FHWA 'Process Guidelines'	Legislated procedures in the Environmental Assessment Act
ENVIRONMENTAL POLICY	Incorporated in 'Policy for Roads' document - reviewed and updated when necessary	FHWA' environmental policy is reflected in the 'Process Guidelines'	Reflected in the Environmental Assessment Act
PROCEDURES	Different levels of government have different procedures - appropriate to type of road	All road projects unless exempt by regulation - Procedures vary depending on whether category 1, 2 or 3 project	All road projects unless exempted by MOE - Procedures vary depending on whether type 'A', 'B' or 'C' project
AUTHORITY RESPONSIBLE FOR DECISION	Secretaries of State for Transport and the Environment	FHWA - approves location and authorises design Record of Decision lodged with EPA	EA Board - accept EA &/or approve undertaking MOE - accept or accept & approve undertaking (with Cabinet approval) MOE - has 28 days to alter any EA Board decision (with Cabinet approval)

Table 1: Features of Environmental Evaluation Procedures for Roads in United Kingdom, United States of America and Ontario (Canada).

Thus, the Federal government does not have any control over provincial road projects, and similarly the Provincial governments have no control over the Federal (inter-provincial) road projects. Therefore, there is no overlap of authority between Federal and Provincial Government with regards to either roads or the environment in Ontario.

There is thus more devolution of power to provincial authorities in Canada than regional authorities in the United States or the United Kingdom with regard to the construction of roads.

Statutory and Administrative Basis: The National Environmental Policy Act of 1969 (NEPA) set a precedent for environmental evaluation. In the USA, the Federal Highway Administration (FHWA) responded by setting out 'mandates for change in the Federal-Aid Highways Act of 1970. In 1974, the Department of Transport published 'Process Guidelines' for taking into account social, economic and environmental effects in the decision-making process. In 1978, the Council on Environmental Quality Regulations were published providing guidelines for the preparation of environmental impact statements. Thus, NEPA, the CEQ regulations and the 'Process Guidelines' form the basis of the legislated system for environmental evaluation of road projects in the USA.

The Province of Ontario, following the example of the USA, published a Green Paper on environmental assessment in 1973. In 1975, the procedure was legislated and according to Jones (1984, p38) the Ontario procedure was the first legislated system in Canada, and was possibly the first legislated system outside the USA. The Ministry of the Environment published 'General Guidelines for the Preparation of Environmental Impact Assessment' in 1978. The Environmental Assessment Act and these guidelines form the basis of the legislated system for environmental evaluation of road projects.

The UK's first steps were taken in 1975 with the Jefferson Commission. This was followed with the Advisory Committee on Trunk Road Assessment Report in 1977 and the Standing Advisory

Committee on Trunk Road Assessment Report in 1979. This led to the development of the Framework Approach which was laid out in the Manual of Environmental Appraisal (MEA) in 1983 and in 1984, the mandatory use of the framework was incorporated into the Department's Highway Manual.

The Framework Approach developed in the UK was developed specifically for road projects, unlike the legislated procedures of USA and Ontario which apply to all development projects. In the USA the Department of Transport and the FHWA have provided guidelines to make the procedures required by NEPA and the CEQ regulations more specific to road projects. In Ontario there has been co-operation between the Ministry of the Environment and the Ministry of Transport and Communication to identify the procedural requirements for different categories of roads projects.

Environmental Policy: Although environmental policy exists in all three cases there are some differences in the way the policy is set out. In the UK the Governments environmental policy with regards to roads is incorporated in a 'Policy for Roads' document which is reviewed and updated when necessary. In USA, although environmental policy exists in NEPA and the CEQ regulations, the FHWA's policy is reflected in the 'Process Guidelines'. Ontario's general environmental policy is reflected in the Environmental Assessment Act of 1975, with only limited reference being made to roads in the 'Consolidated Regulations under the Environmental Assessment Act' (MOE, 1983).

Procedures: In the USA and Ontario, the procedures are applicable to all road projects unless exempt by either regulations (in USA) or the Ministry of the Environment (in Ontario). In Ontario there are two different procedures, namely, class assessments or individual assessments depending on the category of the road project. The procedures are the same with the only difference being that individual assessments are prepared for a specific project while a class assessment is prepared for a 'class' of project. The UK, on the other hand,

has different mandatory procedures for different levels of government which are appropriate to the type of road being constructed. For example, smaller schemes (ie road widening) undertaken by local authorities can be implemented as a result of a decision by the local authority, while major road schemes are subject to public inquiries and other procedures similar to those undertaken by the Department of Transport for trunk road schemes.

Authority Responsible for Decision: In the UK where the procedures have been developed specifically for roads, the decision for final approval is the responsibility of both the Secretaries of State for the Environment and Transport. In the USA, the FHWA is responsible for approving the location and authorising the design. The decision is then lodged with the Environmental Protection Agency (EPA). In Ontario, there are three possible decision routes, namely: the Environmental Assessment Board decides on the acceptance of the EA and approval of undertaking if a hearing is requested; the Minister of the Environment decides on the acceptance of the EA and with the Cabinet approval, on the approval of the undertaking, or the Minister of the Environment decides on the acceptance of the EA and the Environment Assessment Board on the approval of the undertaking. However, the final decision lies with the Minister of the Environment who has 28 days to alter the Boards decision (with Cabinet approval).

4.2. ENVIRONMENTAL EVALUATION PROCEDURES FOR ROADS

The UK, USA and Ontario environmental evaluation procedures, summarised in Table 2, are compared under the following headings: the planning stage; the location stage, and the design stage.

	UNITED KINGDOM	UNITED STATES OF AMERICA	ONTARIO (CANADA)
PLANNING STAGE	- perceive problem - determine extent of problem and scheme identification studies	- analysis of transport systems to determine needs and identify project proposal	- project identification - establish goals and objectives
LOCATION STAGE		- publish Notice of Intent if EIS required	- EA required
	- identify alternatives	- identify alternatives	- identify alternatives
	- consult authorities & public	- multidisciplinary approach, involving the public, outside authorities & agencies	- multidisciplinary approach required & public involvement recommended
	- identify environmental effects of alternatives on particular interest groups	- identify significant issues - analysis of effected environment - determine environmental consequences of alternatives	- identify effects of alternatives - identify possible mitigation measures - evaluate alternatives - iterate these steps if necessary
	- prepare Scheme Appraisal Framework	- prepare & circulate Draft EIS for comment	- prepare EA
	- preferred route shown in comparison to alternatives - Secretary of the State for Transport announces preferred route	- indicate preferred route in Draft EIS	- indicate rationale for preferred route in EA
			- MOE review & notify public
	- Public Inquiry if necessary	- Public Hearing if requested	- Board Hearing if required
	- prepare Evaluative Framework	- prepare & circulate Final EIS	

(Table 2 is continued on next page)

Table 2: Elements of Environmental Evaluation in the Planning, Location and Design Stages of Road Building in United Kingdom, United States of America and Ontario (Canada).

(Table 2 continued)

	UNITED KINGDOM	UNITED STATES OF AMERICA	ONTARIO (CANADA)
LOCATION STAGE (Cont)	- decision by Secretary of State for Transport and the Environment	- FHWA approval	- accept EA & approve undertaking (MOE &/or Environment Assessment Board)
		- Record of Decision lodged with the EPA	
		- possibility to appeal on the adequacy of EIS through the courts	- no formal appeal once MOE has finalised decision with Cabinet approval
Note: Design can start	once the preferred route	(corridor) is indicated	in the location stage
DESIGN STAGE			- Type A projects having the highest potential for significant environmental impacts require a 2nd EA (following the same process) at the end of the design phase
	- Consultation with affected parties - prepare draft orders before Public Inquiry	- Centreline fixed & design commences	
	- Public Inquiry, if and when held, address problems relating to draft orders as well as the preferred route	- Design Hearing if requested provides an opportunity for participation by agencies and public (can be combined with the Location Hearing if design started when preferred route was indicated)	

Table 2: Elements of Environmental Evaluation in the Planning, Location and Design Stages of Road Building in United Kingdom, United States of America and Ontario (Canada).

4.2.1. Planning Stage

In UK, USA and Ontario the planning stage generally consists of perceiving the problem, identifying the project proposal and establishing the goals and objectives that need to be met in order to best address the perceived problem.

The process is usually initiated as a result of an ongoing planning process, by transport or planning authorities, or as a result of public concern. Technical studies are carried out to assess the existing traffic, economic, social and environmental conditions and form the bases for future predictions of these conditions for various alternatives. In the UK the public can be consulted at this early stage. However, this is not usual as the input is quite technical at this stage. In the USA opportunities are provided for the public and outside agencies to contribute to the project proposal. This is required in terms of the FHWA's policy which is to ensure that interested parties have the opportunity to participate and express their views in the systems planning stage. In Ontario, this may also occur but is not required by legislation.

4.2.2. Location Stage

The location stage in the UK, USA and Ontario all have similar elements ie: identifying alternatives, providing opportunities for public involvement, identifying environmental effects of alternatives, announcing the preferred route, preparation of an environmental evaluation document, an opportunity for a public hearing, and finally the decision. However, there are some differences which are highlighted in this section.

In the USA and Ontario there is a screening process to determine whether or not the road project is to be subject to an environmental evaluation procedure. In the USA, projects can be exempt or if there is uncertainty, then an environmental

assessment is undertaken to determine whether or not an environmental impact statement (EIS) needs to be prepared. Ontario, on the other hand, has categorised roads into three categories, namely, those requiring an 'individual assessment', those requiring a 'class assessment', and those exempt from assessment. Although there is no screening process in the UK, different levels of government follow different procedures which are appropriate to the type of road. Furthermore, depending on the extent of the possible impacts of the road project on the environment, the degree of detail required in the framework will vary ie, the greater the probability for environmental impacts, the more detailed the framework will be. Thus, this flexibility avoids delays on projects which have a low probability for environmental impacts.

Once the need for an environmental evaluation has been determined, alternatives are identified. In the UK, although the public can be involved in identifying alternatives this is not common. The rationale behind this is that by not disclosing the widest range of alternatives to the public in this early stage avoids unnecessary anxiety to occupiers of properties adjacent to and on less attractive alternative routes, which really stand no chance of being built (Law, 1984, p69). The public are however informed as to the alternatives and any alternatives identified by interest groups and local authorities will be considered in the framework. In the USA, there are opportunities for the public to be involvement in identifying alternatives and in Ontario this is advised but not legislated.

The next step is to consult with other authorities and the public. In the USA and Ontario a multidisciplinary approach is required by legislation, to identify the environmental effects of the various alternatives. This process where the significant issues are identified for further evaluation is termed 'scoping'.

Once the environmental effects are evaluated, an environmental evaluation document is prepared. The document is called a Scheme Appraisal Framework in the UK, a draft Environmental Impact Statement (EIS) in the USA, and an Environmental Assessment (EA)

in Ontario. In this document the preferred route is usually indicated. The document is circulated for review by authorities and the public and an opportunity is provided for a Public Inquiry in the UK, a Public Hearing in the USA, and a Board Hearing in Ontario.

In the UK an Evaluative Framework is prepared after the Public Inquiry and the final decision lies with the Secretaries of State for Transport and the Environment. In the USA, the route location is then selected, a final EIS prepared and after FHWA approval, a Record of Decision is lodged with the Environmental Protection Agency. In Ontario, the EA is accepted and/or the undertaking approved by the Environment Assessment Board, or the Minister of the Environment accepts the EA and the undertaking is then either approved by the Minister (with Cabinet approval) or is approved by the Environment Assessment Board. The Minister, with Cabinet approval, has 28 days to alter the decision.

In all cases the approval can be granted with or without conditions (ie mitigation measures that need to be taken in order to avoid unnecessary impacts or to enhance positive impacts).

In the USA, the decision can be appealed against in the courts but only on the basis of the adequacy of the EIS. In Ontario there is no formal appeal mechanism to Cabinet under the Environmental Assessment Act (FEARO, 1985, p28). However, before the decision is finalised, there are two stages in the process where a hearing can be requested and after the Environmental Assessment Board's decision there is a 28 day period where the Minister and the Cabinet can alter the decision.

4.2.3. Design Stage

The design stage overlaps with the location stage in that the preliminary design commences before the end of the location stage.

In the UK the design starts after the preferred route is announced. The draft line, side road and purchase orders are published and negotiations with those directly affected are undertaken before the Public Inquiry. Thus there is an opportunity for the public and other agencies to be involved in the preliminary design stage at the Public Inquiry.

In the USA, it is required by legislation that opportunities must be provided for participation by agencies and the public during the design stage.

In Ontario, for individual assessment (ie type 'A' projects which have the highest potential for significant impacts), a second EA is prepared at the end of the design phase. Thus, in Ontario the authorities, interested parties, and the public are involved during the design stage.

The design stage is technical in nature, resulting in participation by authorities, interested parties and the public being limited to aspects such as the fixing the centreline and of the location of side roads. However, involving various disciplines during the design stage can lead to a more sensitive environmental design. It is noted by Hill (1987) that a decision leading to environmentally sensitive design would not be reached if the design process was 'blinkered' by rigidly working towards the single objective of moving vehicles through the area. Therefore by involving various disciplines during the design stage can lead to sensitive environmental design.

4.3. ENVIRONMENTAL EVALUATION DOCUMENTATION

Table 3 briefly compares the environmental evaluation documentation for road projects in the UK, USA and Ontario.

In all three cases the main purpose of the document is to aid the decision-making process. In the UK this is achieved by comparing the environmental effects of alternatives on particular interest groups. In the USA, the main focus is on significant environmental effects of alternatives, while in Ontario, the document describes the purpose, rationale, and environmental effects of the alternatives.

Two documents are prepared in each case. In UK and USA, the document is prepared for the first time after the environmental effects of alternatives have been assessed, and for the second time after the Public Inquiry (UK) or Public Hearing (USA). However, in Ontario an EA is prepared for the first time at the end of the location stage, and for individual assessments, for the second time at the end of the design stage.

In the UK, the framework approach is replicable from scheme to scheme. Therefore, there is consistency in the major effects of alternatives, and the groups of people affected. A listing of the major effects and the groups of people that need to be considered are specified in the 'Manual for Environmental Appraisal'. In the USA, the format of the EIS is specified in NEPA, CEQ regulations and the Department of Transport's 'Process Guidelines'. In Ontario, although a standard format is not required by legislation, the Environmental Assessment Act does specify sections that shall be included in the EA. Both the USA and Ontario have similar sections in their documents which focus on the purpose of the project, the affected environment, alternatives, and the environmental consequences of the alternatives.

	UNITED KINGDOM	UNITED STATES OF AMERICA	ONTARIO (CANADA)
ENVIRONMENTAL EVALUATION DOCUMENT	Framework	Environmental Impact Statement (EIS)	Environmental Assessment (EA)
PURPOSE	Aid to the decision-maker Compares environmental effects of alternatives on particular interest groups	Decision-making tool Focuses on significant environmental effects of alternatives	Medium for reaching a decision Describes the purpose rationale and environmental effects of the alternatives
PREPARATION	Prepared twice - once after the evaluation of environmental effects of the alternatives and once after the Public Inquiry	Prepared twice - the draft EIS after the evaluation of environmental effects of alternatives and the final EIS after the Public Hearing	Prepared twice for 'individual assessments' - once at end of the location stage and once at the end of the design stage
PRINCIPLE SECTIONS	The framework is replicable from scheme to scheme in that there is consistency in the grouping of: - environmental effects of alternatives - groups of people affected	The legislated format for an EIS consists of the following main sections: - summary - purpose and need - alternatives - affected environment - environmental consequences	The main sections of an EA required by legislation are as follows: - summary - description of purpose - rationale for the undertaking, alternative methods and alternatives - description of environment - environmental effects - mitigating measures - evaluation of advantages and disadvantages

Table 3: Environmental evaluation documents for road projects in United Kingdom, United States of America and Ontario (Canada).

Thus, in comparing the UK, USA and Ontario, one finds that they all consider the environmental effects of alternatives in their environmental evaluation documents. There are also manuals, legislation, and/or regulations which specify, and give guidance, to the content and preparation of the environmental evaluation documents.

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CHAPTER FIVE: THE IDEAL

In this chapter, an ideal is generated which combines the common and unique elements found in the procedures followed in the UK, USA, and Ontario. Although the integration of these elements into the environmental evaluation process may differ, due to the different government structures, the preceding chapter revealed that the underlying elements presented are generally comparable.

5.1. THE ADMINISTRATIVE/LEGISLATIVE STRUCTURE

The United Kingdom, the United States and Ontario have adopted different approaches for the environmental evaluation of roads. In the United States and Ontario, the approaches are what Kennedy (1988, p258) describes as formal-explicit ie approaches codified in legislation or legally binding regulations which lead to the preparation of an EIS or report which assesses the effects of a development project. Although these approaches are similar, the actual procedures still differ due to different government structures.

Kennedy (1988, p258) describes the approach in the United Kingdom as informal-implicit ie one where the environmental evaluation is modified or adapted to the needs of the individual situation. This approach does not as such require an environmental impact statement.

The reason for different approaches and procedures being adopted can partly be ascribed to the national and provincial legislative and administrative structure within the country which dictates the structure for the implementation of the environmental

evaluation procedures. (United Nations, 1981, p25 and United Nations, 1987, p6)

Kennedy (1986, p11 and 1988, p258) claims that there has been considerable debate on the usefulness of one type of approach versus the other. However, experience has shown that for environmental evaluation to be successfully integrated into the decision-making process, it should ideally be applied in a formal-explicit way.

Therefore, in order to conform to such a formal-explicit approach, a number of elements should be present in the administrative/legislative structure. These are discussed below.

- National environmental legislation or policy: firstly, to indicate the government's environmental policy, and secondly, to call for the environmental evaluation of projects that have a potential for adversely affecting the environment. Such legislation and policy are found in both the United States and Ontario.

- National environmental authority: firstly, to promulgate regulations/guidelines concerning the procedures for carrying out environmental evaluation procedures, and secondly, for ensuring that the legislation/policy and the regulations/guidelines are adhered to. This occurs in the United States and Ontario. Although this also occurs in the United Kingdom, the environmental authority has a slightly different role in that it does not have any national environmental legislation as mentioned above.

- National road authority: firstly, to indicate the road authority's environmental policy, and secondly to develop guidelines (acceptable to the environmental authority) making the procedures called for in the environmental legislation and regulations more specific for road projects. In all three cases, road authorities do indicate their environmental policy and have developed procedures specific to roads. In the United states and Ontario these procedures are largely based on the procedure called for and stipulated

in national acts and regulations. The United Kingdom, lacking any formalised environmental legislation, has developed an evaluation procedure specifically for roads.

5.2. THE ENVIRONMENTAL EVALUATION PROCEDURE FOR ROADS

It has generally been recognised that for environmental evaluation to be effective, it should be integrated into the existing planning and decision-making procedures (United Nations, 1981, p25 and Kennedy, 1988, p258). Furthermore, in order to aid the integration and effectiveness of the environmental evaluation procedure the following elements are considered necessary: identification of objectives, screening, consideration of alternatives, identification and evaluation of the impacts of alternatives, scoping, public participation, outside review and monitoring (United Nations, 1981, pxx and United Nations, 1988, p ix).

Using the above-mentioned elements, together with other elements identified in the study of the environmental evaluation procedures for roads in the United Kingdom, the United States and Ontario, account is taken of the various stages of a road project. This therefore forms the basis for generating the ideal steps of an environmental evaluation procedure specifically for roads. The ideal steps required for the environmental evaluation of road projects are considered under the following three stages: planning, location and design. These stages are discussed in the following section and are shown schematically in Figure 4.

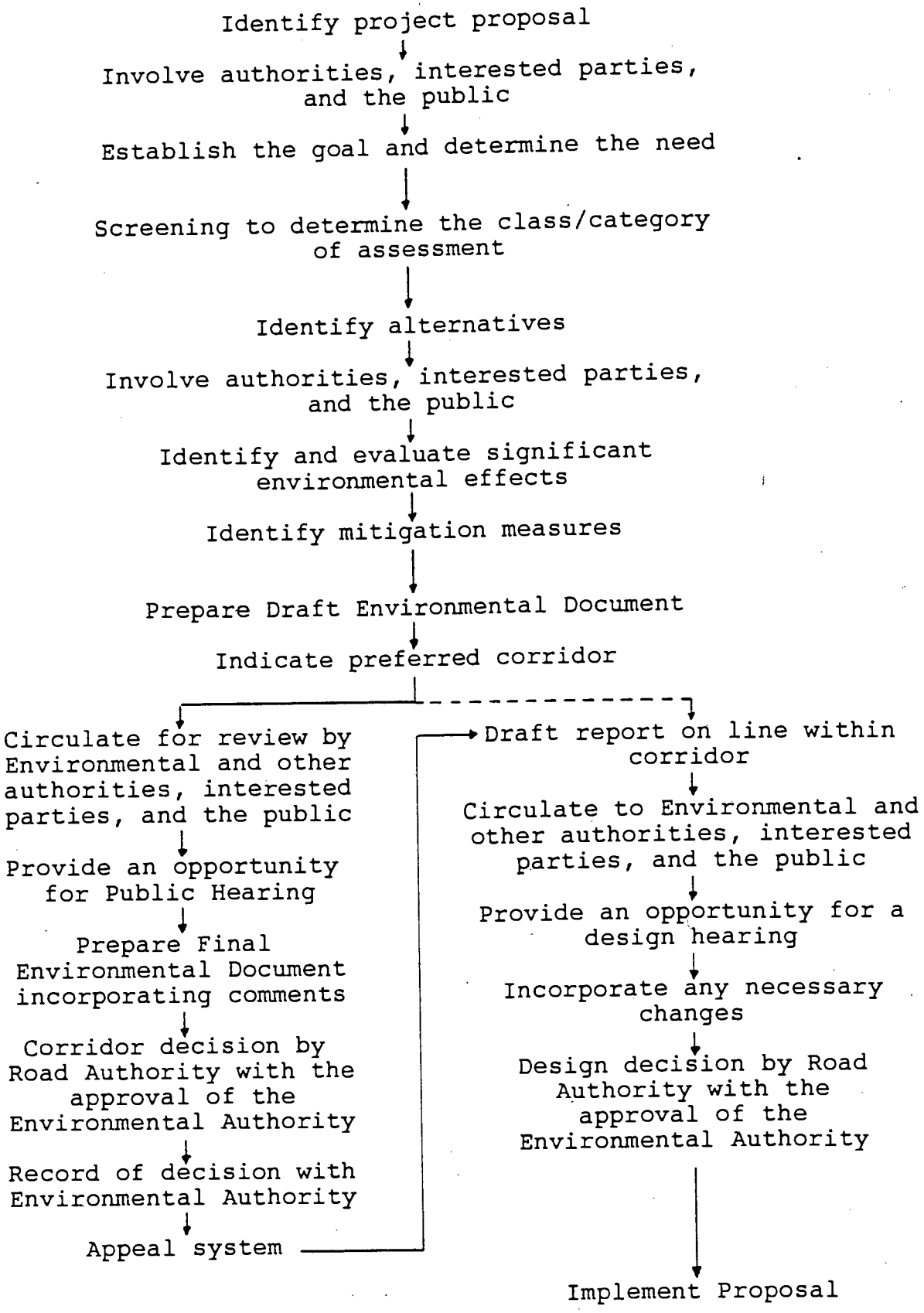

Figure 4: 'Ideal' Stages in the Planning Procedure for Roads.

The Planning Stage: In the past, both economic and traffic evaluation were given higher priority than the environment in determining the feasibility of road projects. In order to overcome this it is necessary to give consideration to environmental feasibility in this early stage, thus ensuring that equal consideration is given to environmental feasibility, economic and traffic evaluation. Although steps have been introduced to ensure the early consideration of the environment in the United Kingdom, it is still considered that too much emphasis is placed on the economic evaluation to the detriment of environmental considerations (Williams et al, 1987, p898). The basic steps in the planning stage are detailed below.

- Technical studies to assess the existing traffic, economic, and environmental conditions to use as a basis in predicting future conditions. This will ensure that equal consideration is given to traffic and environmental feasibility during this early stage.
- Opportunities for other authorities, interested parties, and the public to participate and express their views. This will widen the vision of the road authority to accommodate the views of all the concerned parties.
- Establishment of goals and objectives which must be met in order to solve the problems identified by the preceding two steps.

The Location Stage: During this stage the decision on the corridor of the road is made. Thus, it is imperative that the environmental evaluation procedure be fully integrated within this stage. This will ensure that all the alternatives, their probable impacts, and possible mitigation measures, can be evaluated in the decision making-process (Kennedy, 1988, p257). The ideal steps considered necessary to ensure the environmental considerations are integrated into the location stage are detailed below.

- A 'screening ' process: to determine which road projects should be subject to the environmental evaluation procedure (United Nations, 1981, pxiii). This process will ensure

that only the projects which have potentially significant impacts will be subject to the full environmental evaluation process.

- Identify alternatives (corridors): emphasis should be placed on identifying all possible alternatives, including the "do nothing" alternative. The alternatives are to be explored and evaluated objectively and reasons should be provided where alternatives are eliminated from the detailed study. This will provide a base for integrating environmental considerations into the decision-making process (Council for the Environment, 1985, p111).
- A 'scoping' process: adopting a multidisciplinary approach, the significant environmental effects of the various alternatives which need to be assessed in detail are identified. This will help to focus the evaluation on the most important issues (NEPA, 1969).
- Evaluate the significant environmental effects: this provides the scientific and analytic base for comparing the alternatives in the decision-making process.
- Identify possible mitigation measures: to avoid or reduce the negative impacts and where possible to make the best use of the positive environmental features (Council for the Environment, 1985, p107).
- Prepare a draft environmental document (this is discussed in section 5.3.).
- Indicate the preferred alternative (corridor): this together with the reasons for the choice forms part of the environmental document.
- Circulate the document to other authorities, interested parties and the public: this allows for external review and comment on the environmental evaluation document.
- Provide an opportunity for a Public Hearing (conducted by the environmental authority): to resolve any conflict that may still exist between the various parties (Cohn and McVoy, 1982, pp 126-137).
- Prepare a final environmental evaluation document: to incorporate the responses from the review process and the Public Hearing.
- Circulate the final document to other authorities, interested parties and the public: this provides an

opportunity for them to assess wether their objections to or comments on the draft environmental document have been adequately addressed.

- Decision from the road authority with the approval of the environmental authority.
- Record of the decision: to specify the reasons for the decision, and any conditions that need to be met. Having to publicise and give reasons for the decision will tend to make the decision objective rather than subjective. The record of the decision is lodged with the environmental authority.
- An appeal system: provides an opportunity to appeal against the decision if the decision is not acceptable to any of the parties.

The Design Stage: During this stage the emphasis is on the preliminary design in order to ascertain how the road can be best accommodated within the selected corridor. Hence, this stage is largely technical with a limited amount of participation by authorities, interested parties and the public. However, this is still considered necessary, in order to achieve environmentally sensitive design (Hill, 1987), and it currently forms part of the design stage in the United Kingdom, the United States and Ontario.

This stage can start once the preferred corridor has been indicated in the location stage (see Figure 4, the dotted line). This enables the two stages to overlap to some extent resulting in time savings. This occurs in both the United Kingdom and the United States (see section 1.1, 2.1, and 4.2.3).

Experts from various disciplines should be involved throughout the design stage in order to achieve an environmentally acceptable design (Department of Transport, 1974, §11). This together with the steps detailed below will help achieve a more environmentally acceptable design.

- Preliminary design.
- Prepare a draft report on the line within the chosen corridor and the location of any side and feeder roads.
- Circulate the report to other authorities, interested parties and the public: provides an opportunity for external review and comment on the preliminary design.
- Provide an opportunity for a second Public Hearing: to address and resolve any concerns that may still exist.
- Incorporate any changes that are required as a result of the review process or the Public Hearing.
- Commence with the final design.

5.3. THE ENVIRONMENTAL EVALUATION DOCUMENT

The Environmental Evaluation Document is a report on the environmental effects of the road project. According to Kennedy (1988, p258), the preparation of such a report forms part of the formal-explicit approach which is essential for effectively integrating environmental considerations into the decision-making process. The basic sections that should be included in the environmental evaluation document are detailed below.

- A summary document: to accurately summarise the environmental evaluation document stressing the major conclusions, areas of controversy and the issues to be resolved (Council on Environmental Quality, 1978).
- A statement of purpose and need for the project: to indicating the goals and objectives of the project. This allows for alternatives to be assessed on how effectively they meet up to the goals and objectives (Environmental Assessment Act, 1975).
- The alternatives considered: indicating the environmental impacts of the alternatives. This provides a basis for selecting the preferred alternative (Environmental

Assessment Act, 1975, Council on Environmental Quality, 1978).

- The affected environment: to provide the necessary background in order to understand the effects of the alternatives (Council on Environmental Quality, 1978).
- An evaluation of the environmental effects of the alternatives: to provide the scientific and analytic basis for comparing and selecting alternatives(Council on Environmental Quality, 1978).
- The effects of alternatives on different interest groups: to provide a balance set of comparative data to aid the decision-maker (Law, 1987, p70).
- Possible mitigating measures: to identify ways of reducing or avoiding negative effects, and where possible to enhance the positive aspects.
- An evaluation of advantages and disadvantages in choosing the preferred route: to allow the public to ascertain how the decision was reached.

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PART TWO

ENVIRONMENTAL EVALUATION OF ROADS IN SOUTH AFRICA

CHAPTER SIX: THE ADMINISTRATIVE STRUCTURE, LEGISLATION, POLICY, AND PLANNING PROCEDURE FOR ROADS IN SOUTH AFRICA

6.1. THE ADMINISTRATIVE STRUCTURE

There are three levels of government responsible for the planning, construction and maintenance of roads in South Africa. At the National level the responsibility lies with the Department of Transport Affairs, the National Transport Commission (NTC) and, since 1988, the South African Roads Board. At the Provincial level, responsibility lies with the four provincial administrations, namely the Cape, Orange Free State, Transvaal, and Natal Provincial Administrations. Lastly, at the local level there are various local authorities, namely: regional authorities (Regional Services Councils and Divisional Councils), Metropolitan authorities (Metropolitan Advisory Boards), and Municipal Authorities (Bureau for Information, 1988, p295).

The administrative structure and the responsibilities of these authorities, for the three levels of government, are discussed briefly.

6.1.1. National Level

Department of Transport Affairs: This department, consisting of a number of directorates which co-ordinate and control road, air and sea transport. Of these directorates, the following are of importance to road transport (Dic tum CC, 1988, p158-164):

- Chief Directorate of National Roads: This directorate is empowered to: establish and maintain the National Freeways;

control the National Road Fund, and administer Act 54 of 1971 on behalf of the National Transport Commission.

- Chief Directorate of Land Transport Administration: The function of this directorate is to control, regulate and administrate Land Transport Affairs.
- Directorate of Road Transportation: This directorate controls and regulates the road transportation industry, and administers the provisions of Act 74 of 1977.
- Directorate of Transport Systems Planning: This directorate advises management on the planning of a total transport strategy for the RSA by initiating and evaluating research and formulating policy guidelines.

The Department of Transport Affairs has also set up a Committee of Urban Transport Authorities (CUTA). This committee, consisting of representatives from the major cities, the four provincial bodies and the Department of Transport Affairs, is to discuss, co-ordinate and vet transport policy (Riley, 1989, personal communication).

The South African Roads Board (ex National Transport Commission): With the enactment of the South African Roads Board Act 74 of 1988 and the Transport Deregulation Act 80 of 1988, the powers, functions and duties entrusted to the National Transport Commission under the National Roads Act of 1971, the National Road Safety Act of 1972 and the Urban Transport Act of 1977 have been transferred to the South African Roads Board.

The South African Roads Board is to promote and encourage the development of transport in the Republic and where necessary to co-ordinate various phases of transportation in order to achieve the maximum benefit and economy of transport services to the public.

6.1.2. Provincial Level

Each of the four provinces have their own Roads Departments which are responsible for the planning, construction and maintenance of roads other than those falling under the South African Roads Board, the NTC or local authorities. The Provincial Roads Departments are therefore responsible for trunk roads and main roads. The Provincial Roads Departments are compelled to seek approval for the development of roads falling under the jurisdiction of the South African Roads Board (Bureau of Information, 1988, p296-297).

6.1.3. Local Level

Regional Authorities: In the Cape, the Divisional Councils fall under Province and are responsible for secondary and tertiary roads. Some of the Divisional Councils have been replaced with Regional Services Councils (RSC) - the responsibility for roads in their region remains the same. Some Regional Services Councils have also been introduced in the other three provinces.

Metropolitan Authorities: Provision is made for the establishment of Metropolitan Advisory Boards for areas which have been declared Metropolitan Transport Areas in terms of the Urban Transport Act of 1977. These advisory boards fall under the South African Roads Board and are responsible for the drawing up of short and long term transport development programmes. These plans can qualify for subsidies from the Consolidated Metropolitan Transport Fund. There are at present five Metropolitan Areas - Johannesburg, Cape Town, Pretoria, Durban and Port Elizabeth. Other areas that are likely to be declared Metropolitan areas in the near future include the East Rand, West Rand, Vaal Triangle, Bloemfontein, East London and Kimberly (Bureau for Information, 1988).

Municipal Level: The construction and maintenance of most roads and streets within municipal boundaries are the responsibility of the local authority. Provincial roads in these areas are maintained by the province or by the local authority using a subsidy paid by the province to the local authority for this purpose.

6.2. LEGISLATION

The following Acts and Ordinances pertain directly to road transportation in South Africa:

- National Roads Act 54 of 1971
- South African Transport Services Act 65 of 1981
- Road Transportation Act 74 of 1977
- Urban Transport Act 78 of 1977
- South African Roads Board Act 74 of 1988
- Transport Deregulation Act 80 of 1988
- Provincial Roads Ordinances
- Provincial Road Traffic Ordinances.

A number of existing Acts and Ordinances provide measures to exercise control over the negative environmental impacts of road transportation either directly or indirectly. These include:

- Advertising on Roads and Ribbon Development Act 21 of 1940
- Hazardous Substances Act 15 of 1973
- Atmospheric Pollution Prevention Act 45 of 1965
- Explosives Act 26 of 1956
- National Parks Act 57 of 1976
- Conservation of Agricultural Resources Act 43 of 1983
- Environment Conservation Act 100 of 1982
- Physical Planning Act 88 of 1967
- Provincial Nature Conservation Ordinances

Therefore, there are numerous acts and ordinances which control some of the detrimental effects of road transportation on the environment. These are administered by numerous authorities at central, provincial and local government and there is no single government department responsible for all aspects of environmental management. Allocation of these responsibilities to one government department would probably be unacceptable to those involved and practically impossible to implement, as the use and control over environmental resources is an integral part of the mandate of almost all departments (NTC, 1984).

Thus, although it would not be practical or acceptable to have one government department responsible for all aspects of environmental legislation, it appears that ...

> "... the codification and amalgamation of many of the transport laws that relate to the environment may assist to streamline control of negative impacts, simplify execution of the acts and ordinances themselves and rectify the overlaps and omissions."
>
> (NTC, 1984)

Since 1984, steps have been taken in this regard with the publication of the Road Traffic Act (1989) which consolidates the various Provincial Road Ordinances. Consolidation of the Provincial Road Ordinances would be a useful next step in that it would facilitate the adoption of countrywide procedures for the environmental evaluation of new road projects. However, at the Council for the Environment workshop (August 1989), it was concluded that the consolidation of both the Acts and Ordinances was not a priority.

However, of greater significance is the Environment Conservation Act 73 of 1989 which makes provision for the control over the detrimental effect of activities on the environment. Part V of the Act allows the Minister to identify:

> "21.(1) ... those activities which in his opinion may have a substantial detrimental effect on the

environment, whether in general or in respect of certain areas."

"21.(2) Activities which are identified in terms of (1) may include any activity in any of the following categories, but is not limited thereto:
...
(g) Transportation;
..."

Therefore, if the responsible Ministers identify transportation as an activity in terms of section 21.(1), then the terms of section 22, prohibition of the execution of identified activities, call for

"22.(2)(1) ... reports concerning the impact of the activity in question and of alternative activities on the environment, which shall be compiled and submitted by such persons and in such manner as may be prescribed;"

However, there are as yet no regulations that prescribe the manner in which such reports are to be prepared. Regulations which specify the structure and content of environmental reports for road developments could be promulgated under the Environment Conservation Act.

6.3. POLICY

In 1982, work began on the National Transport Policy Study (NTPS). The aim of this study was to assist the NTC in formulating recommendations towards the rationalisation of transport policy for the Republic of South Africa. The study

included all forms of transport (road, rail, air, sea, post and pipeline) and was undertaken in two phases. Phase I, confined to information describing the existing situation in South Africa, was completed in 1984. Phase II, the evaluative policy analysis and policy formulation part of the study, was completed in 1986.

Having completed phase II, a White Paper on National Transport Policy was submitted to Parliament by the Minister of Transport Affairs in 1986. This White Paper includes sections on: transport and national policy, freight transport policy, organisational matters, co-ordination of transport in Southern Africa, and an implementation programme (White Paper, 1986).

Phase I, Stage 7B of the NTPS revealed the following:

At National level;

> "No documented policy on transportation - induced environmental impact was noted, although frequent reference by senior representatives regarding these organizations' environmental awareness and responsibility appeared from various sources consulted."

At Provincial level;

> "Of the four provincial departments, only the Orange Free State department's representative mentioned an informal policy of making their engineers more aware of the environmental impact of actions.

At Local level;

> "No formal policy was referred to by the representatives of the four municipalities interviewed."

Although considerable attention was given to 'Environmental Aspects of Transport' in Phase I, Stage 7B, both Phase II and the White Paper give this matter scant attention.

The only mention of the environment in the White Paper is in the section on National and Transport Policy under section 2.3 Transport Policy Goals. In this section, out of the sixteen goals stated, goal number 16 reads as follows:

> " 16. To minimise external side effects, ie a negative impact on the environment. "
>
> (White Paper, 1986, p9)

The rest of the White Paper focuses on: Freight Transport Policy, Passenger Transport Policy, Organizational Matters, Co-ordination of Transport in Southern Africa, and an Implementation Programme. There is, however, no formal statement as to how goal 16 is to be implemented at either National, Provincial or Local level of government.

Telephonic contact with representatives of the Cape Provincial Administration, Natal Provincial Administration and the National Transport Commission in December 1988, revealed that there is still no formal environmental policy in the above mentioned departments. However, it was mentioned that if and when it was considered necessary, some form of environmental evaluation would be undertaken (Petersen, Melville, du Plessis, Walker, Meyder, Mainwaring, 1988, personal communication).

In August 1989, at a workshop on 'The Impact of Road Building on the Environment', organised by the Council for the Environment, it was identified that the drafting of an Environmental Policy for Roads was a priority. In a letter (89-10-20), from the Department of Transport to the Environmental Evaluation Unit, the Department of Transport indicates that consultants have been appointed to address a number of specific areas where a co-ordinated policy is required and hence, one of the objectives is to:

"iii. Prepare a policy document (manual) on these road and traffic related environmental aspects which will be issued under the auspices of the South African Roads Board, CSRA and CUTA to all road authorities (both urban and rural)."

(Department of Transport, 1989)

6.4. PLANNING PROCEDURES FOR ROADS IN SOUTH AFRICA

Standard procedures apply to the planning, design, construction, operation and maintenance of roads and are usually in the form of written guidelines, or design manuals. South African road standards are based on overseas standards that have been modified for local conditions. Although the standards are mainly concerned with the control of road geometrics such as alignment, grades, degree of curvature and road widths, they also include some environmental aspects such as retention banks, erosion, re-vegetation, road reserves, litter and pollution.

Phase I, Stage 7B of the NTPS revealed the following:

At National level;

"No documented procedures were noted for the route network and road infrastructure planning.

No specific reference to environmental considerations in the infrastructure and route network planning was noted, although considerable attention is paid to the environment in the detailed materials and structural design stages."

At Provincial level;

"... all four provincial authorities have adopted an ad hoc, voluntary approach to addressing environmental considerations in route planning and road design."

At Local level;

"Except where external funding is involved, there are no external controls over local authority road planning and design."

Although there are documented geometric and design standards at national and provincial level, there is a

"... lack of any systematic, even documented, procedure for taking into account environmental impacts - particularly the more indirect ones."
(NTC, 1984)

This has led to problems which were identified in a review of environmental impact assessment of road projects in South Africa. The problems identified were as follows:

- most assessment reports used different methods and approaches, often resulting in one or more aspects not being adequately covered,
- consultants were often appointed too late and their briefs were also often too limited, and
- economic aspects have taken priority over environmental considerations.

In the past, environmental evaluations also tended to emphasise the technical input of specialists with little or no recognition of the values attached to environmental components by public interest groups. Further problems have also arisen where the consultant carrying out the evaluation is geographically located in a different area with little knowledge of the local conditions in the study area (NTC, 1984).

Furthermore, environmental reports have not always been favorably received. This was illustrated with an example where the CPA, having recently received an environmental report for one of their projects, found that they could only use short sections of this report. The report is said to be superficial, recommends techniques that have previously been found to be ineffective, and in fact presented information that the CPA had gained themselves in the upgrading of another similar road.

It is suggested that these problems are a result of a lack of clarity about what is expected of an environmental evaluation. These problems could be alleviated by better client/consultant communication during the study - communication with all the interest groups, particularly the client, is central to successful environmental evaluation. In addition, a systematic and documented set of procedures need to be developed to ensure that the requirements for each stage of an environmental evaluation are precisely defined, in order to prevent the recurrence of the problems.

Telephonic conversations with representatives of the Cape Provincial Administration and the National Transport Commission in December 1988, revealed that there was still no formal, systematic and documented procedure for addressing environmental aspects of route planning and road design in these departments: the approach adopted is an ad hoc, voluntary one (Petersen, Melville, du Plessis, Walker, Meyder, Mainwaring, 1988, personal communication).

Natal Provincial Administration has, however, adopted the Framework Approach (from the United Kingdom), a systematic approach to take into account environmental factors such as traffic noise, visual impact, community severance, effects on agriculture, heritage and conservation, ecological impact, disruption due to construction, effects on pedestrians and cyclists, driver stress, view from road, air pollution and financial effects (Walker, 1987). However, the Framework is only used if it is specifically needed - when negative impacts are identified and when alternative routes are possible. The

Natal Provincial Roads have only used the approach once in a residential road scheme.

Therefore, in order to minimise the negative effects of road building on the environment, there is a need for a systematic and documented set of environmental evaluation procedures to be developed in South Africa.

Integrated Environmental Management (IEM - a procedure for the environmental evaluation of projects) is currently being developed by the Council for the Environment in South Africa, and it is proposed that this procedure be used for the environmental evaluation of road projects. However, at the Council for the Environment workshop (August 1989) it was emphasised, by road authorities, that such a procedure should be incorporated into the existing road development procedure which comprises of the following stages:

- determining the need
- network planning
- identify corridor
- route planning
- preliminary design

At the workshop, Mr Lombaard (Chairman of the Committee for South African Road Authorities) gave a brief description of these stages.

During the first stage, determining the need, studies are carried out, on an ongoing basis, making forecasts over a 25-30 year period to determine future traffic needs. Network planning is carried out simultaneously. Resulting from these studies, recommendations are made as to whether roads need to be upgraded, or whether a new road is necessary. Moving into the corridor identification stage, a consultant is appointed to prepare a report identifying the corridor for the new or upgraded road. The road authority may either ask the consultant to identify the corridor or specify the corridor to the

consultant. In both cases, the consultant must prepare a report identifying the corridor. This report is then made available to sister departments for comment (eg Agricultural Technical Services). (The width of the corridor, although depending largely on the environment is in the region of 2 km.) The next stage is route planning when the route within the corridor is determined. A report is prepared at the end of this stage and is also made available to sister departments for comment. At this stage, meetings can also be held with land owners. The preliminary design stage then commences after which a report is prepared and meetings are held with those affected. Having completed these stages, the detailed design commences.

In August 1989, at the Council for the Environment workshop, Mr Petersen (Chief Engineer - Planning) indicated that the CPA was committed to Integrated Environmental Management (IEM) and that at a recent one week in-house conference IEM was on the agenda. This commitment by the CPA to IEM was also reflected by Mr T L Kruger (Provincial Road Engineer) at a recent Symposium held by the Habitat Council in Cape Town, and committed to writing in a letter (89-09-04) from the Executive Committee of the Cape of the Province of Good Hope to the Council for the Environment (Province of the Cape of Good Hope, 1989).

The next Chapter discuses IEM in more detail.

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Integrated Environmental Management is currently being developed by the Council for the Environment as an appropriate approach to environmental evaluation in South Africa. The following extracts highlight some important principles of IEM.

> "Integrated Environmental Management (IEM) is a systematic approach developed in South Africa for ensuring the structured inclusion of environmental considerations in decision-making at all stages of the development process."
>
> (Fuggle, 1988)

> "IEM, or Integrated Environmental Management, consists of a set of procedures for guiding development in such a way that the benefits of development are realized without suffering undue environmental costs. The central idea is that development and environmental quality can be had at the same time, but only if there are two important pre-existing conditions:
>
> (1) an efficient procedural framework; and
>
> (2) a co-operative spirit between 'the key actors'."
>
> (Council for the Environment, 1989a)

> "The objective of IEM is not to impede development, but to provide an effective approach, using interactive and iterative evaluation techniques, to improve a proposal, or suggest more environmentally acceptable ways of meeting the purpose and need of a development proposal."
>
> (Fuggle, 1988)

Furthermore, IEM identifies the need for a screening process to identify those projects which are unlikely to have significant harmful effects so that these projects can be more rapidly assessed (Fuggle, 1988). This enables one to determine the class of environmental assessment that would be appropriate for the proposed action (see Council for The Environment: Integrated Environmental Management in South Africa, 1989). Screening criteria could be based on a combination of factors related to the class (scale) of road envisaged and the environmental setting of the proposal.

After the screening process, IEM identifies a scoping process whereby the affected public and relevant authorities can contribute towards identifying the major issues, and suggest possible alternatives to the proposed action. This process narrows down the scope of the evaluation so that effort can be concentrated on the potentially serious effects of the proposal. Scoping, by allowing for early public involvement, also prepares the way for the accommodation and eventual acceptance, by the public, of the approved action (Council for the Environment, 1989).

> "In fact, all interest groups need to be assured that:
> - the negative effects they bear were carefully weighed up, and
> - the final decision was taken by the road planners for the general good of society (road engineers do make decisions on this basis but the process needs to be explicit and in some cases more broadly based).
>
> To achieve this, the features of the environment that are valued by a broad range of sectoral interest groups must be identified to the satisfaction of these groups. The effects of alternative road corridors must be systematically and publicly recorded at an early stage of the planning process to inform the important decisions concerning route selection and location."
>
> (Hill, 1988)

In the NTPS, concern was expressed by the road planning authorities with regard to non-representative public pressure from isolated extremist groups. This can however be avoided by the introduction of strict, but adequate, channels of communication and methods for the assessment of public responses (NTC, 1984). Furthermore, no harm can be done by listening to such groups as ultimately they do not make the decision.

As mentioned in the section on legislation, the Environment Conservation Act 73 of 1989, provides a framework for the implementation of IEM. As yet regulations and guidelines for the implementation of this Act have not been developed. In achieving this,

> "Every effort should be made to simplify and make cost effective the procedural requirements of IEM. Limits on length of the documents and the time taken for assessment, review and appeal should be established to ensure the timely flow of information and minimise costs and delays."
>
> (Council for the Environment, 1989)

Therefore, although the IEM procedure and the format for the environmental report have been developed, this is not required by legislation. However, the Environment Conservation Act of 1989 does empower the Minister of the Environment to pass regulations regarding the scope and content of environmental impact reports. The Act also specifies what the scope and content, of an environmental impact report, may include.

Although no guidelines have been developed for the implementation of the IEM procedure in the planning and management of road projects, at the August 1989 workshop the IEM approach was accepted in principle by the representatives of road authorities present who felt that further co-operation with the Council for the Environment is necessary to incorporate IEM into the existing road development procedures.

7.1. THE IEM PROCEDURE

The IEM procedure is shown schematically in Figure 4 and is briefly discussed in this section under the following headings:

- proposal generation stage,
- assessment stage,
- decision stage, and
- implementation stage.

This section is based on 'IEM A Framework for Harmony between Development and the Environment' by Council for the Environment (1989).

Proposal Generation Stage: This stage involves recognising the need for the proposal, thinking of alternative ways to meet the need and refining the proposal and alternatives to make them acceptable to the relevant authority. The four basic steps in the proposal generation stage are as follows:

- defining the purpose and need for the proposal,
- searching for viable, and more environmentally acceptable alternatives,
- investigating possible effects of the proposal and its alternatives, and
- deciding which alternatives will be formally assessed.

Assessment Stage: During this stage the impacts on both the natural and social environment are identified and described so that their significance can be evaluated. The basic steps in the assessment stage are as follows:

- deciding on what class of assessment is required using a 'screening procedure' (Class 1 assessment if expected

significant harmful impacts, Class 2 assessment if unsure as to whether or not significant harmful impacts, and a Class 3 assessment if almost certainly no significant harmful impacts),

- conducting an investigation of the impacts (appropriate to the class of assessment),
- preparing a Class 2 and a Class 3 report for Class 2 and 3 assessments respectively (if approved, no further steps are required for Class 2 and 3 assessments),
- consulting interested and knowledgeable parties to determine the scope and focus for a Class 1 assessment,
- prepare a draft Class 1 report
- public review of the draft environmental report, and
- prepare the final Class 1 report incorporating any comments from the pubic review.

Decision Stage: At this stage after reviewing the relevant information the best alternative is identified and approved. The basic steps in the decision stage of a Class 1 assessment are as follows:

- review all the information and make decision (approve proposal with or without conditions, approve some other alternative, or allow no action),
- determine any conditions of approval,
- officially record the decision (and reasoning behind it) and make it available on request, and
- provide an opportunity for appeal (with time limits on both filing and ruling of appeals).

In terms of the Environment Conservation Act 73, of 1989, a Board of Investigation may be commissioned by the Minister of Environment Affairs to assist him in the evaluation of any matter or any appeal. The Board of Investigation, appointed by the Minister of Environment Affairs, shall include: a judge (or retired judge) of the SA Supreme Court; a magistrate (or retired magistrate); an advocate, and an attorney who in the opinion of the Minister has the knowledge of matters relating to the environment, and is designated by him as chairman of the Board

of Investigation. A session of the Board of Investigation is to be held in public.

Implementation Stage: During this stage any conditions of approval need to be implemented. This generally requires a monitoring program with selected audits to ensure the implementation of any such conditions and occasionally cross-project audits to determine the efficiency of environmental protection measures.

7.2. THE ENVIRONMENTAL REPORT

The basic format of the environmental report as suggested in the IEM document is as follows:

- the purpose and need for the proposal
- the general nature of the proposal and its alternatives
- activities that would be associated with the proposal, and with any alternatives
- the nature of the affected environment
- the possible impacts of the proposal
- the groups of people that would be affected by these impacts
- possible measures to avoid or reduce harmful impacts and make the best use of environmental features

The level of detail will depend on whether it is a Class 1, 2, or 3 report, with a Class 1 report having the most detail.

The possible scope and content as specified in the Environment Conservation Act 73 of 1989 places more emphasis on: identifying the physical environment, and economic and social interests which may be affected by the activity and by

alternative activities; and the effects that the activity and alternative activities may have on the physical environment, and economic and social interests. The Act, in specifying the scope and content of an environmental impact report, also includes, "a concise summary of the finding of the environmental impact report". This is not included in the format suggested in the IEM document.

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PART THREE

DEVELOPING A PROCEDURE FOR THE ENVIRONMENTAL EVALUATION OF ROADS IN SOUTH AFRICA

CHAPTER EIGHT: A COMPARISON OF THE ENVIRONMENTAL EVALUATION OF ROADS AND IEM IN SOUTH AFRICA, AND THE IDEAL

8.1. THE ADMINISTRATIVE AND LEGISLATIVE STRUCTURE

The South African administrative and legislative structure is compared to the 'Ideal' administrative and legislative structure in Table 4. From this table it can be seen that the South African administrative and legislative structure is not at the same level as that of the 'Ideal'. Although environmental legislation has recently (June 1989) been promulgated in South Africa, regulations still need to be passed requiring that projects, which may have a detrimental effect on the environment, be environmentally evaluated. Until these regulations are passed, IEM which is being developed by the Council for the Environment, will not be mandatory. Furthermore, until such time as these regulations are passed the Council for the Environment's IEM procedure can only be recommended by, and not enforced by, the Department of Environment Affairs or any provincial or local environmental authorities.

With regard to the road authorities, they do not have any formal environmental policy for roads, nor have they developed any guidelines for incorporating IEM procedures into the existing road development procedures. However, at the Council for the Environment Workshop in August 1989 on 'The Impact of Road Building on the Environment' the road authorities indicated that:

- the drawing up of an environmental policy was a priority, and
- that they accepted the IEM approach, but felt that further co-operation with the Council was required to incorporate IEM into the existing road development procedures.

THE IDEAL	SOUTH AFRICA
National environmental legislation or policy: firstly, to indicate the government's environmental policy, and secondly, to call for the environmental evaluation of projects that have a potential for adversely effecting the environment,	The Environment Conservation Act 73 of 1989 indicates the government's environmental policy and makes provision for the environmental evaluation of projects which may have a detrimental effect on the environment. However, regulations in this regard still need to be promulgated.
National environmental authority: firstly, to promulgate regulations/guidelines concerning the procedures for carrying out environmental evaluation procedures, and secondly, for ensuring that the legislation/policy and the regulations/guidelines are adhered to.	The Council for the Environment has developed the IEM procedure for the environmental evaluation of projects which may have a detrimental effect on the environment. The IEM procedure is not mandatory as there are no regulations requiring the environmental evaluation of projects yet.
National road authority: firstly, to indicate the road authority's environmental policy with regards to roads, and secondly to develop guidelines (acceptable to the environmental authority) making the procedures called for in the environmental legislation and regulations more specific for road projects.	The national road authority (South African Roads Board) has neither a formal environmental policy for roads, nor any guidelines for incorporating IEM into the existing planning procedures.

Table 4: The 'Ideal' Administrative and Legislative Structure vs the South African Administrative and Legislative Structure for the Environmental Evaluation of Roads.

Therefore, to bring the South African roads, administrative and legislative structure, in line with that of the 'Ideal' the following should be done:

- develop and pass regulations which identify transport as an activity requiring environmental evaluation,
- make the use of IEM mandatory for activities requiring environmental evaluation,
- draft an environmental policy for roads, and
- develop guidelines for incorporating IEM into the existing road development procedure.

8.2. THE ENVIRONMENTAL EVALUATION PROCEDURE FOR ROADS

There have been no formal procedural requirements for the environmental evaluation of roads in South Africa in the past and projects have been assessed on an ad hoc basis if and when it was considered necessary. The road authorities now accept that guidelines need to be developed to incorporate IEM into the existing road development procedure. Currently, the Department of Transport has approached consultants to undertake a study to develop a 'Road and Traffic Environmental Control Manual' (Department of Transport - Letter, 20-10-89).

This section compares the elements of the 'Ideal' environmental evaluation procedure, IEM and the existing road development procedure. As the IEM procedure is still to be incorporated into the existing road development procedure, there will be differences between the 'Ideal' procedure (specifically for roads) and the IEM procedure (not specifically for roads). The comparison is therefore to determine whether the IEM procedure is an acceptable procedure, that should be incorporated into the existing road development procedure, and suggest modifications to bring the existing road development procedure in South

Africa, incorporating IEM, in line with the requirements of the 'Ideal' environmental evaluation procedure for roads.

Table 5 presents the elements within the different stages of the 'Ideal', IEM, and the existing road development procedures. The similarities and differences are discussed under the different stages of the 'Ideal'.

8.2.1. Planning Stage

The planning stage of the 'Ideal' corresponds to network planning and determining the need for specific proposals in the existing road development procedure. However, in the existing road development procedure, the technical studies should include a study of the environment, and an opportunity should be provided for other authorities and the public to be involved in determining the purpose and need for the proposal. As road projects are ultimately for the public benefit, it would be appropriate to provide the public with an opportunity, at this stage, to express their needs and views concerning the proposal. In the IEM procedure, searching for alternatives and investigating possible environmental effects corresponds to identifying alternatives in the location stage of the 'Ideal'. However, by incorporating this step in the existing road development procedure, studies on the environment will be carried out at this early stage.

Therefore, in order to make network planning and determining the need, of the existing road development procedure, comparable to the planning stage of the 'Ideal', it is recommended that:

- the IEM proposal generation stage be incorporated into the network planning and determining the need stage of the existing road development procedure, and
- that an opportunity be provided for other authorities and the public to participate in determining the need.

THE IDEAL	IEM	ROAD DEVELOPMENT PROCEDURE
Planning Stage	Proposal Generation Stage	Network Planning and Determining the Need for Specific Proposals
- technical studies - traffic, economic, and environmental - for predicting future conditions		- technical studies carried out, however, should include study on environment at this stage
- opportunity for other authorities, interested parties, and the public to participate		
- establish goals and objectives that need to be met in order to solve the problems identified	- define purpose and need for the proposal	- establish need
	- search for alternatives; investigate possible effects of proposal & alternatives; decide on alternatives to assess	
The Location Stage	Assessment Stage	Corridor Identification Stage
- a 'screening ' process	- 'screening' process	
- identify alternatives		- identify different corridors
	- conducting an investigation of the environmental impacts - start by consulting with interested and knowledgeable parties to determine scope and focus of Class 1 report	
- involve other authorities, interested parties & public to identify the environmental effects of the various alternatives (ie 'scoping'),		
- evaluate the significant environmental effects,		
- identify possible mitigation measures	- indirectly part of IEM as decision is made with or without conditions	
- prepare draft environment evaluation report	- prepare draft Class 1 report	
- indicate preferred corridor		
- circulate draft report for review by other authorities, interested parties & public	- affected public and interested parties review draft report	
- provide opportunity for Public Hearing	- provision made for Board of Investigation in Environment Conservation Act	

(Table 5 is continued on next page)

Table 5: A Comparison of the 'Ideal' Environmental Evaluation Procedure, IEM and the Existing Road Development Procedure in South Africa.

(Table 5 Continued)

THE IDEAL	IEM	ROAD DEVELOPMENT PROCEDURE
Location Stage (Cont) - prepare a final environmental evaluation report incorporating the responses from the review and Public Hearing - circulate the final report for review by other authorities, interested parties & the public - request approval for route location selection (corridor) from road authority - record of the decision - an appeal system	Assessment Stage (Cont) - prepare final Class 1 report incorporating any comments from the review and Board of Investigation (if held) - request approval from responsible authority - officially record decision - opportunity for appeal	Corridor Identification (Cont) - report prepared by consultant identifying the selected corridor - report is made available to sister departments for comment
The Design Stage Preliminary design - can start when preferred corridor is indicated: - publish report on line within selected corridor and location of any side and feeder roads - circulate report for review by other authorities, interested parties and the public - provide opportunity for second Public Hearing - incorporate changes resulting from hearing		Route Planning Stage - prepare report on the route within the selected corridor - circulate report to sister departments and land owners for comment
		Preliminary Design Stage (Note this differs from the preliminary design in the 'Ideal') - a report is prepared at the end of the preliminary design - meetings are held with those affected (ie land owners)
Commence with final design		Detailed Design Stage

Table 5: A Comparison of the 'Ideal' Environmental Evaluation Procedure, IEM and the Existing Road Development Procedure in South Africa.

8.2.2. Location Stage

The steps in the location stage of the 'Ideal' in most instances compare favorably to that of the assessment stage of the IEM procedure. However, there are a few differences which are highlighted.

In the IEM procedure, alternatives are identified in the proposal generation stage before the screening process, and the scoping process is conducted as the first stage of the investigation of environmental impacts. Although, the order of the screening process and the identification of alternatives is different, this is not a major concern.

There is no provision in the IEM procedure for a Public Hearing to resolve any conflict that can not be resolved by negotiation. However, the Environment Conservation Act 73, of 1989, does make provisions for a Board of Investigation to be appointed by the Minister of Environment Affairs to assist him in the evaluation of any matter or appeal.

In the assessment stage of IEM, the final Class 1 report is not circulated for review by other authorities, interested parties and the public before the final decision is made. This review stage provides an opportunity for those who commented on the draft environmental report (and others) to see how their comments where addressed and incorporated into the final environmental report. Any concern that there may still be can then be raised before the final decision is taken. Therefore, consideration should also be given to providing an opportunity for the review of the final environmental report.

The preferred route is not indicated in the Class 1, draft or final report. This is primarily due to the fact that IEM is a general procedure and not specific to roads. In the corridor selection stage of the existing road development procedure, different corridors are identified and a report is prepared identifying the selected corridor. This report is made available to sister departments for their comment. Therefore

corridor selection is part of the corridor identification stage. However, it is felt that the Class 1 environmental report should be incorporated into the present corridor selection report and should: be prepared in draft and final form; indicate the preferred corridor; be made available to other authorities, interested parties and the public for comment after both the draft and final report is prepared.

The appeal system at the end of the assessment stage of IEM can be through the Board of Investigation which is appointed by the Minister of Environment Affairs to assist him in the evaluation of any matter or appeal.

Therefore, in order to make the corridor identification stage, of the existing road development procedure, comparable to the location stage of the 'Ideal', it is recommended that:

- the steps in the IEM assessment stage be incorporated into the corridor identification stage,
- an opportunity for a Board of Investigation (in terms of the Environment Conservation Act 73, of 1989) be held after the draft report has been prepared and at the appeal stage, and
- the Class 1 report be incorporated into the existing corridor selection report, and it should:
  * be prepared in draft and final form,
  * indicate the preferred corridor,
  * be made available at the draft and final stages for comment by other authorities, interest parties and the public.

8.2.3. Design Stage

There is no corresponding stage to the design stage of the 'Ideal' in the IEM procedure. In the development of a road project there is essentially a two stage approach in deciding on the actual route (line) of the road. Firstly, the corridor is

selected, and secondly, the line of the road within the selected corridor is decided upon. IEM, a general environmental evaluation procedure does not incorporate this two stage approach.

In the route planning stage of the existing road development procedure a report is prepared on the route within the selected corridor. This corresponds to the publishing of a report on the line within the selected corridor and the location of any side and feeder roads during preliminary design in the 'Ideal'. In the existing road development procedure, this report is only made available to sister departments and land owners, whereas ideally, the report should be a public document and made available to other authorities, interested parties and the public for their comment. Furthermore, another opportunity should be provided for a Board of Investigation if there is still any conflict that can not be resolved by negotiation. Any changes resulting from the comments or the Board of Investigation should be made before proceeding with the final design. If route planning commences after the preferred corridor is indicated, then one Board of Investigation can be held to resolve any conflict that may arise in selecting the corridor and in determining the line within the selected corridor.

In the existing road development procedure, a further report is prepared at the end of the preliminary design stage and meetings are held with land owners. This preliminary design stage differs from the preliminary design in the 'Ideal' in that the focus is on the land take of the proposed road. Although this is not required in the 'Ideal', this can only be of benefit to the project as a whole.

The detailed design stage in the existing road development procedure corresponds to the commencement of final design at the end of the design stage in the 'Ideal'.

Throughout the design stage, in the 'Ideal', experts from various disciplines should be involved in order to achieve a more environmentally acceptable design. Likewise, this should

be encouraged in the route planning, preliminary design, and detailed design stages of the existing road development procedure.

Therefore, in order to make the route planning, the preliminary design and detailed design stages of the existing road development procedure, comparable to the design stage of the 'Ideal', it is recommended that:

- the route planning report be a public document and be made available to other authorities, interested parties and the public,
- provision be made for the holding of a second Board of Investigation when necessary (which may be combined with the first Board Hearing if the route planning commences when the preferred corridor is indicated), and
- experts from various disciplines be involved throughout the route location and design stages.

8.3. THE ENVIRONMENTAL EVALUATION DOCUMENT

There is no legislated format for the environmental report in South Africa. However, in terms of the Environment Conservation Act 73, of 1989, regulations may be passed specifying the report content and structure. The Act specifies what these regulations may include, and the IEM document also recommends a format for the environmental report. These formats (in the Act and IEM) are compared against the 'Ideal' format for an environmental evaluation document in Table 6.

Referring to Table 6, there are no major differences between the 'Ideal' format and the formats recommended in IEM and the Environment Conservation Act. It is therefore recommended that

the corridor selection report, which is to be prepared in draft and final form (see section 8.2.) follow the format and structure recommended in IEM and the Environment Conservation Act.

THE MODEL	SOUTH AFRICA
- a summary document	- regulations in terms of the Environment Conservation Act - when passed - may include a concise summary of the findings in the environmental report
- a statement of the purpose and need for the project	- the purpose and need for the proposal
- the alternatives considered	- the general nature of the proposals and alternatives
	- activities associated with the proposal and with any of the alternatives
- the affected environment	- the nature of the affected environment
- an evaluation of the environmental effects of the alternatives	- possible impacts of the proposal
- the effects of alternatives on different interest groups	- the groups of people that would be affected by these impacts
- possible mitigating measures	- possible measures to avoid or reduce harmful impacts and make the best use of environmental features
- an evaluation of the advantages and disadvantages in choosing the preferred route	- in the official record of the decision, the reasoning behind the decision is to be included

Table 6: The 'Ideal' Format for the Environmental Evaluation Document vs the Recommended IEM, and Environmental Conservation Act Format.

CHAPTER NINE: A PROCEDURE FOR THE ENVIRONMENTAL EVALUATION OF ROADS IN SOUTH AFRICA

Implementing the recommendations, made in the comparison of the 'Ideal', IEM and the existing road development procedures, a procedure for the environmental evaluation of roads is developed which compares favourably to the 'Ideal' environmental evaluation procedure (generated in Part One, Chapter 5). Figure 5 shows the recommended environmental evaluation procedure for roads in South Africa schematically.

The procedure starts with network planning and determining the need. Technical traffic, economic and environmental studies are carried out. In the environmental studies, alternatives and their possible environmental effects will be considered so that a decision can be made as to what alternatives will be considered in the corridor identification stage. Other authorities, interested parties and the public should be given an opportunity at this stage to indicate to the road authorities what their needs and views are with regards to the project proposal.

In the corridor identification stage a screening process needs to be developed identifying the level of assessment that is required. According to IEM: a Class 1 assessment would be the most thorough assessment, applicable to proposals which are "expected to have significant harmful impacts"; a Class 2 assessment would apply to a proposal which "may or may not have harmful impacts", and a Class 3 assessment would be for a proposal which "almost certainly will not have any significant harmful impacts". For a Class 1 assessment, the environmental impacts are evaluated. At the beginning of this step interested and knowledgeable parties are to be involved in determining the scope and focus of the report which is to be prepared (ie scoping). Possible mitigation measures for the different alternatives are also identified at this stage. A draft corridor selection report is then prepared indicating the preferred corridor. The report is then circulated to other authorities, interested parties and the public for their

comment. At this stage an opportunity is provided for a Board of Investigation to be held. Such an investigation can be requested by either the Minister of Environment Affairs or the public and should be held in public. A final corridor selection report is then prepared which incorporates any comments from the review and the Board of Investigation (if held). The corridor selection decision is then made by the road authority with the approval of the environmental authority who officially records the decision and the reasoning behind the decision with the environmental authority. The record of decision is a public document and it must specify any conditions of approval. At this stage there is an opportunity where the decision can be appealed against through the Board of Investigation.

The route planning stage, which can start once the preferred corridor is indicated (see Figure 5, the dotted line), involves preparing a draft report on the line of the road within the selected corridor. The report is circulated to the authorities interested parties and the public for their comment. Again there is an opportunity for a Board of Investigation to be held to resolve any conflict that can not be resolved through negotiation. The decision on the line of the road is made by the road authority with the approval of the environmental authority.

In the preliminary design stage a further report is prepared, on the land take of the proposed road, and made available to other authorities and meetings are held with land owners affected by the proposed road project. Detailed design then commences and the project is implemented.

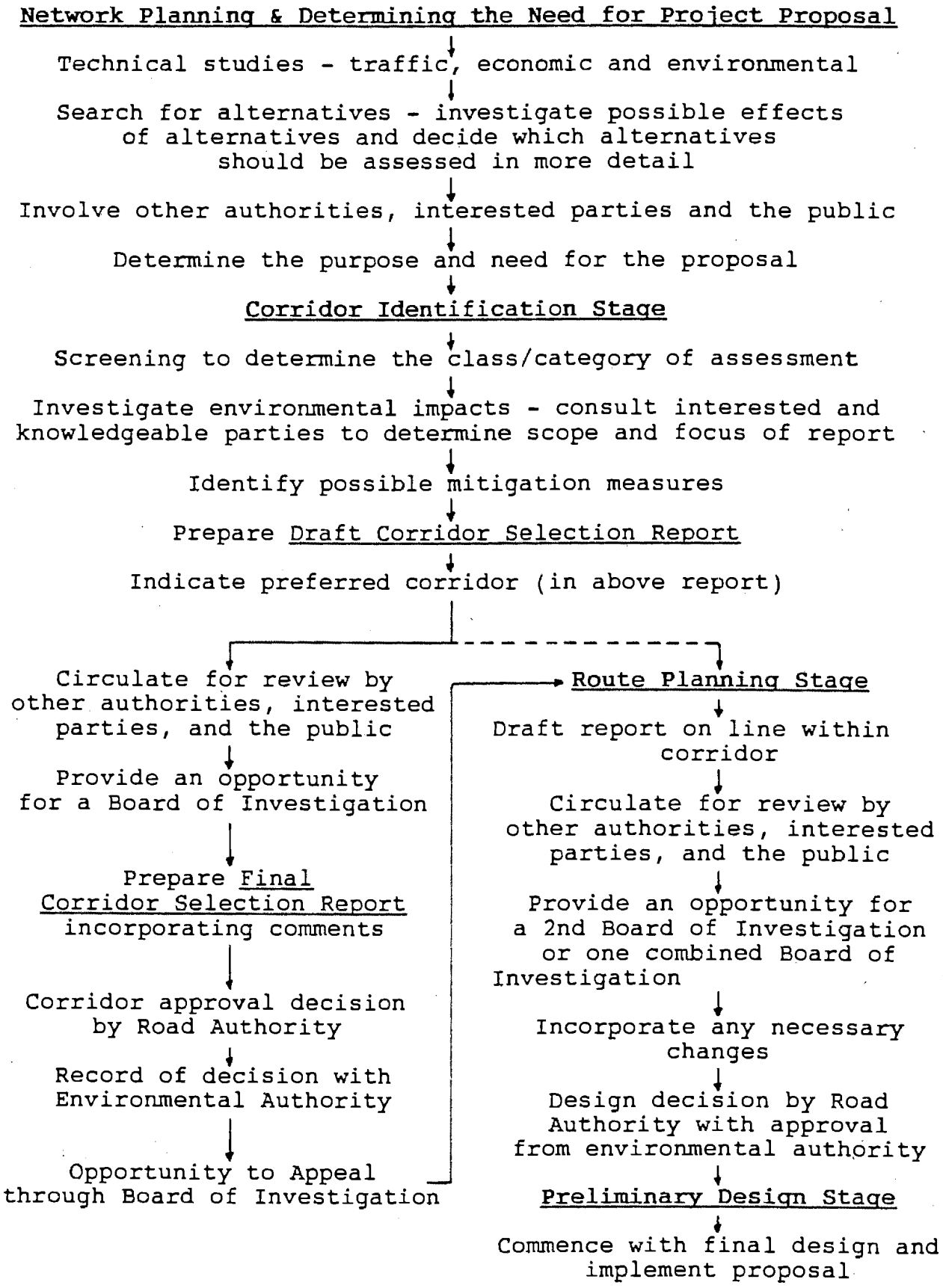

Figure 5: The recommended environmental evaluation procedure for roads in South Africa.

SUMMARY OF THE REPORT

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1. In the analysis of the environmental evaluation of roads in the UK, USA, and Canada (Ontario) it was found that although the procedures adopted in these countries are different, largely due to different government structures, the elements of the different procedures are comparable.

2. Identifying the elements for the environmental evaluation of roads in the UK, USA, and Canada (Ontario), an 'Ideal' is generated.

   The 'Ideal' administrative/legislative structure for the environmental evaluation should include:

   - national environmental legislation or policy: containing environmental policy and calling for the environmental evaluation of road projects,
   - a national environmental authority: to enforce legislation and pass regulations concerning the procedural requirements for environmental evaluation, and
   - a national road authority: to indicate environmental policy for road authorities and develop guidelines implementing the legislation and any regulations.

   The 'Ideal' environmental evaluation procedure for roads should include the following steps:

   - in the planning stage:
     * technical studies (traffic, economic and environmental)
     * participation by other authorities, interested parties and the public
     * establishing the goals and objectives of the proposal

- in the location stage:
  * 'screening'
  * identify alternatives
  * 'scoping'
  * evaluate significant effects
  * identify any mitigation measures
  * prepare a draft environmental report
  * indicate the preferred corridor
  * other authorities, interested parties and the public review the environmental report
  * provide an opportunity for a Public Hearing
  * prepare a final environmental report
  * other authorities, interested parties and the public review of the final environmental report
  * corridor selection decision by road authority with the approval of the environmental authority
  * record the decision
  * an appeal system

- in the design stage:
  * preliminary design
  * draft report on actual line of the road
  * review of the report by other authorities, interested parties and the public
  * a 2nd Public Hearing opportunity
  * incorporate any changes
  * final design
  * implement the proposal

The 'Ideal format for an environmental evaluation report should include:

- a summary document
- a statement of purpose and need for the project
- the alternatives considered
- the affected environment
- an evaluation of the environmental effects of alternatives

- the effects of alternatives on different interest groups
- possible mitigation measures
- the evaluation of advantages and disadvantages of alternatives in selecting the corridor.

3. The study on the environmental evaluation of roads in South Africa revealed that there is at present no formal environmental policy or any systematic documented set of procedures for the environmental evaluation of roads in South Africa although the Department of Transport has appointed consultants to prepare a Road and Traffic Control Manual (October 1989).

4. The study on Integrated Environmental Management (IEM) revealed that the road authorities are committed to IEM. However, the IEM procedure still needs to be incorporated into the existing road development procedure.

5. Comparing the administrative and legislative structure in South Africa to the 'Ideal', shortcomings are identified and the following recommendations are made to overcome them:

   - pass regulations to identify transport as an activity requiring environmental evaluation,
   - pass regulations requiring the mandatory use of IEM for environmental evaluation of road development projects,
   - prepare an environmental policy for roads, and
   - develop guidelines for incorporating IEM into the existing road development procedure.

6. Comparing the existing development procedure for roads in South Africa to the 'Ideal' environmental evaluation procedure for roads, reveals that IEM does address some, but not all, of the shortcomings. To bring the existing road

development procedure in line with the 'Ideal', the following recommendations were made:

- in the planning stage: incorporate IEM proposal generation stage into network planning and determining the need stages, and provide an opportunity for other authorities and the public to be involved in determining the need;
- in the location stage: incorporate IEM assessment stage into the corridor identification stage; provide an opportunity for a Board of Investigation after the draft report is prepared, and incorporate the Class 1 report of IEM into the corridor selection report;
- In the design stage: make the route planning report a public document, provide an opportunity for a 2nd Board of Investigation (which may be combined with the 1st), and involve experts from various disciplines throughout the design stages, and
- In the implementation stage: incorporate monitoring and selected audits from the IEM procedure.

7. The IEM report structure and the proposed structure in the Environment Conservation Act compare favourably to the 'Ideal'. Therefore, it is recommended that the route selection report prepared in draft and final form follow the structure and format recommended in IEM and the Environment Conservation Act.

8. By implementing these recommendations a procedure for the environmental evaluation of roads in South Africa is developed. The basic steps of this procedure are as follows:

- network planning & determining the need stages:
  * technical studies (traffic, economic and environmental)
  * search for, and decide on alternatives to be assessed

    * involve authorities, interested parties and public
    * determine the purpose and need

- corridor identification stage:
    * screening
    * investigate impacts (involve scoping)
    * identify possible mitigation measures
    * prepare draft corridor selection report
    * indicate preferred corridor
    * circulate for review by authorities and public
    * opportunity for Board of Investigation
    * prepare final corridor selection report
    * corridor decision by road authority with the approval of the environmental authority
    * officially record decision with environmental authority
    * system for appeal (through Board of Investigation)

- route planning stage:
    * prepare a draft report on actual line of the road
    * circulate for review by authorities and the public
    * opportunity for Board of Investigation
    * incorporate any changes
    * design approval by road authority

- preliminary design stage

- commence with final design and implement proposal

In summary, the environmental evaluation procedure developed for roads in South Africa is based on common and unique steps and elements in the procedures followed in the UK, USA, and Canada (Ontario). The procedure developed takes into account the existing administrative and legislative road structure in South Africa, the IEM procedure that is currently being developed in South Africa, and the Environment Conservation Act. Therefore, it is considered that this procedure should be acceptable to both road and environmental authorities.

As there is at present no formal documented procedure for the environmental evaluation of roads in South Africa, it is recommended that this procedure be considered by road and environmental authorities with a view to implementing it.

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APPENDICES

DELEGATES ATTENDING THE COUNCIL FOR THE ENVIRONMENT WORKSHOP ON THE IMPACT OF ROAD BUILDING ON THE ENVIRONMENT - 22 AUGUST 1989

Dr D Hey	-	Chairman of the Committee for Terrestrial and Freshwater Systems of the Council for the Environment, and member of the Committee for the Built Environment.
Mr S A Gerber	-	Chief Director of Environment Conservation, Department of Environment Affairs, Pretoria.
Mr E J Hall	-	Deputy Chairman of the Council for the Environment, and member of the Committee for the Built Environment, c/o De Leuw Cather and Associates, Consulting Engineers, Braamfontein.
Mr E Adler	-	Member of the Committee for Terrestrial and Fresh Water Systems of the Council for the Environment.
Mr G T Fagan	-	Chairman of the Committee for the Built Environment of the Council for the Environment, c/o Fagan Architects.
Mr M L Heyns	-	Deputy Director, Resource Conservation, Department of Agriculture, Economics and Marketing, Pretoria.
Mrs N F Armstrong	-	Member of the Committee for Coastal and Marine Systems and the Built Environment of the Council for the Environment.
Mr H Lith	-	Town Planning Branch, Cape Town Municipality.
Dr J H Neethling	-	Director of Nature and Environment Conservation, Cape Provincial Administration.
Mr E S Rivett-Carnac	-	Member of the Committee for the Built Environment of the Council for the Environment.
Mr R F Petersen	-	Chief Engineer: Planning, Roads and Traffic Department, Cape Provincial Administration.
Mr J C Lombaard	-	Chairman of the Committee for South African Road Authorities, Free State Roads Department, Free State Provincial Administration.

Mr P G Fanner	-	Chief Engineer: Design, Chief Directorate National Roads, Pretoria.
Mr J P van der Breggen	-	Chief Landscape Officer, Chief Directorate National Roads, Pretoria.
Mr B L Dawson	-	Potchestroom University, Research Scientist, Brackenfell.
Mr J P Raimondo	-	Environmental Evaluation Unit, University of Cape Town.
Mr J P de Wit	-	Member of the Committee for Terrestrial and Freshwater Systems of the Council for the Environment.
Mr P R Botha	-	Chairman of the Council for the Environment.
Mr R C Hill	-	Environmental Evaluation Unit, University of Cape Town.
Mr D E Faure	-	Environmental Evaluation Unit, University of Cape Town.