FINAL REPORT

European Commission, DG Environment

Strategic Environmental Assessment of Transport Corridors: *Lessons learned comparing the methods of five Member States*

January 2001

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Reference 5684

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For and on behalf of
Environmental Resources Management

Approved by: _____

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1 EXECUTIVE SUMMARY

1.1 THE AIMS OF THIS REPORT

In 1997 the European Commission, in collaboration with five Member States (Austria, France, Italy, Sweden and the United Kingdom), embarked on a programme to develop and test Strategic Environmental Assessment of transport corridors. Five corridors were selected out of the wider Trans-European Transport Network, once for each participating country. Each Member State then set out to:

- assist the development of methodologies to assess the environmental impacts of large scale plans, programmes and/or policy measures in the transport sector;
- show that SEA is feasible and that it is a valuable tool for decision-making;
- ensure consideration of sustainability in transport planning and development; and
- assist in deciding the choice between alternatives to solve transport problems in a corridor.

The studies were successfully completed in 1999 and are a major contribution to the advancement of SEA theory and practice. Their concrete example will help to demystify once and for all some of the concerns behind SEA's feasibility.

This report was commissioned from Environmental Resources Management (ERM) with the aim of reviewing the five pilot SEAs and drawing out the most relevant aspects of good practice. The Directorate General Environment of the European Commission presents this report as a contribution to the SEA debate in the context of transport, and to the wider discussions on environmental integration which have been a priority since the Cardiff Process was set up by the European Council of Ministers.

ERM carried out the study using the following approach.

- An initial review of the corridor study's final reports.

- A series of interviews with selected representatives of the teams involved in each corridor study.

- The circulation of a draft to representatives of the Commission services in the Transport and Environment DGs, and to the individuals interviewed (March-April 2000).

- The production of this final report, which takes into consideration the comments and suggestions made on earlier drafts.

This report owes much to the time and support of all interviewees who have provided insight into the work they have carried out. We would like to thank

in particular: *Andreas Käfer of Trafico, Austria; Bruce Davidson of Environmental Resources Management, United Kingdom; Carlo Benedetto and Maria Rosaria De Blasiis of the Università degli studi "Roma 3", Italy; Ernst Lung of the Bundesministerium für Wissenchaft und Verkehr, Austria; Inga Maj Eriksson of the Swedish National Road Administration, Sweden; Jean Marie Braun of INGÉROP, France; and Pierre Skriabine of the Service d'Études Techniques des Routes et Autoroutes, France.*

1.2 THE CORRIDORS AND THEIR ASSESSMENTS

The five studies looked at the following transport corridors:

- the Gothenburg-Jönköping Transport Corridor (Sweden);
- the Trans-Pennine Corridor (United Kingdom);
- a section of the Danube Corridor (Austria and neighbouring regions);
- the road Corridor between port of Ravenna and Venice (Italy); and
- the Corridor Nord between Paris and Brussels (France/Belgium).

The surface area covered ranged from 5000 to 22000 km^2, two of the corridors were international, and the cost of the studies varied from Euros 100000 to 465000.

Despite setting out with a common set of objectives, each assessment has been developed in significantly different ways, reflecting the variety of planning systems and appraisal cultures in the Member States involved. This confirms that SEA applied to theoretically similar issues (namely, transport corridors) can actually result in radically different approaches and methods, depending on the context in which it operates.

Ultimately, the effectiveness of SEA methods will depend on the identification of the planning stages which are most likely to respond to an assessment and which provide the strongest lever to influence decision-making. Inevitably, this will vary significantly from country to country. But the studies also showed variation in the type of questions which each study had explicitly set out to address. For example, the question "*which option will meet the environmental objectives?*" aims to provide a direct link between a predicted (quantified or qualified) effect and a broad policy objective for the corridor. Quite a different focus, and level of detail, is implied by the question "*what is the best route for each option?*", where the decision to be taken is not a choice between broad strategic alternatives and scenarios, but one of spatial location.

1.3 LESSONS LEARNED AND WAYS FORWARD

On SEA and its objectives

The objectives and scope of a corridor SEA will reflect available resources, the country's existing transport system (its characteristics and problems), and the planning system and assessment culture, especially in terms of:

- the level of strategic choices to be considered (e.g. solving the corridor's transport problems through multimodal and demand management measures, or seeking to accommodate traffic through new infrastructure avoiding sensitive areas);
- the link between the environmental component of the corridor assessment and the socio-economic and technical evaluations; and
- the type and timing of public participation and consultation to be carried out.

On consultation and public participation

The pilot studies found that information sharing, consultation, and participation are all essential parts of the SEA process and have the greatest positive impact if initiated at the earliest stages. This also helps stakeholders to familiarise themselves with this relatively new method and thus increases their ability to contribute to the debate. The involvement of a broad range of interest in the process will also bring benefits such as buy-in and credibility for the results of the SEA. It will also widen the range of issues and the perspective from which a transport plan is being assessed.

The experience, albeit limited, from the studies does not appear to support the classic concerns in relation to the feasibility of consultation at the 'SEA level'. The assumption that this may be almost impossible given the scale of the issue and/or the size of the population potentially involved, and the fear that this will be too expensive and time consuming, could all be addressed – so long as there is the political will to do so.

On scoping as a critical stage in SEA

The scoping stage is perhaps the most critical stage in SEA. In particular, the studies found it provides an important opportunity to inform and involve stakeholders in discussions on objectives, indicators, initial ideas on alternatives, and data availability. Scoping necessarily means focusing on what is necessary and sufficient for the type of decision that needs taking. It is an effort of fine balance whose success dictates the effectiveness of the SEA process in achieving its main goals.

On identifying alternatives

This stage was judged by the various experts to be SEA's greatest and most constructive contribution to sustainability and environmental protection. Not surprisingly, it was found to be the most dynamic and intensive phase of the assessment process, particularly for those studies which looked at infrastructure and policy-type alternatives, and which involved some degree of consultation.

On assessing potential impacts

Each study developed methods aimed at substantially different types of corridors, planning stages and levels of decision-making. Thus, the approaches to assessing impacts are not directly comparable, and they present both similarities and differences, which are worth highlighting.

All SEAs referred to environmental and sustainability objectives, showing that these can be helpful to both quantitative and qualitative methods. Indicators and constraint mapping were used in very different ways by each assessment team, however, a limited and tightly focused number of indicators seemed to provide the best balance between analytical assessment and clarity in the overall evaluation and interpretation of results. The recourse to - sometimes complex- assumptions was considered inevitable, as was the need for transparency in their formulation.

The use of Geographical Information Systems (GIS) and modelling – including land use models -, played a critical role in some studies and a rather secondary role in others. Its many advantages are described in *Sections 7.3* and *7.4,* however, it is equally important to note that GIS and modelling are not always essential in order to provide adequate and sufficient information for decision-makers. Much will depend on the level and type of plan being assessed.

On the linkage to other assessments

Overall, it was felt that consideration of the economic implications of different alternatives was necessary and helpful in providing a balanced picture when presenting results. Methods for inclusion of CBA-type analyses (cost-benefit analyses) varied greatly, also reflecting cultural approaches to planning and long established evaluation processes. For example, not all approaches led to monetary evaluation of impacts.

On reporting

SEAs based on an objectives-led approach will tend to present results in connection to these objectives. This makes results easily understandable and helps the reader and decision-maker to obtain an immediate understanding of their wider significance, especially if presented as simple questions. The use of maps was generally considered an effective way of conveying results with important spatial implications, but it was felt that it should be kept to a minimum.

1.4 ON THE FUTURE OF CORRIDOR SEAS AND MULTIMODALITY

The methods proposed, and their application to demonstration studies, show that SEA of multimodal corridors is not only methodologically feasible, but also that it can be designed to fit within the national planning process and appraisal culture. This experience supports the arguments for a flexible approach to SEA, which aims to shape and blend the assessment process in harmony with the existing planning and assessment systems.

Difficulties such as data availability and transport demand forecasting remain present in many of the studies. However, rather than signalling a need to postpone the application of SEA, these obstacles call for further practice in SEA, since this enables solutions to be sought through the constant refinement of methods, by collaboration and investment at national and international levels (especially in the context of transboundary corridors).

SEA can make a positive contribution towards strengthening a culture of multimodality as well as optimising the combination of infrastructure and non-infrastructure solutions. Consideration of two or more modes of transport does not necessarily lead to a choice between modes (an either/or scenario). Quite the contrary. Especially in those cases where more than one type of infrastructure already exists, such assessment is likely to result in

recommendations for the improvement of several modes. However, transport administrations at national level will have to support and provide the legal and administrative means to carry out transport corridor SEAs, also clarifying the role of regional and local administrations.

Therefore, the way forward, both for SEA in general and for SEA of TEN-related initiatives in particular, will require:

- the strengthening of political support for SEA;

- the creation of legal and administrative conditions which enable the effective application of SEA to strategic transport initiatives;

- further effort, by the EU institutions and the Member States, to address the problems of international data, including – where it exists - the terms for its accessibility;

- a continuing effort to exchange and compare experiences throughout different countries, disseminating good practice, but also discussing the problems encountered and possible solutions;

- emphasis on the need for each country to understand the role of SEA –and therefore its scope and structure - in the context of their planning and assessment cultures; paying particular attention to the need to integrate SEA in the overall 'evaluation effort' which lies behind any policy or planning process.

CONTENTS

1 FOREWORD

The Trans-European Transport Network and SEA

The Trans-European Transport Network (TEN) is a key part of the European Union (EU) policy on TENs which aims to provide the physical basis to achieve an integrated Europe.

The TEN Guidelines [1], adopted in July 1996, include a general consideration for the environmental implications of the policy. They refer to the need to help "*achieve the Community's objectives, particularly in regard to the environment*" (Article 2), to "*integration of environmental concerns into the design and development of the network*" (Article 5). This is one of the priorities which contribute to a project being considered of common interest (Article 7). The Guidelines then call upon the Commission to develop "*methods of analysis for strategically evaluating the environmental impact of the whole network*" and for "*corridor analysis covering all relevant transport modes*" (Article 8(2)).

In response to Article 8, the Commission (Directorate Generals for Transport and Energy, and for Environment, Eurostat and the European Environment Agency) has engaged in a work programme that has produced some important and encouraging results on SEA for the transport sector. The work programme involved:

- Producing a manual of SEA methodology for the transport sector;
- Carrying out a pilot SEA of the overall TEN;
- Promoting pilot assessments of TEN corridors by individual Member States involving, where possible, multimodal options.

This report reviews the five pilot SEAs of TEN corridors which were initiated as part of the above work programme and highlights the lessons learned from the Member States' experience. The European Commission, Directorate General Environment, presents this report as a contribution to the SEA debate in the context of transport, and to the wider discussions on environmental integration which have been a priority during recent meetings of the European Council of Ministers. (2)

Signed….

(1) Decision of the European Parliament and the Council on Community guidelines for the development of the trans-European transport network (1692/96/EC)..

(2) See in particular the European Councils of Vienna (December 1998) and of Cologne (June 1999).

2 INTRODUCTION TO THIS REPORT

Section Contents

2.1 THE AIM OF THIS REPORT

In 1997 the European Commission joined forces with five Member States in promoting and providing financial contribution towards an SEA of the following transport corridors (see also *Figure 2.1*):

- the Gothenburg-Jönköping Transport Corridor (Sweden);
- the Trans-Pennine Corridor (United Kingdom);
- a section of the Danube Corridor (Austria and some neighbouring regions);
- the road Corridor between port of Ravenna and Venice (Italy); and
- the Corridor Nord between Paris and Brussels (France/Belgium).

The aim of this report is to review the five corridor studies to:

- present an overview of lessons learned in the development and application of methods for SEA at transport corridor levels;

- focus on key aspects of the different methods which represent good practice and innovative approaches that can be applied in other Member States;

- make recommendations for the future application of SEA to the TEN.

This report, and the original studies on which it is based, are aimed at a wide audience and, in particular to the European and Member State governments, transport planning authorities and consultancies who will be looking at the experience gained from this exercise for future application of SEA to transport planning.

2.2 METHOD AND STRUCTURE OF THIS REPORT

The study was carried out using the following approaches:

- An initial review of the corridor study's final reports;

- A series of interviews with selected representatives of the teams involved in each corridor study;

- The circulation of a draft to representatives of the Commission services in the Transport and Environment DGs, and to the individuals interviewed (March-April 2000);

- A final report which takes into consideration the comments and suggestions made to earlier drafts.

Figure 2.1 The Five Corridor Studies

The drafting of this report owes much to the time and support of all interviewees who have provided further insight into the work they have carried out. We would like to thank in particular:

Andreas Käfer of Trafico, Austria; Bruce Davidson of Environmental Resources Management, United Kingdom; Carlo Benedetto and Maria Rosaria De Blasiis of the Università degli studi "Roma 3", Italy; Ernst Lung of the Bundesministerium für Wissenchaft und Verkehr, Austria; Inga Maj Eriksson of the Swedish National Road Administration, Sweden; Jean Marie Braun of INGÉROP, France; and Pierre Skriabine of the Service d'Études Techniques des Routes et Autoroutes, France.

It should be noted that this report focuses on the experience of the five Member States involved in the pilot initiative launched by the EC. It does not take into account the existing experience in other countries. Such experience is being discussed in the context of the TEN-SEA sub-Committee, which is looking at progress on SEA of TEN, in the light of the forthcoming paper by the European Commission on the possible revision of the TEN Guidelines.

The document is divided into nine main sections. *Sections 3 to 8* refer to the key stages of an SEA process. The analysis compared the different approaches of the five pilots with reference to such stages:

- Section 1 Foreword
- Section 2 Introduction to This Report
- Section 3 The choice of Corridors and Methods
- Section 4 Consultation and Participation
- Section 5 Scoping and Baseline Data
- Section 6 Outline of Alternatives
- Section 7 Assessment of Potential Impacts
- Section 8 The SEA Report
- Section 9 Conclusions and Ways Forward.

2.3 *BACKGROUND - RECENT DEVELOPMENTS IN SEA*

2.3.1 *SEA as a tool for integration*

Since 1996 the drive for integration of the environment in the Community's main policy areas, including TEN, has been significantly strengthened.[1] The EU Ministers of Transport have recognised that integration of the

(1) The "Principles" of the Amsterdam Treaty (1997) establish that the European Community decree that environmental protection requirements must be integrated into other Community policies (Article 3c, new Article 6). Thus, the duty to integrate environmental protection requirements into all activities of the European Community is established as a key precondition for sustainable development.
The Commission has recently undertaken to strengthen its environmental assessment of policies and related programmes which are likely to have important, positive or negative, environmental effects (proposed in its Communication on "Strategy for Integrating Environment in EU Policies, Cardiff - June 1998" (COM(98)333 final of 27.05.98). In response to this the Transport Council produced a report for the EU Council in Vienna (no. 13811/98) which clearly recognises the importance of Amsterdam's requirement for an evaluation of existing and planned initiatives, in order to "integrate environmental requirements into sectoral policies".

environmental dimension in mainstream decision-making relating to the transport sector is essential in order to address the various environmental effects of transport and promote sustainable solutions.

Two recent European Summits have requested integration strategies from the transport sector (amongst others).(1) The Transport Council of 6 October 1999, responding to such request, presented an integration strategy which includes a request whereby the Commission should present a report on the application of SEA in the transport TEN by 2001. (2)

SEA can assess the transport corridors' contribution to the objectives of the TEN, in particular with respect to environmental sustainability.

2.3.2 SEA in the European Union

At EU level there are two fields of activity which are currently being developed and negotiated:

The proposed SEA Directive

In 1996 the Commission proposed an SEA Directive. The Common Position based on the amended proposal (1999), has received political agreement in December 1999. This is currently subject to intensive negotiations particularly concerning the area of application. Final adoption is expected in 2001. The purpose of this proposed Directive is not to prescribe in detail how the Member States have to do SEA. In view of the multitude of administrative structures in the EU 15, this is neither possible nor desirable. In the spirit of subsidiarity, the aim is to create framework conditions to enable the systematic consideration of the environment at the strategic planning level – to be put into practice in accordance with national and sub-national circumstances.

SEA in the Framework of the TEN

With the approval of the Guidelines on the TEN in 1996 (see Preface, above), the Commission has undertaken to address SEA - together with socio-economic assessment - as part of the future network development. Article 8 of the Guidelines requires the Commission to develop appropriate methods of analysis for strategically evaluating the environmental impact of the whole network and of individual corridors.

In response to this requirement, a joint work programme between DG TREN, DG ENV, Eurostat and the European Environment Agency was launched. This consisted of the following elements:

(1) See the European Councils of Vienna (December 1998) and of Cologne (June 1999).

(2) Council strategy on the integration of environment and sustainable development into the transport policy submitted by the "Transport" Council to the European Council of Helsinki, Dec. 1999

a) To produce a manual of SEA methodology for the transport sector

The draft manual was completed early in 1999 by consultants on behalf of DG TRANS. It provides guidance to public authorities and practitioners involved in SEA of transport plans and programmes. It describes: a) the principles of SEA for transport, b) the main SEA steps, and c) basic information on how to assess global, regional and local impacts. The manual's methods and practical suggestions are based on international good practice and research.

b) To carry out a pilot SEA of the overall TEN - three stages

Stage 1) To promote feasibility studies for a spatial and ecological assessment of the TEN roads and rail network - the Commission organised a Technical Workshop in April 1997 to explore the feasibility and existing good practice for the strategic assessment of spatial and ecological impacts of transport initiatives. The results of this workshop contributed to the assessment of the physical impacts of infrastructure, through the evaluation of land use, disturbance and fragmentation of, for example, nature areas. The assessment, published in 1998 also makes clear recommendations on what needs to be done to carry out a complete assessment.

Stage 2) To support a research consortium on the assessment of the traffic related environmental impact of the TEN - DGVII has formed a consortium of projects under the 4th Framework Research Programme which aims to develop and test methods and tools for predicting the effect of the TEN in terms of traffic-generated impacts such as emissions of greenhouse gases, acidifying gases and pollutants, and energy consumption, safety and -if possible- noise. The task requires the use of predictive traffic and environmental models for the whole EU.

Stage 3) To make a comparative evaluation of predicted impacts of TEN - The results of the previous two stages would be aggregated in order to make a comparative evaluation of predicted impacts in the light of the Community's environmental objectives and targets. This final stage has yet to be completed, partly due to difficulties in integrating the first two stages.

c) To promote pilot corridor assessments by individual Member States

The Commission has provided financial contribution to five Member States to develop and test methods for SEAs of transport corridors involving, where possible, multimodal options. These corridors are the subject of this comparative analysis.

2.3.3 Characteristics and basic requirements of SEA

Introduction

This section presents some of the key characteristics and requirements of SEA applied to transport corridors, as presented and discussed in the European Commission's *Draft Manual on SEA of Transport Infrastructure Plans* (a report

prepared by DHV for DG TREN, 1999 - see also *Section 2.3.2*), the proposed SEA Directive, and in other good practice guidance documents. [1]

(1) For example: ECMT (2000) *Strategic Environmental Assessment*; published by OECD. EC (1999) *A Handbook on Environmental Assessment of Regional Development Plans and EU Structural Funds Programmes*; published by the European Commission.

Basic Principles of SEA

A number of basic principles can be used to define the essential parts of an SEA process: (1)

- SEA should be applied, at the earliest stage, to all transport infrastructure plans and programmes that will have significant environmental consequences;

- The authority which proposes and develops the transport infrastructure plan should be responsible for the preparation of an SEA report, with the support and co-operation of the environmental authorities;

- The SEA report should be reviewed by environmental authorities and other interested parties and by the public;

- The competent authority should take the SEA report into account in making decisions about the proposed transport infrastructure plan;

- Consultation and participation are integral to the SEA process and should be planned at various stages (eg. Discussing and agreeing objectives, scoping, identifying alternatives etc., see below).

Planning the Carrying Out of an SEA

When an SEA is required, the draft Manual suggests ways to organize the assessment process in order to ensure effective communication with other agencies and with the public, and help the different individuals and institutions involved by:

- setting **clear targets** for the SEA report;
- setting up an **interdisciplinary team**;
- ensuring good **collaboration** exists between the planning and environmental authorities;
- enabling effective **feedback** to be made;
- providing sufficient **time and resources** to carry out public participation;
- ensuring that the results of the evaluation are taken into consideration in the **final decision**.

As we shall see in the next sections, most case studies have followed the processes suggested in the first four bullets. The last two bullets apply only to the UK, and to a lesser extent the Austrian studies, since both linked the "demonstration" exercise to real decision-making processes.

(1) Adapted from: European Commission (1999) Draft Manual on SEA of Transport Infrastructure Plans. Report prepared by DHV for DGVII.

2.3.4 Key stages of the assessment process

SEA processes can vary depending on the level of the strategic action, the sector, and the country planning procedures. These factors will be analysed in relation to the five case studies. However, in general, the SEA steps presented in *Box 2.1* tend to be commonly adopted.

The work of the five pilot studies was mainly focused around steps 2 to 5 (in bold).

Box 2.1 Key stages of the assessment process

1. Screening to determine the need for SEA at this stage of the planning process;

2. **Determining the objectives of the strategic action and the environmental goals and/ or targets;**

3. **Scoping: identification of:**
   -- the physical / regional limits;
   -- the impacts to be addressed;
   -- the alternative actions that need to be assessed;

4. **Carrying out of the assessment:**
   -- Predicting the environmental impact of the action and its alternatives;
   -- Evaluating the significance of the impact (e.g. through comparison with environmental objectives)
   -- Proposing recommendations: preferred alternative, mitigation and monitoring measures;

5. **Preparation of the SEA report and review by competent authority;**

6. Decision: taking into account the findings of the SEA and the consultation;

7. Making arrangements for monitoring;

8. Conducting further environmental assessments (at later stages of planning process, e.g. as project EIA).

Source: ECMT 2000

3 INTRODUCTION TO THE CORRIDOR STUDIES

Section Contents

3.1 THE OBJECTIVES OF THE CORRIDOR STUDIES

3.1.1 Common Objectives

The strategic goals and objectives lying behind the joint EC-Member States initiative to apply SEA to the corridors included:

- assisting in development of methodologies to assess the environmental impacts of large scale plans, programmes and/or policy measures in the transport sector;
- showing that SEA is feasible and that it is a valuable tool for decision-making;
- ensuring consideration of sustainability in transport planning and development; and
- assisting in deciding on choice of alternatives to solve transport problems in a corridor.

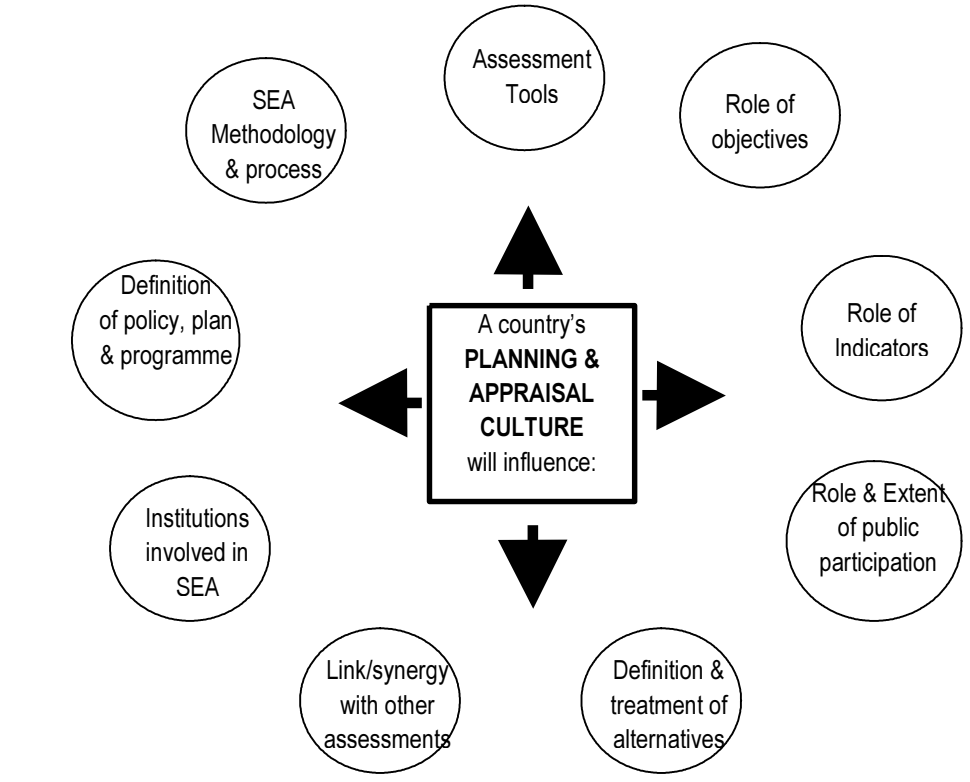
All the case studies aimed to contribute towards the development of methodologies for the strategic environmental assessment of transport corridors; and to a varying degree to the other three objectives listed above. It is therefore important, before laying out the details of the approach for the analysis of the corridor SEAs, to stress that the principle objective of most of the studies was ***not*** the carrying out of a full SEA on a real example, with the exception of the UK SEA. The analysis therefore identifies lessons learned in terms of methods and applications on a combination of real and fictitious scenarios, which were defined for the sole purpose of the pilot assessment.

3.1.2 Different approaches and cultures

Despite the common starting point, each study has been developed in significantly different ways, reflecting the variety of planning systems and appraisal cultures in the Member States involved.[1] The analysis of these five studies therefore offers an opportunity to see how SEA applied to theoretically similar issues (namely, transport corridors) can actually result in radically different approaches and methods.

At the core of any environmental assessment lies the question: *what will be the effect or impact of a certain initiative on the environment?* At the strategic level, the way this basic question is formulated and answered can differ quite significantly, depending on the planning and assessment cultures. Such cultures inevitably influence various elements of the assessments' methodologies and processes (see *Figure 3.1*), and clearly highlight the importance of *flexibility* in SEA practice. The type of questions which each study has explicitly set out to address can help to explain this point.

Figure 3.1: The Influence of Planning and Appraisal Cultures



Source: Bina 2000

(1) "Appraisal cultures" is used here to refer to the custom of using specific instruments, data and procedures for assessment; to the familiarity -or otherwise- of working with multi-disciplinary teams; and to the tendency to see an SEA as a final bureaucratic phase of administrative procedure, or as a dynamic process which contributes to it.

Table 3.1 gives an overview of the key questions which the five SEAs were meant to address. The question "*which option will meet the environmental objectives?*" aims to provide a direct link between a predicted (quantified or qualified) effect and a broad policy objective for the corridor (or area-region). Quite a different focus, and level of detail, is implied by the question "*what is the best route for each option?*", where the decision to be taken is no more a choice between broad strategic alternatives and scenarios, but one of spatial location.

Further evidence of this trend can be drawn from comparing Sweden and France. Questions from the Swedish study:

- can SEA provide practical support to decision-makers in choosing between different alternatives?
- can SEA help in choosing where to direct or concentrate traffic at macro-regional level?
- can SEA help to prioritise links within a network? Can it help to establish whether a link should be of European, national or regional importance?
- can environment and sustainable development issues become a more prominent factor in decision-making through SEA?

This set of questions aims to understand whether SEA has a role in addressing very broad policy-type options relating to transport systems. It seeks to test SEA's potential to strengthen the consideration of environmental and sustainability issues at strategic decision-making levels.

Table 3.1 Comparing the "Key Questions" which will be addressed by the SEA

Study	Questions
Austria	• What are the environmental problems caused by transport in the Danube Corridor, today and in the future, depending on different scenarios (rail, road and inland waterways)? • How do the different scenarios differ in terms of their impacts on health, the environment, the need for additional infrastructure? • What are the concrete advantages of ecological transport solutions in the corridor?
France	• What is the environmental impact of each option? • What is the best route for each option?
Italy	• How does the proposed initiative relate to strategic (policy) objectives? • What is the risk of environmental impact for each option?
Sweden	• What is the environmental impact of each option? • Which option will meet the environmental objectives?
United Kingdom	• To what extent will each option achieve the environmental (and integrated land use, economy, accessibility and safety) objectives? • What is the value for money of each option?

The French study's questions, outlined below, are more focused on the technical side of decision-making: the choice of alternatives and their routes. Questions from the study included:

- can the methodology provide clear elements to be used in a public inquiry?
- can the methodology help to compare different modes of transport in terms of their compatibility with the spatial environment?
- can the methodology help in the analysis of different routes for different modes?
- what is the potential of GIS in the context of corridor SEAs?

> "*La présente étude tente pour la première fois à notre connaissance de comparer par une utilisation complète de la puissance des systèmes d'informations géographiques des scénarios multimodaux de création d'infrastructures nouvelles dans un corridor et d'apporter une contribution concrète sous les aspects environnementaux aux analyses multicritère trop souvent limitées jusqu'à présent aux seuls aspects techniques et socio-économiques*" INGÉROP 1999b

Finally, some studies had additional aims, including:

- To inform the development of a Regional Plan or Strategy (Austria and United Kingdom);[1]
- To identify how SEA can feed into/be helpful for project EIAs (Austria and Italy);
- To test and where necessary adapt existing SEA methods to optimise their use in the context of multimodal network evaluations (France).

> *The main objective of this project [Danube Corridor] is to show that the SEA is an effective instrument in the following respect:*
> - *Increased and more balanced consideration of environmental issues in the planning of the transport infrastructure through:*
>
> *- systematic demonstration of the likely effects which transport planning will have on the environment;*
> *- through public involvement (not yet carried out here);*
> *- through the resulting additional, well-prepared information as a basis for political decisions;*
>
> - *An amendment to the EIA Project in that environmental issues will already be given more consideration in the making of basic decisions.*
>
> *BMWV and BMUJF(2000b)*

The last objective (listed above) is peculiar to the French study, which identifies 5 categories of infrastructure projects and related evaluations: 1) EIAs of projects, 2) preliminary environmental studies of projects, 3) SEA of programmes within a corridor, 4) SEA of programmes at national level, and 5) evaluations of proposed legislation. Current experience in France includes practice and methodological studies for categories 1, 2 and 4. Thus, the opportunity to develop a case study for the Corridor Nord, which falls into

(2) Indeed, the UK and Austrian case studies aimed to be somewhat more than a demonstration project. The results were to feed into regional planning.

category 3 above, was particularly welcomed since it would fill a gap in the experience and the need to develop appropriate methods for dealing with multimodality at corridor scale.

3.2 INTRODUCTION TO THE KEY FEATURES OF EACH CORRIDOR

3.2.1 Overview

When the original initiative of carrying out a number of corridor SEAs was discussed, the MS and the Commission did not define in any specific way the concept of "a corridor", therefore leaving it open to broad interpretation. Not surprisingly, this has led to the choice of a very diverse range of "corridors", both in terms of size and physical characteristics and in terms of their link to strategic planning (this is discussed in *Section 3.3*).

The common denominator for each corridor was that it had to be part of a Trans-European Transport Network and therefore a communications artery of significant importance for European economic development and integration. However, a large amount of freedom was given to the initiators in terms of selecting the corridor and methods to be used. The following are amongst the key characteristics which led to the selection of the five areas:

- the corridor has important international multi-modal transport (road, rail and waterways) linkages both between EU member states and with the EU's accession partners (FR, A, UK);

- the corridor is already under pressure from traffic, particularly freight transport and car journeys, this is expected to increase in the future (A, UK, I, FR); and the corridor has safety problems which require urgent consideration (I, S);

- the corridor is characterised by densely populated areas, economic infrastructure and industry interspersed with a number of nationally (and in some cases internationally) important sites of ecological and recreational importance (UK, A, S);

- a certain amount of data (environmental and/or transport) is already available for the corridor, providing a good basis for the SEA (FR, A, S);

- none of the previous studies (e.g. EIAs or early SEAs) related to the corridor area in question had examined the multi-modal dimension (A, FR, S);

- the regional stakeholders including local government, private sector economic and transport bodies, academia and environmental groups recognised the need to plan transport and land use within the corridor at a strategic level (UK);

- specifically for the Danube corridor (A), as an important linkage between the EU and its eastern accession partners, the Austrian SEA study and the

sustainable transport solutions that it aims to promote, will represent an excellent example for successful co-operation of EU member states with its accession partners; and

- in general, the pilot studies confirmed the rule whereby the geographical coverage of the evaluation has to be compatible with, and relevant to the nature of the questions being addressed in the SEA (see *Box 3.1*).

Box 3.1 Choosing the corridor's physical boundaries: Italy and the UK

The Italian study

This study argues that at this more strategic level of intervention on the transport system it is essential to distinguish between long distance and short distance travel.

- In terms of long distance travel (e.g. between regions) the study area should be large enough to enable the consideration of transport provision in multimodal terms. This will require consideration of the national scale. Here the aim is to consider the induced effects of the proposed initiative on the distribution of demand for mobility over each transport mode, i.e. looking at the situation of the overall supply;

- For medium distance travel the study should include the main transport systems (particularly road - typically used for medium and short distance travel) as well as the secondary network of connections in relation to the new infrastructure. This will require consideration of a more detailed scale, which will also depend on the characteristics of the regions affected by the initiative. Here the methodology is expected to apply to the transport mode selected (see *Section: 'The Italian Approach'* below).

Thus, the Team proposes a simple correlation between scale and functional issues relevant to the questions being addressed by the SEA:

Scale used to define the area of interest:	**Link with functional issues:**
Geographical	Intermodal mobility
Territorial – spatial	The Transport system and network affected by the initiative
Local	Significant environmental problems, sensitive areas etc.

The UK study

The geographical scope of the study needs to be relevant to the questions that the SEA is addressing. A major aim of the UK case study was to examine regional transport policy options. The physical boundaries of the UK case study were therefore delineated very broadly to encompass the east-west links between the Irish sea ports from Heysham to Holyhead and the North Sea ports from Hull to Grimsby, a corridor which had already been considered as part of the North European Trade Axis. This scope was the outcome of previous discussions between all stakeholders in the region and also with the UK government and the EC to provide a wider National and European perspective.

As a result of these varied characteristics, the five studies are significantly different and provide very interesting insight in the cultural, methodological and financial implications of different approaches.

3.2.2 *Key Features of the Corridor Studies*

Table provides a short summary of the principal characteristics of the studies.

Table 3.2 The corridors at a glance

Corridor	Main authors	Initiators of the study	Approx. Cost (euros)	Transport mode	Approx. surf. Area covered by the study (km^2)	Territory/Jurisdiction
Austria	Gruppe sup Donaukorridor - Consultants (TRAFICO)	Austrian Ministry of Transport and M. of Environment	150 000	inland waterways rail road	16 600	international (Austria, Hungary, Slovakia and Germany)
France	Consultants (INGEROP)	French Road Administration (SETRA)	110 000	road rail inland waterways	22 000	international (France, Belgium)
Italy	Consultants (Univ. di Roma)	Regione Emilia Romagna and Regione Veneto		road (rail)		national
Sweden	Consultants Transek AB and VTI	Swedish Road Administration	100 000	road rail	5 000	national
United K	Consultants (MVA and ERM)	Trans-Pennine Corridor Steering Group (including central and local government, government agencies and transport providers and operators)	465 000 euros - of which 52 500 for the SEA, excluding transport modelling	road rail and other public transport; demand management	14 000	national

Five distinguishing aspects are worth discussing in more detail:

- *Main Authors and Initiators:*

With the exception of Sweden, all studies have been carried out mainly by external independent consultants. This is partly explained by the fact that the main objective was to produce methods, rather than an SEA report *per se*. Nonetheless, in varying degrees, all consultants reported and discussed progress with the transport administrations, which had initiated the project.

It should be stressed that the advantages of carrying out an SEA are as much in doing the assessment as in producing the report and obtaining the results of the analysis. By doing an SEA, people learn to think in terms of environmental integration and sustainability, and they will set up collaborations and new channels of communication between transport divisions/ministries and environmental authorities (ministries and/or environmental protection agencies).

- *Cost:*

The cost of each study varied widely. This is a direct reflection of the different methods adopted and level of detailed data gathering and analysis which was carried out. However, these should not be considered examples of full cost of an SEA since they include methodological research and development, and exclude (in most cases) an element of consultation and a full process of data gathering and analysis.

- *Alternatives/Modes:*

All studies provide interesting lessons on how to compare different modal solutions. In addition, the UK and Austrian cases have taken into consideration non-infrastructure alternatives, thus providing a very comprehensive range of methods and approaches to SEA and to the concept of alternatives which may be considered at this planning stage.

- *Surface area:*

The surface area included in the studies varied only slightly, compared to the variation in cost. Thus, the method adopted may have serious implications in terms of overall costs.

- *Territory/Jurisdiction:*

It is worth highlighting that the Austrian and French study have looked at trans-boundary corridors. This is particularly important for the TEN, which is a network aiming to connect all EU Member States, and the issues raised in terms of data and collaboration make a contribution to future SEAs in this area.

The following sections provide an introduction to each corridor studied.

3.2.3 Gothenburg - Jönköping Transport Corridor, Sweden.

The Gothenburg-Jönköping Transport Corridor lies in south western Sweden and is a section of the Gothenburg - Stockholm corridor. An "Environmental Impact of Strategic Choices" in the corridor was initiated by the Swedish National Road Administration and aims to contribute towards the European Commissions development work on SEA of entire multi-modal transport networks.

The study was undertaken by Transek AB and the Road and Traffic Research Institute (VTI). The study was published in 1998. The objectives behind corridor development include:

- improve the National Road 40 to guarantee road safety;
- promote economic and social development through multi-modal linkages to transport and economic nodes - e.g. better rail connections to Gothenburg and Jönköping airports.

Environmental considerations are not considered to be the main reason for changing the current transport system, although regional goals support a move to more a environmentally considerate transport system.

3.2.4 Trans-Pennine Corridor - United Kingdom

The SEA of the Trans-Pennine Corridor (TPC), an area extending from coast to coast across northern England and covering 14,000 km^2, aims to evaluate the environmental (transport, land-use and socio-economic) consequences of regional transport strategy options. The SEA was undertaken by MVA, Environmental Resources Management (ERM) and David Simmonds Consultancy and was commissioned by a regional Steering Group composed of central and local government , government agency, transport providers and operator, and academic partners, active in the area. A need for a regional approach to development had been identified in 1994 by these interests, which led to the conception of a strategic transport study. The assessment process began in March 1998 and was completed in July 1999.

The SEA study incorporates the process of transport strategy formulation as well as analysis, in which present and future problems are identified and examined, alternative strategies devised and their potential impacts (in all significant respects, not just upon the environment) are considered.

The Trans-Pennine Corridor is part of the Northern European Trade Axis and is characterised by large urban conurbations, old industrial towns interspersed with some of the United Kingdom's most valued scenery as well as areas of high nature conservation value. The area is experiencing increasing pressures on its environment from regional economic development and the expansion of urban and surrounding rural areas, increasing transport use and recreational pressures.

The corridor runs from coast to coast bringing together the two regions of North West England (including the cities of Manchester and Liverpool) and Yorkshire and Humberside (with the cities of Leeds, Bradford, Sheffield, York and Hull), and the adjacent areas of Derbyshire, North Wales and their trading links with Ireland and the North Sea countries. The total population in the area amounts to over 10.5 million.

3.2.5 SEA Danube Corridor - Austria

An SEA of the Austrian section of the Danube Corridor (SUP Donaukorridor), was initiated by the Austrian Federal Ministry for the Environment, Youth and Family Affairs and the Federal Ministry of Science and Transport in response to the European Commission's plan to complete SEAs for the TENs.

The Study was undertaken by TRAFICO Verkehrsplanung. A first interim report of the SEA was published in April 1998 with an Interim Summary document in October 1998, and a Final Report in December 1999.

The Corridor stretches some 320km east to west across north eastern Austria, roughly following the route of the Danube, between the Hungarian and Slovak Borders to the German Border. The total area assessed in the SEA is approximately 16,660km^2 which is over one sixth of the area of Austria and incorporates some 598 local administrative areas, crossing 5 federal states. The SEA does however take into account socio-economic trends in a much wider

area comprising the whole of North eastern Austria and the neighbouring regions in Hungary, Slovakia and Germany.

The assessment area has a population of around 3.6 million people (1991 figures) which is concentrated in the main urban areas of Vienna, Linz/Wels, Salzburg and St Pölten/Krems. When tourist numbers are also taken into consideration, these urban centres also have the highest population densities of up to 5000 people per km^2. The study area also supports over half of Austria's jobs, with more than half of these being in the Vienna area.
The corridor is an important transport route linking Bavaria and Austria to the EU's eastern neighbours. The road and rail linkages, and the River Danube have since historical times played a very important part in the economy of Central Europe, and their role has become increasingly important as a result of the EU's increasing association with its eastern neighbours. The corridor in general is also experiencing increasing development pressures as a result of expanding trade and relations with Eastern Europe. In particular, freight movement and car traffic through Austria (both north - south traffic and increasingly east - west traffic) has increased rapidly over the last decade to the extent that its impacts on the environment are becoming unacceptable.

3.2.6 Test sur le Corridor Nord - France

The scope of the study initiated by the Direction des Routes and SETRA was that of methodological research, applied only for illustrative reasons to the Corridor Nord. This was never intended to be an actual SEA of the corridor, and the alternative scenarios which have been considered were developed exclusively in order to test a methodology, not to be proposed in reality.

In agreement with the European Commission, the study was intended to address the intermodality and the concept of corridor in a trans-boundary context, and it was to consider the use of GIS.

At first, the Corridor Nord was designed to test the SEA methodology which had been developed for the road link A79 between Lyon and Narbonne (1996). However, the scope was soon extended from a simple test, to an optimisation and a further development of the methodology, due to the difficulties and shortcomings of applying a road-only method to a complex multimodal corridor.

The study was undertaken by INGEROP consultants between 1998 and 1999. The final report on which this analysis is based, was produced in February 1999.

The trans-boundary corridor includes all the area north of Paris and south of Brussels within which lie the cities of Amiens and Lille. The area of the study covers a surface of approximately 22 000 km^2 (of which 3 200 km^2 are situated in Belgium). The maximum length of the corridor on the axis which is most used by traffic is 230 km; the maximum width is 190 km. The French side concerns five administrative regions (départments), whilst the Belgian side includes two provinces of the Wallonne region.

At present, it includes roads, railway and a waterway. However, it is envisaged that the level of traffic will increase to the point where the corridor's infrastructure will need to be reviewed. For this reason, infrastructure within the corridor has already been the subject of a number of studies for the development of different modes: motorways, national roads, high speed rail, freight railways, and a canal.

3.2.7 Progetto Romea SEA - Italy

The scope of the study initiated by the two Italian regional governments of Veneto and Emilia Romagna, was to define a coherent impact assessment methodology which would bring environmental considerations to the forefront of planning and would support project related EIAs.

The corridor includes a crucial road connecting the port of Ravenna and Venice, along Italy's East coast. The strategic dimension of the problem affecting this link goes well beyond the administrative boundaries of the two leading regions, and affects transportation along the entire Adriatic coast. Increasing local and transit traffic have led to severe congestion and safety problems which cannot be addressed by structural mitigation measures on the existing infrastructure. Landscape and land-use problems relating to the quantity and quality of transport flows will require intervention in terms of environmental protection and enhancement. The need to strengthen the current system was identified by national Ministerial Decree back in 1986.

The study had to propose and assess different alternatives for how to improve the existing link in order to meet transport and environmental protection objectives.

3.3 LINKING RESULTS OF THE CASE STUDIES TO REAL DECISION-MAKING PROCESSES

3.3.1 Different planning stages and contexts

SEA is an evaluation process which provides information to support decision-making in relation to strategic planning. The success and effectiveness of SEA is directly related to its ability to influence the planning process and the final decision on the plan or programme. This section highlights the weaknesses of the concept of transport corridor in relation to real decision-making procedures.

Each country applied SEA in a different administrative context. *Table 3.3.* shows the planning level which is most relevant to the transport initiatives and corridors selected. At the highest level, they are linked to the start of the planning process and to sustainable transport strategy options based on, for example, demand management or integrated transport and land-use policies (e.g. UK). It is at this level of assessment that the range of alternatives which might feasibly deliver sustainable transport objectives within a corridor is at its greatest. At the opposite end of the scale is the linear corridor which requires a decision in relation to a specific route and new transport infrastructure (e.g. the second stage of Italy's SEA).

It should be noted that some -like the French and Italian studies- were not really linked to a "plan" or "programme" for the pilot corridor. Whilst others, like the UK example, were clearly linked to an ongoing process of planning for the area selected as "the corridor".

Table 3.3 ***The strategic dimension of the different planning stages relating to the corridors selected***

Stage in the Planning Process	UK	Sweden	Austria	Italy	France
(Strategic Policy Development) *					
Strategic Options to meet Policy Objectives	X	(X)	X		(X)
Development of Plans/Programmes		X	X	(X)	X
Development of Projects				X	

* = this stage is placed in brackets since it is not expected to be addressed at corridor level, but more typically at policy or plan levels.

The five studies being reviewed have defined SEA methods, which were then tested on the corridors themselves, however, as explained in the original objectives for these studies (see above), most of them applied SEA as a demonstration only:

- The French study results are explicitly intended for methodological and illustrative purposes only;

- In the Austrian example, the initiator aims to provide basic information and recommendations for decisions relating to federal transport infrastructure plans, even though there is no official planning process to which the SEA can be directly related. The SEA would point decision-makers towards a transport policy for the corridor which was environmentally sustainable, and to solutions which were capable of meeting strategic targets (e.g. climate protection);

- In the Italian example, the SEA provides an assessment of a major link in relation to the strategic plan of which it forms a part; the SEA analyses the the proposed mode and the exact routing of the new infrastructure, although in practice, the decision regarding this corridor had already been taken prior to the pilot study. It is therefore more of an illustration rather than an SEA which was meant to influence transport decisions;

- Finally, in the case of Sweden, the future of the link was still open for discussion at the time of the pilot study however, the planning process for it had started several years earlier and the SEA was not intended to have a direct influence on the final planning decision, except in terms of providing information.

In general terms, the experience of working at corridor level has shown that most countries' planning framework do not include the concept of corridors in any formalised planning stage or decision-making process. This effectively means that - in general - there are no "transport corridor" plans or programmes (or indeed policies), and as such, there can be no "SEA of a corridor" *per se*.

If SEA of corridors is to become an integral part of planning and evaluation, this difficulty may need to be addressed by the different countries in the context of their existing planning cultures. In order to give an example of the situation in practice, the current planning framework in Great Britain, France and Sweden are briefly described below.

The UK situation

The UK study is perhaps the only one which was effectively developed as part of a real decision-making process. The Trans-Pennine Corridor affects two regions: the North West and the Yorkshire and the Humber regions.

The Trans-Pennine Corridor SEA was initiated to develop a sustainable transport strategy for the corridor and in so doing was "ahead of its time" in the UK. The SEA was already underway when the UK Government issued its

White Paper, *A New Deal for Transport*, setting out its transport strategy for the forthcoming years.

The White Paper recognised the current void in transport planning between the national and local levels and introduced a requirement for the development of *regional* transport strategies in order to fill this void:

> "…regional conferences will be responsible for the development of long term regional transport strategies, giving the people a greater say in what happens in their region.";
>
> "This replaces the current arrangement where the planning conferences simply give advice to the Secretary of State".

Since then, the output of the Trans-Pennine Corridor SEA has already fed into the regional transport strategy being developed for the Yorkshire and the Humber Region.

The French Situation

Taking France's transport planning structure as an example, one can see that there is no intermediate formal level between the national multimodal Plan "chemin de service" (including road, rail, air and navigation) and individual projects (see *Box 3.2* for more detail). Although there is a process whereby regional administration engage in a political debate on transport issues, the instrinsic political nature of this stage means that it cannot be subject to an SEA.

Thus the new method developed for the Corridor Nord is intended as a pilot which may be applied in the future to inform the discussion on strategic transport corridors. But changes in the formal planning system will be required before SEA can become a systematic and binding process in relation to such corridors.

Box 3.2 Recent changes in the planning of transport infrastructure in France

Until very recently, the French central government would produce separate general national plans for all modes (air, road, rail, waterways). The definition of such plans would not require a formal stage of comparison and integration between modes. Some consultation with the Ministry of Environment would take place. Then the State proposals would be presented to the 22 Regions for comments, whilst the final decision is taken by the State's Ministry of Transport.

A new law has now introduced significant changes to the planning process, requiring only two multimodal national plans: one for freight and one for passenger transport.

To date, the analysis of environmental impacts is essentially limited to project level, with rare exceptions when some form of assessment was made, looking at broad issues such as protected areas and major topographic characteristics. Project level EIAs are carried out in parallel with socio-economic evaluations and this whole process is often very long and costly. Since the early 1990s, the Ministry of Environment has to sign off the final decision taken by the Ministry of Transport, and, on several occasions, it has refused approval of projects on environmental grounds.

The project team for this case study, felt that SEA carried out at an earlier planning stage, could avoid situations where an extended process of project evaluation from an environmental and socio-economic perspective, is finally rejected, thus saving precious time and resources. The "difficulty" remains in the fact that there is no obvious planning stage between the new national multimodal plans and the individual project level.

The Swedish situation

In Sweden, transport decision making can be summarised looking at the three main levels:

- National level (Government departments for each main mode of transport, producing national transport plans);
- County level (20 County Advisory Boards producing regional transport plans);
- Local Municipalities (270 municipalities which administer state funding for transport).

The complexity of corridors, which inevitably cut across different administrative boundaries (let alone international boundaries), makes it very difficult for the existing structures to act effectively at corridor level. In addition, spending power often lies mainly at the national and municipal level, leaving a gap, which also acts as an obstacle to decisions being taken at corridor level.

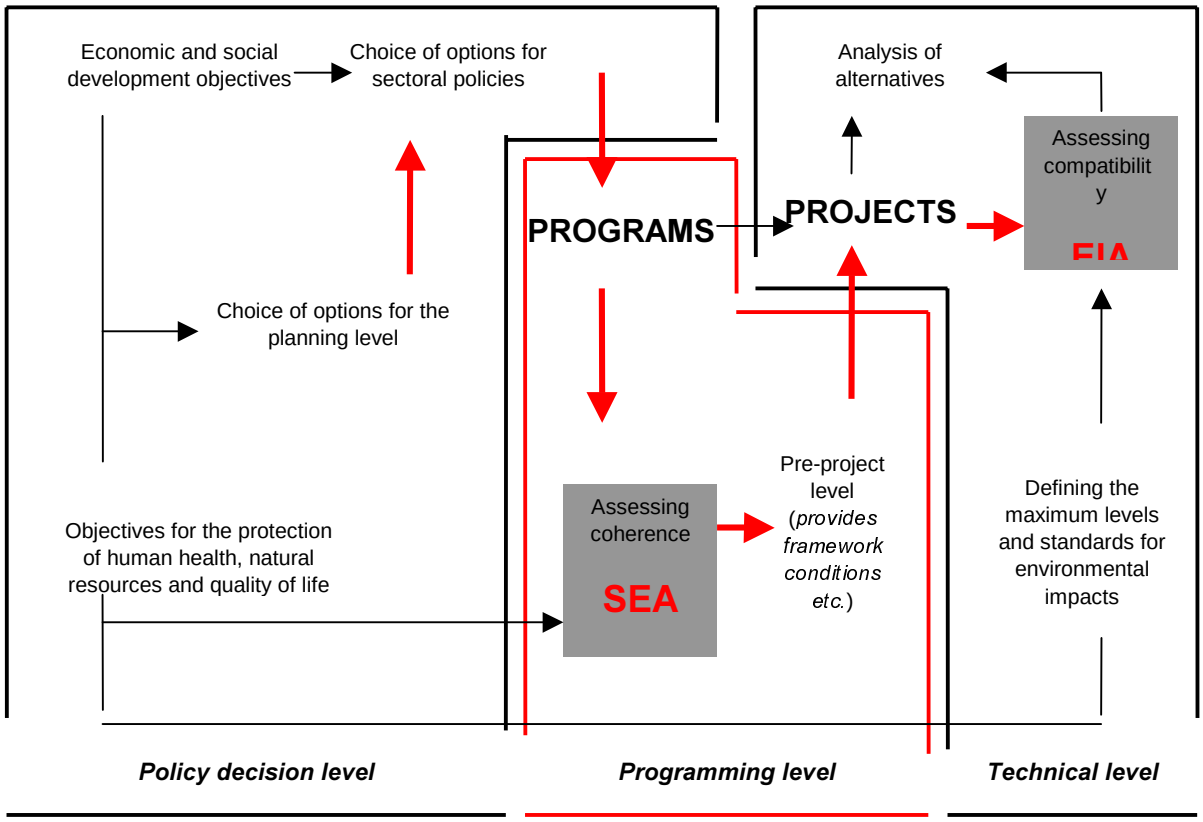
> "*Transport corridor studies should serve as an important contribution to regional land use planning. In Sweden, however, this kind of planning only exists for certain metropolitan areas. Otherwise, land use planning is based on comparatively large municipalities… [In this study area] seven municipalities are affected. Transport corridor studies are in other words important to foster cooperation across municipal borders, across regional boundaries applied by the [SNRA], and between these types of traffic in general, in order to obtain the optimal solution of the problem*" Sweden- SNRA 1998

3.3.2 The Italian approach

Although a significant part of the Italian's methodology deals with a pre-project level which, according to some interpretations, could almost be regarded as relevant to EIA rather than SEA, parts of the theoretical framework offer an interesting insight into the role of SEA in Italy's planning context.

Figure 3.2 summarises the study's discussion of the main stages in policy making and planning for the transport sector, their scope and their relation to environmental assessment (both SEA and EIA). It shows the emphasis of SEA in relation to programmes and the pre-project level, and highlights the link that the latter creates with project EIA.

Figure 3.2: The Influence of Planning and Appraisal Cultures



Source: Benedetto and De Blasiis – Translated by ERM

The Italian study designed an evaluation method to look at technical alternatives which are considered in the first phase of a project's execution. This was seen by the assessment Team as a critical stage which, in Italy, is often dealt with superficially, with an emphasis on financial and time-related savings, rather than with a view to environmental implications.

In this approach, the scope of the SEA is to provide project planners with a clear framework and conditions, which would lead to the identification of the appropriate environmental option, rather than in the analysis of the impacts of a sub-optimal solution and the recommendation of mitigation measures. The aim is:

- to lead to the optimization of technical choices in relation to a variety of objectives;
- to select the most appropriate type of solution in relation to:
    - infrastructure size;
    - speed for the traffic on the new infrastructure;
    - alternative routings;
    - connections with existing transport systems and urban nodes.

Thus, SEA contributes to an analysis of alternatives at the project level, which would then be followed by a full EIA. The results should be binding for the project design stage.

3.4 CONCLUSIONS AND LESSONS LEARNED

Objectives and scope of SEA of corridors

The objectives and scope of a corridor SEA will reflect available resources, the country's existing transport system (its characteristics and problems), the planning system and assessment culture, especially in terms of:

- the level of strategic choices to be considered (e.g. solving the corridor's transport problems through multimodal and demand management measures, or seeking to accommodate traffic through new infrastructure avoiding sensitive areas);
- the link between the environmental component of the corridor's assessment and the socio-economic and technical evaluations; and
- the type and timing of public participation and consultation to be carried out.

Transport corridors and decision-making processes

The concept of transport corridor has raised two important challenges to the pilot studies: one in terms of the definition of its geographical and physical boundaries, and one in terms of the existence of transport plans and programmes which focus on such entity.

In general, the studies confirmed the rule whereby the geographical coverage of the evaluation has to be compatible with, and relevant to the nature of the questions being addressed in the SEA. Also, the experience of working at corridor level has shown that most countries' planning framework do not include the concept of corridors in any formalised planning stage or decision-making process. This effectively means that - in general - there are no "transport corridor" plans or programmes (or indeed policies), and as such, there can be no "SEA of a corridor" *per se*.

In Sweden and France, the experience linked to this study and others, has led to the recognition that the concept of corridors needs to be further developed, that guidance is necessary to help:

- in defining corridors;

- in identifying factors which make it necessary and worthwhile to adopt an SEA approach (ie. Not all corridors will necessarily require an SEA).

A similar need is likely to be relevant to most Member States, especially in the light of TEN's implementation and the increasing emphasis on strategic corridors within the network.

4 CONSULTATION AND PARTICIPATION

Section Contents

4.1 INTRODUCTION

Consultation with relevant planning authorities, transport agencies and all other stakeholders in the region or corridor is key in identifying the scope and relevance of an SEA. The involvement of a broad range of interest in the process will also bring benefits such as buy-in and credibility to the results of the SEA.

> *"Public relations and participation of citizens are to be improved in national and international transport policy and planning"*
> *Austria - BMWV and BMUJuF, 2000.*

More in general, public participation can contribute to widen the issues and the perspective from which a transport plan is being assessed. Based on past experience, the Swedish team felt that, to be effective, participation requires the public to be presented with arguments which they can relate to. As a result, the inclusion of public participation can actually influence the overall planning and evaluation process requiring this to focus on issues of accessibility and transport management which are more directly linked to the public's interest and are linked to sustainability. (1)

Since most of the studies were for demonstration only, it is perhaps not surprising that only limited resources were devoted to public participation. However, it is interesting to note that none of the case studies had the definition of public participation strategies as a specific objective for the development of SEA methods.

In general, the reasons for limited attention to public participation at the strategic level of assessment, are:

- the assumption that this may be almost impossible given the scale of the issue (ie. Too complex to be understood, or not concrete enough to be presented to the general public), and/or the size of the population

(1) Note that for this particular study, the Swedish team was not able to include full participation since the study was essentially a demonstration study only.

potentially involved;

- the fear that this will be too expensive and time consuming.

The experience, albeit limited, from the studies does not appear to support such concerns, and actually tends to support the broad range of advantages mentioned above.

4.2 *AN OVERVIEW OF THE DIFFERENT APPROACHES*

Table 4.1 below summarises the institutions and organisations involved in each case study, as contractors and key stakeholders. *Table 4.2* summarises the types of consultation methods adopted by each study.

Table 4.1 Initiators and Key Participants in the SEA Process

Clients and Participants in the SEA process	UK	Sweden	Austria	Italy	France
Ministry with responsibility for Transport/National Road Administrations	/	X	X		X
Ministry with responsibility for Environment	/		X		/
Local/Regional Government	X	/	/	X	
Transport Infrastructure interests	/	/	/		
Transport providers/operators	/	/	/		
NGOs	/	/			
Public	(/)				
Academia	/			(/)	

X Contracting Authority responsible for the Corridor SEA
/ Key Stakeholder closely (or partially if in brackets) involved in the SEA process

In general, the pilot studies used more traditional means of consultation and participation. Some interviewees thought it would be useful to see whether SEA at corridor level lends itself to other means, such as use of the internet. The next sections discuss the experience of the UK, Austria and Sweden and their emphasis on slightly different methods. *Box 4.1* gives an example of changing approaches to participation, with reference to the French experience.

Table 4.2 Methods of Consultation used

Consultation methods	UK	Sweden	Austria	Italy	France
printed materials - brochures, displays etc			X		
Use of Media					
Public information sessions					
Use of Internet					
Surveys					
Large meetings	X	X			
Small meetings	X	X	X		
Advisory Groups	X	X			
Problem Solving Techniques					
Consensus building techniques					

Source: Consultation methods taken from DG VII Draft SEA Manual.

Box 4.1 France and consultation practices

Although no public participation took place in connection with the corridor SEA, the French team highlighted an important characteristic of the national legal system which may have important implications if, in the future, SEA will be more widely applied. In normal circumstances, public participation takes place at the final stages of an EIA process, however, since the Circulaire Bianco of 1992, large infrastructure developments require a procedure which involves the public even before a decision is taken on the opportunity or otherwise of considering such development. Thus the public is asked to comment on the usefulness of such a project in principle, rather than on where it should be located.

4.2.1 The UK use of Conferences

The UK SEA was commissioned and overseen by a Steering Group which was established as a result of a recognised need for regional co-operation and a regional strategy for integrated economic development, land-use and transport planning. The Group comprised:

- central and local government, government agencies (e.g. Highways Agency);
- transport operators (e.g. train operating companies);
- transport providers (eg Railtrack);
- academia (from Manchester University - these had secondary environmental interests); and
- DG VII of the EC.

Being the initiator, the Steering Group had direct inputs and a direct say in the scope and content of the SEA and it will also be a key player in taking forward its outcomes.

The consultations that were held included two Conferences. The first took place at the start of the process with the aim of identifying and understanding the key land use, economic development, environmental and transport issues in the corridor and to reach some conclusions on what feasible strategy options could address these. Options included, among others, traffic restraint (through road charging and restricting parking in urban areas), investing in public transport and land use planning strategies for business, services and residential development.

The Steering Group invited a wide range of key stakeholders in the area including environmental interests. Over 150 delegates attended the conference, coming from Local Authorities, transport operators and providers, statutory environment organisations (eg Countryside Agency) and NGOs (e.g. Council for the Protection of Rural England, Royal Society for the Protection of Birds) and transport, spatial planning, regional development and environmental consultancies. Given the diverse range of interests attending the conference, there was a considerable number of messages which

emerged from it. However, the feedback from the conference (and from supporting consultation with selected bodies) enabled:

- The explicit definition of the nature of existing environmental problems in the study area; and

- The formulation of appropriate strategy options for testing and assessment.

As regards the environment objectives a key message which was raised through consultation was the concern about future air quality.

The second conference was undertaken once the results of the SEA were available. This event was equally important and presented to consultees the key components of a possible transport strategy for the study area. It was recognised at the conference that it would be beneficial for additional strategy options to be tested in order to further inform the development of the strategy. In particular, representatives of the freight industry and ports authorities felt that more tests should be undertaken of freight orientated strategy options given the important role of freight in the overall transport system for the corridor. This was indeed the case, since limitations in terms of time and available resources had led to constraints in the number of options which could realistically be tested.

It was however also clear that, given more time, such additional test could have been carried out using the methodology which had been developed, and indeed they are likely to be implemented in the near future.

4.2.2 *Austria's use of Workshops*

From the very beginning, the study has involved close consultation with the federal ministries who commissioned the exercise (Ministries with responsibilities for environment and transport), with key national and regional stakeholders (notably national, state and local government departments), as well as transport infrastructure providers and transport service providers covering all three transport modes considered in the study. All these organisations have been added to a mailing list and have received study updates, news and reports throughout the study.

The study team have also organised a number of workshops to which the above stakeholders were invited. These have covered the following issues:

- an initial workshop 8 weeks into the study, aimed to inform the stakeholders about the role and value of SEA and reported on the initial stages of the study (justification for applying SEA, current environmental condition in the corridor etc.);
- a second workshop in June 1998 considered the development of the SEA methodology. A draft method had been circulated and this was discussed. Experts in EIA/SEA from neighbouring regions of Germany were invited to attend. The workshop resulted in slight adaptations being made to the method and also the addition of more evaluation criteria;

- a further workshop was organised in order to discuss the new SEA regulations being suggested by the Commission. A key aim was to raise awareness amongst the study stakeholders of the consequences and value of these draft regulations.

A key problem with consultation has been the resistance of some stakeholders to SEA, due partly to limited understanding of the scope of this process, and to some reticence to consider changes in transport planning policy in order to prevent environmental damage. The commonplace fear of SEA becoming an additional bureaucratic burden was also a difficulty when dealing with transport infrastructure developers.

Partly as a response to this, the team has aimed to raise awareness of the value and importance of SEA in reducing future costs and time spent in infrastructure planning.

4.2.3 Sweden's consultation at the scoping stage

Sweden's experience looked at consultation principally in relation to the scoping stage. The Swedish EPA, the national rail administration, the Swedish National Conservation Society and various NGOs were all involved in commenting on what were the most important environmental issues for this kind of study. Interestingly, this exercise showed how relatively new SEA is, and how consultees were unfamiliar with it. Once a draft report was made available to them, comments came more easily and many specific comments were made, although the report was generally supported.

Throughout the study, the Road Administration, which was leading the work, had frequent contacts with the Railway administration which had previously completed an environmental assessment of the rail link between Stockholm and Goeteborg and was therefore able to provide significant input.

Time and resource constraints did not allow Sweden to involve County Administration Boards. However, if the study was done on a real case, they would certainly have to be involved.

4.3 CONCLUSIONS AND LESSONS LEARNED

Who should be involved and when

- Information sharing, consultation, and participation are all essential parts of the SEA process and have the greatest positive impact if initiated at the earliest stages. This also helps stakeholders to familiarise with this relatively new method and thus increases their ability to contribute to the debate;

- Consultation and participation should include all stakeholders representing transport, social and environmental interest, to ensure wide support ("buying in") to the solutions being put forward;

- In those countries where SEA is still a very new process, it is especially important to involve directly those interested parties which are less supportive of the process, in order to facilitate the understanding of the scope and features of SEA;

- The public and stakeholders, including NGOs, need to be informed of the SEA process and the options being considered, from the very beginning;

- Information should be presented in clear and simple terms, and should be relevant to the stakeholders. For example, the results of CBA and traffic forecast are often too complex and of limited interest to the general public.

The case for close involvement of private sector

By their very nature, planning and SEA will be exploring a wide range of alternatives which may have implications for investment in different modes (see *Section 6* for details). In many countries, such investment plans will ultimately involve the private sector. It is therefore highly recommended that such interests are represented and involved from the earliest stages of planning and SEA.

5 SCOPING

Section Contents

5.1 INTRODUCTION

The scoping phase aims to outline the issues to be considered in the study, including the study area, the options to be considered and the issues and objectives that need to be assessed. The scope should concentrate on the impacts and issues most relevant to the decision-making process, so that important issues are not obscured by aspects which are dealt with more appropriately at less strategic levels of assessment. This will also ensure that the time taken and cost of the study is minimised. The ideal is therefore to concentrate on a small number of key issues of relevance to strategic decision-making and to restrict assessment to the most feasible options or alternatives.

The scoping stage was a fundamental part of the SEA process for all the five studies. The most common issues discussed were:

- environmental and sustainability objectives;
- impact categories, environmental themes, and related indicators; and
- alternatives (discussed in more detail in *Section 6*).

> *"It is important that SEA is restricted to central issues… If questions that are too small or detailed are dealt with at this level, there is a risk of the major issues becoming lost in the process" Sweden - SNRA*

Each team took a slightly different approach to scoping. This is discussed below. It should be noted that a combination of such approaches may well be the best way forward to ensure that scoping is done effectively and provides the greatest benefits to the rest of the process.

5.2 SCOPING USING EXISTING EXAMPLES AND EXPERT JUDGEMENT

5.2.1 *Starting from Existing SEAs*

The French study started by referring to the list of environmental themes which had been selected for the more detailed (project-level) A 79 study. It then considered:

- the specific characteristics of the Corridor Nord;
- the scale of the study;
- the availability of data;
- the homogeneity of data over the whole territory, particularly between the French and Belgian sides. Note however, that this criteria was not given great weight since it would otherwise have led to a very limited coverage of themes;
- the spirit of the SEA study which is intended to assess the environment globally, taking it into consideration as a system; and
- multimodality and the various elements which had to be taken into consideration in order to allow the alternative consideration of different modes.

For the Austrian example, the criteria used and the experiences gained in other SEA/corridor studies in Europe were the starting point for the selection of specific criteria for the Danube corridor. These were then discussed with the contracting authorities and data availability was also examined.

5.2.2 *Expert judgement*

Expert judgement was used to further refine the definition and focus of environmental issues for the French SEA. Three main impact categories were chosen for the study:

- land take
- disturbance
- fragmentation and length of crossing of very sensitive areas.

The notable absence of major environmental themes such as air pollution and global warming is due to the overall objectives set by SETRA (the commissioning body). The assessment of such global impacts had already been tested at the national scale, and this French study was intended to explore new SEA methods, so it was decided that it should focus on the assessment of the above impact categories which had no application at such scale to date. Furthermore, the corridor had already been subject to detailed socio-economic studies (two years before the SEA) and these had included the traffic analysis and related energy consumption and emissions implications (referred to as the *global impacts*).

Once completed, it was felt that the focus on such physical and spatial issues inevitably created a bias, and that a real-case assessment should analyse

alternatives and present results also taking into account issues such as air pollution and energy consumption.

5.2.3 *Justifying your choices*

Both the Austrian and Swedish examples provide a clear justification for the issues that will and will not be included within the scope of the assessment. For example, the Swedish study lists the issues it intends to examine (see *Table 5.1*) giving brief explanations. It also lists issues which will be excluded from the assessment, for example local contamination of storm water from road run-off. The exclusion is justified, in this case, because this will be an impact irrespective of how and on what alignment the transport infrastructure is developed (and should therefore be examined at the project specific level).

Table 5.1 Example of key issues considered in the Swedish study

General category	***Example** of detailed issues*
Socio-economic conditions	*Economic development - planning questions:* • *economic development in built-up areas* • *Commuting* • *Increased dependency on cars - distribution questions* *Regional communication routes - structure of towns/villages and built-up areas*
Climate, over-fertilization and acidification	*Regional emissions of impurities in traffic*
Conservation of natural resources	*Use of fossil fuels* *Agricultural land* *Ground and surface-water resources*
Natural and cultural environment	*Specially identified/classified areas* *Ancient remains* *Ecological infrastructure:* • *barrier and corridor effects for animals and plants* • *interactions and structures in the cultural landscape*
Recreation and outdoor activities	*Local and regional activities*
Living conditions and health	*Living town centre* *Barrier effect for residents* *Air quality* *Noise conditions* *Road safety*

Source: SNRA 1988

5.3 *SCOPING FOR OBJECTIVES AND INDICATORS*

5.3.1 *Objectives*

The scope of objectives (and indicators), which provide the basis for the SEA, should ideally be defined with reference to regional or national objectives and priorities. The case studies show that transport SEAs need to refer to both sustainability and environmental protection objectives. For example, the

approach taken in the UK case study was to define the overall objectives for the Trans-Pennine Corridor in agreement with the Steering Group (and to disseminate these through the first consultation exercise described in *Section 4.2.1*). Four primary objectives were agreed:

- to protect and enhance the environment;
- to promote safety;
- to promote adequate accessibility; and
- to promote economic efficiency of transport, and efficiency of economic activities.

In terms of sustainable transport and land-use system the aim was to define:

- a strategy which protects and enhances the environment and improves safety **whilst**
- promoting accessibility and economic efficiency **and**
- ensuring that economic and environmental benefits are not enjoyed at the expense of future generations **and**
- which is equitable and socially inclusive, affordable and financially sustainable, and practical and capable of implementation in the required timescale.

This summary gives an interesting view of how regional authorities in the UK are beginning to look at transport in an integrated manner, emphasising the strong linkages between transport and the environmental, social, economic and equitable dimensions. To a certain extent, the Austrian case study has also looked at such a wide range of issues (see *Secondary objectives* in *Table 5.3*).

For the environment, the Team and Steering Group chose six environmental objectives which reflected key priorities of the UK government in terms of sustainability and are also directly relevant to transport policy and planning. The objectives are derived from the European Fifth Environmental Action Programme and the UK government's guidance document for appraisal of transport programmes (see *Table 5.2*).

Table 5.2 ***UK study: the environmental objectives***

Category	Objective
Global Issues	
• Climate change	Minimise emission of greenhouse gases
• Regional air pollution	No exceedence of critical acidification loads and levels
Natural and Built Resources	
• Landscape, biodiversity, heritage and townscape	Enhance natural and built resources and minimise negative impacts on landscape, biodiversity, heritage and built environment
• Water resources	Minimise pollution of fresh and marine surface waters and groundwater
Community Issues	
• Noise	Avoidance of exposure to levels which endanger health or quality of life
• Air quality	Protection against recognised health risk for air pollution.

Source: MVA 1999

The Swedish study referred mainly to the goals of the Swedish EPA. These are essentially general environmental goals for transport, arranged in three categories:

- the use of land and water;
- stock resources; and
- pollutants.

However, failure to translate national level objectives in terms of the local characteristics and reality has led to problems. The Swedish transport initiatives resulted almost all in conflict with these broadly defined objectives. The issues which were identified using the existing national policy and guidance documents resulted too generic. This, it was felt, had an impact on the meaningfulness of some of the results of the SEA analysis. The experience showed the need for the definition of more operational transport and environment goals at national and regional levels.

The Austrian case study also bases its assessment objectives and indicators on existing objectives for environmental protection, derived from, for example, the Austrian National Environment Plan and the Toronto commitment to reduce green house gas emissions (*Table 5.3*).

Table 5.3 Austrian study: Topic areas for defining the Objectives

Main Objectives	*Secondary Objectives*
• Energy Consumption • CO_2 – emissions • All other emissions • Land-use • Impacts on environment and regional development	• Economic Growth • Ensuring of Mobility • Ensuring of getting everywhere

"Future transport development will be… compared for the first time to previously set environmental objectives (e.g. Kyoto Protocol)"
Austria - BMWV and BMJuF, 2000b.

Overall, the studies show that there is a certain common baseline of themes from which objectives are identified and defined. The main difference is perhaps visible in the choice to include socio-economic objectives as well, with an aim to provide a balanced and complete picture. The reasons for not including such objectives as part of the SEA is often linked to the country's appraisal culture.

Finally, in terms of the wider role of objectives in SEA, it is worth bearing in mind that the analysis of potential impacts of strategic decisions is likely to be most informative for decision-makers if it is compared to overall environmental and sustainability objectives. The comparative analysis of the five studies fully supports this point. All the studies have referred to "*objectives*" in their analysis, in the way they would have referred to *environmental criteria* in a project-EIA (see *Section 7*).

5.3.2 Indicators

Once the geographical, temporal and assessment criteria and objectives have been defined, simple, measurable indicators should be chosen in order to allow comparisons between various options. These indicators need to be directly relevant to the assessment objectives chosen and need to be supported by available data. This topic is discussed in detail in *Section 7.2*.

5.4 USE OF CONSULTATION AT THE SCOPING PHASE

As discussed in *Section 4* above, consultation was not a strong element of the case studies, with the possible exception of the UK case study. However, a few lessons could be drawn from the experience of the different teams.

Whilst the underlying objectives of an SEA should be based on regional, national and sometimes international goals, some of the Teams felt that consultation with representatives of a range of interests within the area of analysis could play a crucial role in determining the relevance and applicability of the objectives. Similarly, consultation was often considered key to determining options and alternatives to be assessed.

In the UK, the objectives and indicators chosen for the assessment were actually approved by the study's Steering Group (which represented economic, transport, local planning and academic interests in the area), as well as through wider consultation. This approach was found to be effective in obtaining consensus on the objectives and in disseminating their meaning in tangible terms. In addition, being able to refer to a Steering Group, as well as using consultation by means of a conference, had the advantage of providing a relatively agile and efficient consultation mechanism.

Further consultation with bodies outside the Steering Group led to some amendments to the scope of the UK assessment as it progressed:

> National government agencies (national government and statutory environmental bodies) wanted to see the emerging concepts of "countryside character and environmental capital" incorporated into the assessment. These have recently been defined in the UK in an attempt to provide an indication of critical environmental capital, and the government was keen to see how this could be used.

The experience stressed the importance of consulting with external organisations who have an interest in the study area. It also highlighted the need for flexibility during the whole SEA process. Similar lessons could be drawn from the Austrian case study, which also found it necessary to adopt new elements for the scope of the assessment:

> A workshop held with Federal Ministry representatives approximately a year after the SEA study had been commissioned, and this resulted in the contracting authorities requesting the incorporation of additional issues to the scope of the SEA.

Attention however should be given to the resource implications of such changes, since considering new issues in an SEA can require substantial additional data gathering and alterations to the assessment methods used.

5.5 BASELINE CONDITIONS AND ENVIRONMENTAL DATA

5.5.1 Introduction

The importance of understanding the characteristics and conditions of the environment and natural resources or a region or area is a necessary step in

planning and SEA. At this stage the assessment Teams aimed to establish the baseline conditions with reference to the issues, problems and indicators identified. An equally important outcome of this stage is the identification of gaps or inaccuracies in the available data. (1)

This element of scoping is also crucial in helping planners and evaluators to understand the strengths and weaknesses of an area's natural endowment, how these can support or constrain development strategies. Together with all other aspects of scoping, this part of the SEA process can help to shape the type of initiatives proposed, from a very early stage. This is shown perhaps most vividly through the French case study approach.

(1) See for example European Commission (1998).

5.5.2 *Ensuring relevance of baseline data for a strategic EA*

The level of detail provided in the studies for the baseline situation is generally adequate and informative and some case studies (e.g. UK and Sweden) have explicitly stressed the need for the scoping exercise to restrict the baseline to factors clearly linked to the type of decision at hand: an issue often raised as critical in manuals on strategic-level assessments. If data is provided on a level which is too detailed or small scale, there is a risk that major issues will be obscured in the process.

The five studies confirm the view that there is indeed a direct correlation between the degree of detail in data collection and: (1)

- the very different strategic dimensions of each corridor (see *Section 3*; and
- the approach taken to assess impacts and effects of the proposed alternatives on the environment (see *Section 7*).

In general, they also confirmed that data gathering related to traffic flows accounts for a very significant share of the time and resources devoted to baseline information.

5.5.3 *Difficulties*

In the case of France, one of the main advantages which was linked to the choice of the Corridor Nord for the pilot study was that the majority of the data was already available in suitable numerical formats. This would have enabled the team to focus on improving the method rather than on gathering the data for the study.

> "*...le simple collationnement et redressement des données, aussi imparfaites soient-elles, a représenté près de 50 de l`énergie et du temps consacrés à cet exercice*" INGÉROP 1999b

Reality, turned out to be somewhat different however. The following difficulties were experienced in France, Sweden and Austria with regard to the use of existing data, and are worth noting:

- Difficulties in obtaining reliable data for the complete area of the corridor. Gaps were often a problem, for example for the geographical coverage of natural sites (France);

- Some data was available only in excessively aggregated formats. For example, in Austria, the volume of ship transport was only available for the whole country;

- Scale of certain data "layers" - the Swedish example applied geo-referenced data on "large unspoiled areas" to the area of the transport corridor. This resulted unusable since such type of area comprised almost the entire corridor in one of the two counties affected. In France, the scale

(1) See Chapter 6 of CEC 1999a.

at which data was available was not always compatible or appropriate, and scales varied between 1:100,000 to 1:1,000,000;

- Time implications of using data from other studies. In Sweden, the time needed for data interpretation was underestimated. Much of the data used originated from feasibility studies and preliminary design plans for road projects. It was hoped that this would facilitate quick assessment and interpretation of the corridor but in reality, data had to be adapted quite considerably;

- Lack of comparable data across regions or counties (eg. France and Sweden);

- Finding data with comparable time scales was a particular problem in Austria. The assessment method relied on existing traffic and regional development forecasts to provide a scenario of what the transport and hence the environmental situation would be like in 2015. The forecast dates did however vary and assumptions were necessary in order to homogenise the forecast period;

- Lack of information on the data. In the French case study for example, there was no explanation of the criteria upon which data on "valuable landscapes" have been based;

- International coverage - The French case study required data from both France and Belgium. Wherever possible, comparable data from each country was used. This highlighted the advantages of the databases being compiled by the European Environment Agency, for example Corine Land Cover data. There was however some key lessons which arose from attempting to use the EEA as a data source. These are summarised in *Box 5.1*.

Box 5.1 Use of European Environment Agency Data

The French case study needed to rely on comparable data from both Belgium and France and therefore databases compiled by the European Environment Agency (EEA) such as Corine Land Cover were sought. Key lessons which resulted from this include:

- the authors of the French case study were re-directed several times from one European institution to another (European Commission, Eurostat, EEA, and others) before finally being able to acquire the Corine data from the national intermediary for France and for Belgium;

- as a result of the way Corine data is stored by the intermediary institutions, the data had to be geometrically corrected, despite belonging to the same database system.

A conclusion from this is that it should be a priority for the European Commission to make available a set of environmental data which is indeed homogeneous, centralised and easily accessible. This will have important implications for the timing and cost of SEAs of European corridors.

5.5.4 *Making assumptions*

Problems in terms of comparability and completeness of data (see above) meant that various assumptions had to be made in order to predict various potential impacts. In general, assumptions were based on the professional judgement of the consultants and on recognised research results, and were often discussed by the relevant stakeholders.

Traffic and air pollution
In Austria for example, with an assessment time scale to 2015, baseline data was needed on the level of pollutant emissions that could be expected from, for example, road traffic. This needed to take account , among other things, of improved emissions technology in road transport. As a result, recognised estimates of emissions reductions compiled by the car industry were used. Since the study was commissioned jointly by the Ministries with responsibility for transport and environment, the Team could argue that the use of such data was fully legitimised.

Land take and disturbance
The French study made a number of assumptions regarding both the land take and the width of the area which would be disturbed in developing different types of modes (see *Table 5.4*). It was assumed that each infrastructure would affect in a constant manner the area given in the table multiplied by the length of the proposed development. This type of assumption and generalisation is often necessary at strategic-level EA.

Table 5.4 France: assumptions regarding land take and disturbance

Infrastructure	Land take (width)	Disturbance areas (width)
New HS rail	145 m (15 m in urban areas)	1500 m
New freight rail	130 m (15 m in urban areas)	5000 m
Motorway	170 m (30 m in urban areas)	4000 m
Extension national road	120 m (20 m in urban areas)	4000 m
Canal	220 m (60 m in urban areas)	0
Alignment HS rail and motorway		5000 m
National road 2 or 3 lanes		3000 m

Source: INGEROP/SETRA 1999 - translated by ERM

Further discussion of some of these issues can be found in *Section 7*.

5.6 *CONCLUSIONS AND LESSONS LEARNED*

Scoping: a critical stage

The scoping stage is perhaps the most critical stage in an SEA. It involves deciding what issues are worth assessing at the scale and level of decision-making under assessment, and offers an important opportunity to inform stakeholders and include their views in the final choice of objectives and indicators which will be used in the analysis.

Scoping is necessarily an iterative process. Issues such as the type of impacts to be considered, and of course the alternatives will need to be reviewed and discussed at different stages (see in particular the approach adopted in the UK study, *Figure 6.1* in the next chapter). This further strengthens the call for flexibility throughout the SEA process.

A focusing exercise

In SEA, scoping requires a constant effort in order to focus on those themes, objectives and indicators which are necessary and sufficient for the type of decision being taken. It is an effort of fine balance whose success dictates the effectiveness of the SEA process in achieving its main goal: to provide decision-makers with information on the environmental and sustainability implications of proposed strategy.

Objectives

Overall, the studies show that there is a certain common baseline of themes from which objectives are identified and defined. The main difference is perhaps visible in the choice to include socio-economic objectives as well, with an aim to provide a balanced and complete picture.

It was generally agreed that objectives should be based on current international, national and regional policies and legislation, although it clearly transpired that best results can be obtained when these objectives are translated into tangible goals closely related to the specific character of the corridor's area under assessment. Consultation and participation by key stakeholders can be particularly helpful at this stage.

Finally, it is worth bearing in mind that the analysis of potential impacts of strategic decisions is likely to be most informative for decision-makers if it is compared to overall environmental and sustainability objectives. Thus, these play a crucial role in the evaluation.

Baseline data

Gathering and organising data for SEA is an essential and often demanding stage of the process. Effective scoping can make a huge difference to this stage, ensuring that efforts are concentrated on information which really necessary and essential. However, there will still be difficulties in terms of availability of data, harmonisation etc., particularly when looking at international corridors - where the European Environment Agency is seen to play an important role.

There appears to be a clear need for more adequate and reliable ways of predicting future changes in transport demand.

Using assumptions

In corridor SEAs a wide range of assumptions is to be expected and is this considered an inherent characteristic of this level of assessment.

6 OUTLINE OF ALTERNATIVES

Section Contents

6.1 INTRODUCTION

"*Project-level EA fails to help in project selection. While there is still much flexibility in design and much scope for mitigation of impacts, project-level EA is useless in selection of the project in the first place. That is a strong argument for promoting the use of sectoral or strategic EAs*" and

"*Analysis of alternatives is unwelcome at the time of project preparation; it should become part of sector work leading to project identification*"
(Goodland and Mercier 1999).

The application of SEA preceding project identification and project design can lead to significant benefits in terms of the nature and range of alternatives considered, and the overall sustainability of proposed development. Project-level Eas, which propose fundamental project design changes will cause major conflicts and are only considered and implemented with great difficulty. This is particularly evident when considering demand management solutions versus new transport infrastructure.

SEA is widely considered to be a useful method for identifying and analysing a range of alternatives. The examples reviewed in this study have supported this view. Each pilot SEA has adopted radically different types of alternatives, ranging from virtually policy-level solutions for transportation (including taxation mechanisms) to very specific route options, which arguably will overlap with the remit of project-EIA.

6.2 INFRASTRUCTURE AND POLICY-TYPE ALTERNATIVES

6.2.1 *The options of the UK case study*

Of the five studies, the UK example offers the greatest insight into SEA methods, which can deal with non-infrastructure solutions. The study makes a detailed analysis of the implications of various policy options (see *Table 6.1*), in advance of any planning process or decision relating to alignments. The overall assessment looks at the effects of a do-minimum scenario (i.e. no

significant interventions other than programmed improvements - option 0) and six strategy options (options 1-6).

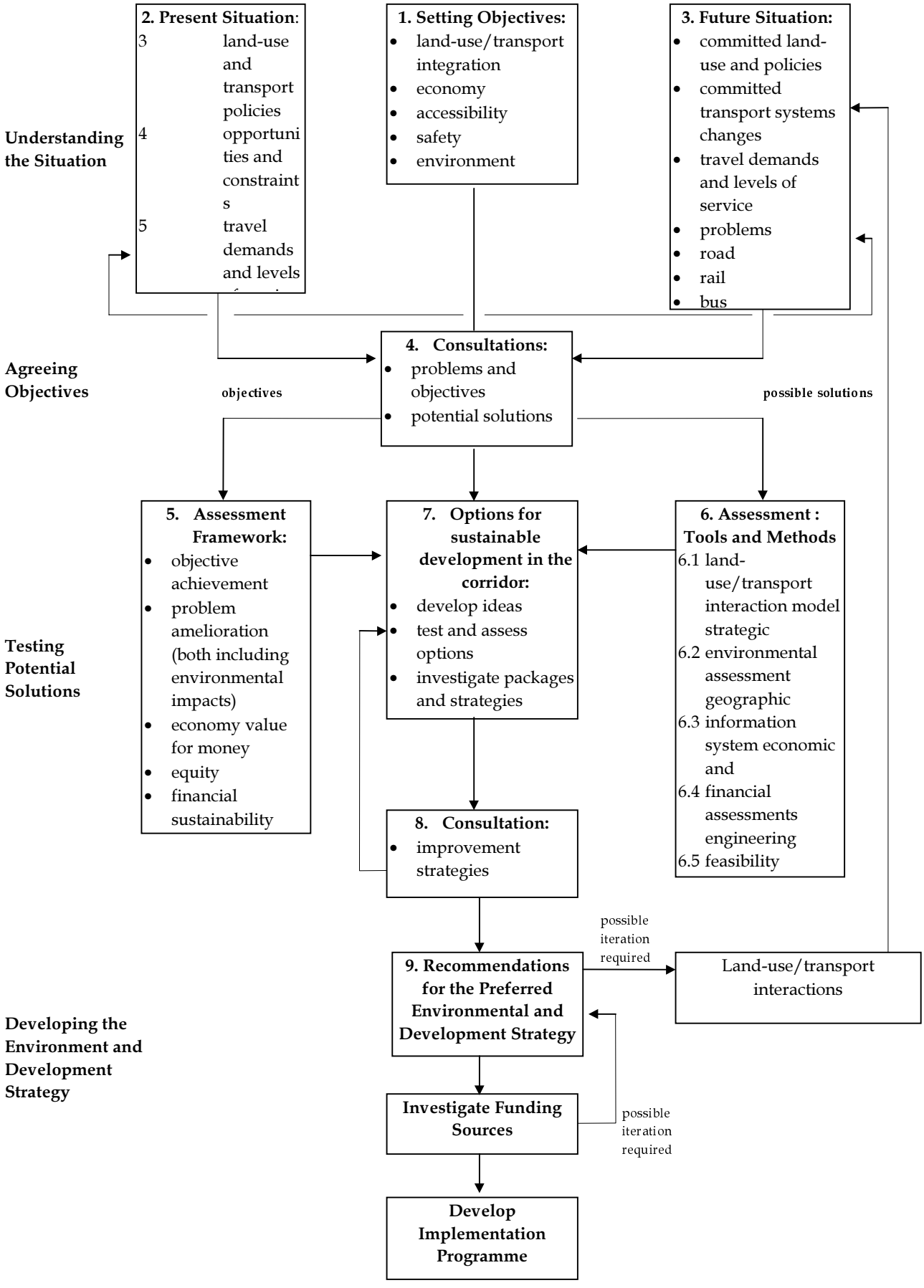
Table 6.1 Definitions of Options Tested

	Strategy/Option	Description
0	Do-minimum	Committed transport infrastructure schemes; current transport policies assumed to continue, but without any intensification; PPG13/PPG6 policies but with a high priority to economic development opportunities regardless of location
1	Public transport investment	Primary rail service speed and frequency investment
2	Road traffic reduction - parking and trans-Pennine charging	halving of parking capacity in urban centres, combined with charging on all major roads across the Pennines
3	Road traffic reduction - urban road user charging and trans-Pennine charging	Road user charging in urban areas, with higher charges for urban centres, combined with charging on all major roads across the Pennines.
4	Road capacity reallocation in favour of goods vehicles and buses	Establishment of a network of priority vehicle lanes on main roads and motorways
5	Selective road capacity increases	Widening of the following motorways: M62 M6 to junction with A1 M6 M56 to M58 M1 M18 to M62 M60 Stockport to M62
6	Centralisation of land-use development	Concentrate new development in major urban areas, particularly in or near their centres
7	Optimisation of trans-Pennine charging	Adjustment of charges in Option 3 to maximise benefits in relation to total costs
8	Optimisation of urban road user charging	Adjustment of charges in Option 3 to maximise benefits in relation to total costs
9	Major road traffic reduction measures	Application of high fuel price increases (factor of 10) with trans-Pennine and urban road user charging as per Option 3
10	Public transport investment with road traffic reduction measures	Combination of an enhanced Option 1 with Option 7 and 8, plus testing of assumptions about the impact of potential changes in attitude to car alternatives. Land-use policy a more intense version of that for Option 6

Source: MVA 1999

Note: In Option 7, 8 and 9 rail fares were set so as to reflect an annual 1% decrease in real rail fares as a policy input.

Figure 6.1


Understanding the Situation
2. Present Situation:
3 land-use and transport policies
4 opportunities and constraints
5 travel demands and levels
1. Setting Objectives:
• land-use/transport integration
• economy
• accessibility
• safety
• environment
3. Future Situation:
• committed land-use and policies
• committed transport systems changes
• travel demands and levels of service
• problems
• road
• rail
• bus
Agreeing Objectives
4. Consultations:
• problems and objectives
• potential solutions
objectives
possible solutions
Testing Potential Solutions
5. Assessment Framework:
• objective achievement
• problem amelioration (both including environmental impacts)
• economy value for money
• equity
• financial sustainability
7. Options for sustainable development in the corridor:
• develop ideas
• test and assess options
• investigate packages and strategies
6. Assessment : Tools and Methods
6.1 land-use/transport interaction model strategic
6.2 environmental assessment geographic
6.3 information system economic and
6.4 financial assessments engineering
6.5 feasibility
8. Consultation:
• improvement strategies
possible iteration required
Land-use/transport interactions
Developing the Environment and Development Strategy
9. Recommendations for the Preferred Environmental and Development Strategy
Investigate Funding Sources
possible iteration required
Develop Implementation Programme

UK study approach

The method proposed for the UK case study (see *Figure 6.1* steps 5 and 6) includes an analysis of the economic value for money, financial and engineering feasibility in co-ordination with the SEA. Other studies have included some degree of linkage between the SEA and, for example a cost-benefit analysis (see *Section 7.6* for more detail), however, what makes this example of particular interest is the systematic process of co-ordination and integration of the different analyses.

The integration of different analyses needs to be managed carefully. For example, in terms of the identification, analysis and selection of alternatives, one should pay particular attention to the order in which they are subject to the different analyses. This has crucial implications for the overall outcome of the appraisal. For example, if in the first instance only economic and financial implications are considered, there is a risk that this priority order can potentially screen out options which are desirable from an environmental/sustainable point of view.

In the case of the UK study, consideration of the economic and financial feasibility together with performance against overall objectives (*Figure 6.1* steps 5 and 1) acted as the first "filter". This ensured that the overall analysis and the use of assessment tools focused on those options which were realistically going to contribute to a range of objectives which had been set during scoping:

- land-use/transport integration;
- economy;
- accessibility;
- safety; and
- environment objectives.

For example, Option 5 (Selective Road Capacity Increases), when tested using the transport model developed for the study, was found to perform poorly in relation to the integration and economy objectives since it had little effect on traffic flows and journey time. Given its poor performance in this respect and that it would certainly not give rise to any environmental benefits, it was scoped out and not taken forward for full assessment against the environmental objectives set for the study.

This approach is based on a strong degree of pragmatism and the combined consideration of a variety of factors. This approach has the advantage of providing an *early warning mechanism* which can help to screen out alternatives and reduce the burden for the environmental assessment which can have significant time and cost implications linked to modelling.

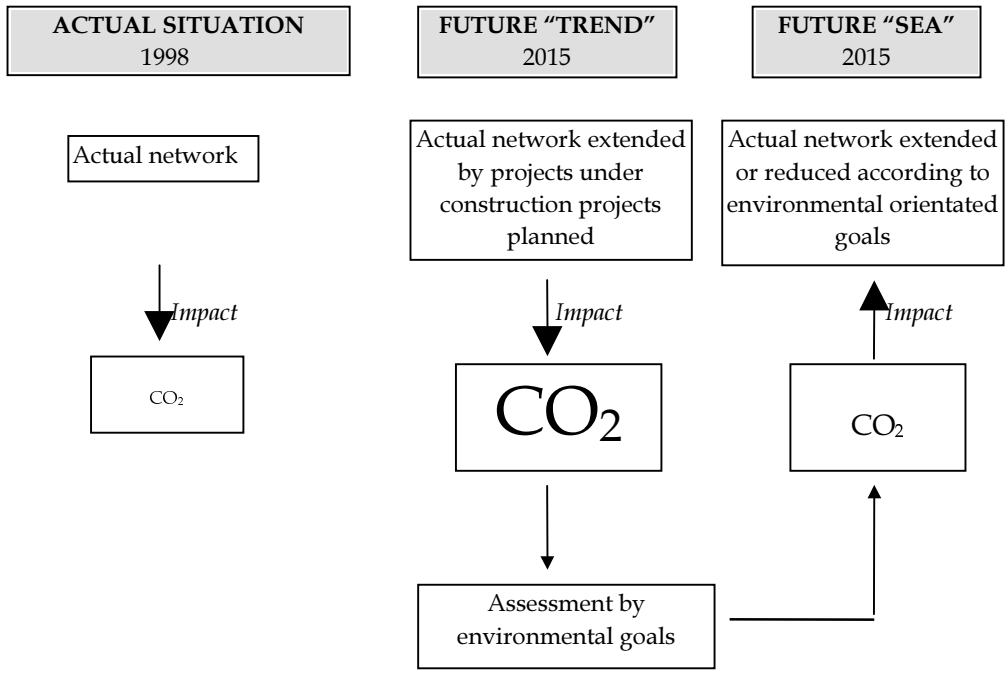
The last option (Option 10 in *Table 6.1*) is designed to deliver significant road traffic reduction and environmental benefits and is based on the most effective components of the previous strategy option tests. The identification and design of this option was the result of an iterative process of evaluation and re-evaluation which is shown in *Figure 6.1* by the arrows linking stages 1

to 9, including evaluation, discussions and consultation. Options 7, 8 and 9 were the intermediate outcome of such process (see "*Description*" column in *Table 6.1)*.

6.2.2 *Strategic alternatives for the Austrian study*

The Austrian example is perhaps a little different in that it does not explicitly start out to compare a number of strategic alternatives. Rather, the method used, **results** in the development of an alternative which aims to meet the environmental objectives set (*Figure 6.2* shows the example in relation to CO_2).

Figure 6.2 ***Structure of the SEA "Danube-Corridor" scenarios and environmental implications***



Source: Trafico 2000

In brief, the method examines the current transport situation and its environmental impacts and the impacts on the environment in 2015 if business continues as usual (i.e. road, rail etc. capacity is increased to meet demand as is currently the case – see *Table 6.2*). The effect on the environment in 2015 is then considered if measures such as road pricing, or putting road traffic onto rail are added into the scenario. The result is a more ecologically sustainable transport situation for 2015.

> *In addition to measures in infrastructure, the desired success [sustainable transport] can however be achieved merely through measures in the "software area" (better co-ordination and networking between the modes of transport rail/rail and rail/bus etc., improved timetable offer), as well as regulatory-organisational measures (road-pricing, improved rail/ship logistics).*
> *Austria - BMWV and BMJuF, 2000b.*

Table 6.2 Inputs for Modelling

Group of measures	Measure	Business as usual Trend "2015"	Scenario Opt 1 "2015"	Scenario Opt 2 "2015"
Infrastructure inputs				
Inland waterways				
Wachau	upgrading to 2,7m RNW	no	yes	yes
Rail				
Salzburg - AttnangPucheim	new track via Mondsee - Thalgau	no	no, adaptation present track	yes
Road				
A1 Wallersee - Haid	5 + 6 lane	no	no	no
Operational conditions	**inputs**			
Timetable public transport		no charges to 1995	improved supply	improved supply
Legal Framework inputs				
Speed limits in the road network	reduction of speed limits	no	yes	yes

Source: Trafico 2000

6.2.3 *Focus on infrastructure options*

The experience of the French

The French study assessed four sets of multi-modal infrastructure solutions within a corridor: two essentially relating to road transport; one mainly focused on rail (with small road improvements); and fully multi-modal solution looking at toad, rail and waterways.

The focus was therefore on infrastructure alternatives. Nonetheless, it was pointed out that non-infrastructure solutions had been assessed in the context of the socio-economic analysis, which included:

- analysis of the need for the policy, plan or programme (especially in relation to traffic issues);
- analysis of the costs;
- analysis of the technical feasibility;
- analysis of the socio-economic aspects (employment, industry etc.);
- analysis of environmental implications.

This distinction of roles between a socio-economic study and an environmental study is likely to remain part of the French system. A team ensures that each element of the analysis focuses on the same set of scenarios and starting point. It is then up to each component to discuss and explain if and why certain scenarios are not chosen or even assessed.

It is however worth mentioning that, in addition to the split between assessment tools, the reasons for not considering non-infrastructure solutions relates once again to the national planning system and the distribution of responsibilities at different administrative levels (cf. also Sweden - *Section 3.3*). For example, the fundamental link between land-use and transport can only be dealt with at the municipal and regional levels, whilst, as we have seen, infrastructure plans are being defined by the central government.

The experience of the Swedish project

In Sweden, 7 alternative combinations of road and rail connections and upgrades plus a zero option alternative were examined. These alternatives were identified at the beginning of the study by the Road Administration in discussion with the regional administrations affected by the link. The study was restricted to this rather narrow range of alternatives (the report acknowledged that more transport options, including more rail alternatives and traffic control and management measures, should have been included) due to time and resource constraints. Nonetheless, by carrying out the pilot assessment, the evaluation team was able to make recommendations for the future consideration of alternatives:

- alternatives should be constantly reviewed as the SEA progresses. A first set of alternatives is identified during the stages of data gathering (baseline) and scoping; these alternatives should then be reviewed to allow for new and/or different options to be introduced; and
- non-infrastructure alternatives should also be considered.

The experience of the Italian project

The Italian study focuses on structural options and alternative alignments, thus dealing with a much higher level of detail. However, it still draws the link between such specific decisions and the strategic directions given by regional and national policies and plans. In addition, although a significant part of the pilot study focuses on alternative road solutions, the report explores rail options. It provides an overview of the logistics and timescales for services from this mode in the region, their strengths and limitations and the reason why they cannot be taken into consideration at the more detailed level of analysis since they are not considered realistic alternatives in the short-to-medium term.

6.3 BUSINESS AS USUAL SCENARIOS

All the studies have some sort of business as usual option as a base alternative. In the Austrian example, the consultants highlighted that a key benefit of this is raising awareness amongst transport planners and government decision-makers on what the likely impacts of such a scenario would be. This was particularly relevant because there is still some resistance to a move to more sustainable transport planning.

6.4 CONCLUSIONS AND LESSONS LEARNED

It is during the process of identification, discussion and evaluation of strategic alternatives that SEA can make its greatest and most constructive contribution to sustainability and environmental protection. Not surprisingly, this stage was found to be the most dynamic and intensive phase of the assessment process. Particularly for those studies which looked at infrastructure and policy-type alternatives, and which involved some degree of consultation.

The main lessons learned:

- Alternatives should be identified bearing in mind the overall objectives which have been set for the transport corridor - these will normally include a mixture of environmental, socio-economic and transport led objectives;

- The greatest benefits are to be obtained by the consideration of both infrastructure and policy-type alternatives. However, depending on a country's planning and appraisal system, the administrative responsibility for policy-type measures may be delegated to different administrative levels, thus making it difficult to consider such options in a corridor context;

- A business-as-usual scenario plays an important role in decision-making since it can highlight the sustainability implications of lack of, sometimes radical, action on strategic policy and infrastructure options;

- Similarly, co-ordinating (and possibly integrating) the socio-economic, transport feasibility and environmental assessments enables to identify alternatives which are desirable from a number of perspectives, and are able to meet more than one type of objective (ie. not only a strictly environmental one);

- Consultation on alternatives is considered of great importance at this stage in planning and assessment. Open discussion about the alternatives which should be considered, as well as those which are likely to be scoped out following preliminary consideration, will help to identify realistic options, and reduce conflict at a later stage;

- The process of identification and definition of options is iterative, and may entail the subsequent refinement of basic options.

7 ASSESSING POTENTIAL IMPACTS

Section Contents

7.1 INTRODUCTION

Having looked at the scoping stage (*Section 5*) and the outline of alternatives (*Section 6*), the report now compares the impact assessment approach which was developed by each case study. It is worth reminding the reader that a common objective of all studies was to define methods for the analysis of multi-modal solutions at corridor level. This section will discuss the use of objectives and indicators, the role of geographical information systems, the balance between quantified and qualified impacts, the link between environmental and economic/technical assessments, and the type of difficulties which were faced by some of the assessment Teams.

The methods presented by each study reflect the overall objectives of the pilot projects, and the type of questions which they aimed to answer. These were presented in *Section 3*, and for ease of reference, *Table 3.1 Comparing the "Key Questions" which will be addressed by the SEA,* is repeated below.

Table 7.1 Comparing the "key questions"

Study	Questions
Austria	• What are the environmental problems caused by transport in the Danube Corridor, today and in the future, depending on different scenarios (rail, road and inland waterways)? • How do the different scenarios differ in terms of their impacts on health, the environment, the need for additional infrastructure? • What are the concrete advantages of ecological transport solutions in the corridor?
France	• What is the environmental impact of each option? • What is the best route for each option?
Italy	• How does the proposed initiative relate to strategic (policy) objectives? • What is the risk of environmental impact for each option?
Sweden	• What is the environmental impact of each option? • Which option will meet the environmental objectives?
United Kingdom	• To what extent will each option achieve the environmental and sustainability objectives? • What is the value for money of each option?

Each study adopted fundamentally different methods and the next sections attempt to provide sufficient insight into the main aspects of each approach.

7.2 *INDICATORS AND CONSTRAINT MAPPING*

Virtually all five examples have used indicators (see *Section 5.3.2*) and some form of constraint mapping as part of the impact assessment stage. Since the French study has developed a method which heavily focuses on this technique, its two stage approach is discussed below:

- Stage 1 - choosing between different possible routes for each mode;
- Stage 2 - environmental comparison of different scenarios involving new infrastructure.

The aim of the study was to suggest solutions to a number of *challenges* specific to the establishment of corridor SEAs, which are highlighted in the introduction to the French method (*Box 7.1*).

Box 7.1 France: key technical challenges for multi-modal corridor SEA

- Comparing different modes involves considering very different types of impacts (e.g. arinsing from rail and waterways);
- The alternative scenarios can be of very different importance and significance (e.g. In terms of length of new development, or costs);
- The infrastructures which make part of the different scenarios are often defined only in terms of initial studies, and these will vary significantly in terms of level of detail (e.g. High speed trains are studied within a 1000 mt. Corridor, the extension of an existing road is studied in a corridor ranging from 250-5500 mt.);
- Some new infrastructure will be located along a new alignment, whilst other new elements may simply involve the further development or adjustment of an existing infrastructure;
- Some infrastructure will be joined to other;
- The infrastructures will not be developed at the same time and some environmental impacts will therefore take place at different times.

Source: INGÉROP 1999b - translated by ERM

7.2.1 French Stage 1 - choosing between different possible routes for each mode

The first stage of the French method had as its primary objective that of developing further the existing methodology for the environmental analysis of a single mode corridor, which had been developed to analyse the A79 on behalf of the Ministry of the Environment in 1996. This method looks at a number of themes (*Table 7.2*) and components which are used to build up a series of maps showing, for each transport mode:

- *the intrinsic value of the environment* - the intrinsic value of the environmental component (i.e. independently of the infrastructure);
- *the sensitivity of the component* - in relation to the type of mode;
- *the residual impacts* - following mitigation measures.

These three dimensions are scored from 1 to 6 through *expert judgement*. On the basis of the scoring results, a series of maps are produced to show each of the three dimensions in relation to the different modes. The results are purely qualitative.

Table 7.2 Themes used in Stage 1 of the French study

Themes and Environmental Criteria	Example of detailed component
4 Surface waters	surface water network < 15 mt, >15 mt (width)
5. Underground waters	groundwater capacity: <10m^3/hr, etc.
6. Natural environment	nature reserves, protected areas etc.
7. Vegetation	woodland: <300 ha, 300<x<1000 ha etc.
8. Noise	quiet zones
9. Agriculture	fragile soils, pastures etc.
10. Cultural heritage	monuments etc.
11. Landscape	landscapes of exceptional beauty
12. Human and industrial activities	urbanisation, derelict land etc.

Source: INGÉROP 1999b - translated by ERM

Finally, the dimensions are combined to create a grid showing the cumulated constraints for each individual mode. Again, this is translated into maps

which show, for each mode's alternative, the route which will have the lowest degree of constraints.

It is interesting to note that the French expert team concluded that the adaptation of the "A79 methodology" for preliminary infrastructure studies would not be sufficient to produce a methodology which was appropriate for multimodal corridor SEAs; and thus capable of addressing the key questions outlined above (*Box 7.1*).

> "*…nous avions pleinement conscience que les questions méthodologiques à résoudre pour des EISE de niveau 2* [i.e. corridor SEAs] *… sont très différentes de celles à résoudre pour des études préalables d'infrastructures..*" INGÉROP 1999b

It was felt that the necessary step would be to further develop the themes and components used in the A79 example and translate these into specific *indicators*.

7.2.2 *French Stage 2 - environmental comparison of different scenarios involving new infrastructure*

For this second stage, the French study has invested some effort in devising a method which could assess quantitatively the evolution of transport's impact on the environment within the corridor, distinguishing impacts caused by *existing* transport from the additional impact which will be caused by the proposed new development. The different transport development scenarios could then be compared in terms of their relative additional impact on the environment.

Four types of impacts on the environment were identified and divided into two categories: those that change according to the transport mode, those that are independent of the type of mode (*Table 7.3*).

Table 7.3 France: four types of impacts

A) Impacts linked to mode type	**related indicator category:**
Land-take and natural resource consumption	• natural risks • urbanisation • surface and underground waters • agriculture • cultural heritage
Disturbance	• noise • surface waters • air pollution
Constraints	• protected areas and biodiversity • cultural heritage sites
B) Impacts independent of mode type	**related indicator category:**
Fragmentation	• natural environment and habitats • landscape.

Source: translated by ERM from INGÉROP 1999b

"*Le calcul de tels indicateurs pour chaque scénario alternatif pourrait permettre d'en comparer les impacts sur l'environnement et d'apporter une aide à la décision prenant en compte ce critère d'environnement*" INGÉROP 1999b

Indicators of absolute, representative and additional impacts

"Absolute indicators"

In developing a set of indicators, the French team distinguished three types of indicators, arguing that absolute indicators (type 1) provide an unclear message: by calculating, for example, the length of land-take caused by a new infrastructure it is often difficult to establish "*the real importance of the impact on the area analysed*" (1) . In the actual study of the Corridor Nord, this type of indicator was calculated as a basis for the other two, rather than for reporting purposes.

(1) Quote translated by ERM from INGÉROP /SETRA (Summary of results) 1999.

"Representative indicators"
They focused on so-called "*indicateur relatif de représentativité*", i.e. indicators capable of linking the resource which is affected to the overall resource (eg. The section of a destroyed or disturbed habitats is related to the overall protected area of which it is a part).

"Additional impact indicators"
Finally, they developed indicators which could compare the environmental effects of past developments (i.e. existing infrastructure) with those of proposed new development. A so-called "*indicateur relatif de croissance*".

Table 7.4 France: proposed criteria for the selection of indicators

Criteria	Specification in the case of a Corridor SEA (*the Corridor Nord)*
The nature and level of the assessment	• this is an environmental assessment intended to feed into a multi-criteria analysis • it refers to a large corridor, not a single route.
The scale of assessment	• scale varies between 1/100 000 and 1/250 000
The method's replicability	• the indicators must be transferable to all corridor case studies; althogh adjustments will be necessary to reflect specific environmental characteristics.
The durability of the indicators	• indictors must be valid throughout the life of the project and the infrastructure's development.
The multimodal character	• in order to favour the comparison and the calculation of cumulative impacts, indicators must apply to all terrestrial modes.
The transboundary character	• indicators will have to match each country's objectives and available set of data, and must remain homogeneous.
The baseline	• the indicators must identify change with respect to the state of the environment and the intrinsic value of the environment's natural and cultural resources before development takes place.
Homogeneity	• in order to facilitate decision-makers, indicators should maintain a certain consistency in the way they are designed and in terms of their measurement units.
Simplicity	• only the most significant and relevant indicators should be developed. Their message must be easy to grasp and interpret. Their number must be limited in order to be able to visualise them and to integrate them into a multi-criteria analysis.

Source: translated by ERM from INGÉROP 1999a

Cumulative impacts

The team developed a hypothetical scenario whereby it calculated the impact indicators starting from a completely intact territory "*territoire supposé vierge*

de toute infrastructure linéaire". Adding the impacts of existing infrastructure to such scenario, followed by the possible (different) impacts expected from the alternative options being proposed for development.

> "*…il nous a semblé intéressant de connaître plus globalment la détérioration de ce territoire par toutes les infrastructures linéaires qu'elles soient présentes ou futures*" INGÉROP 1999b

Although interesting in principle, the SETRA is thinking of simplifying this approach since it finds that it may cause excessive complications.

7.2.3 *The use of Indicators in the UK study*

In order to assess the degree of achievement of the objective by an option, the UK study has developed a set of indicators (see *Table 7.5*) which have been selected as the most representative:

- in relation to the baseline problems identified in the corridor;
- the trends expected as a result of the existing legislation;
- the changes in conditions forecast by the land-use/transport model; and
- the information available for assessment purposes.

Indicators are used in the following way:

- for geographic display, for each modelled zone, using a GIS; and
- as text and tabular summaries of the impacts of the important indicators.

Table 7.5 United Kingdom: SEA indicators (and related objectives)

Category	Objective	Indicator
Global Issues		
• Climate change	minimise emission of greenhouse gases:	change n quantity of CO_2 emitted.
• Regional air pollution	no exceedence of critical acidification loads and levels:	change in quantity of NO_x emitted (and related to areas exceeding critical loads and levels).
Natural and Built Resources		
• Landscape, biodiversity, heritage and townscape	enhance natural and built resources and minimise negative impacts on landscape, biodiversity, heritage and built environment:	landtake and changes in traffic (pcu-kms) in sensitive areas.
• Water resources	minimise pollution of fresh and marine surface waters and groundwater:	changes in traffic (pcu-kms) as a proxy of the potential for impacts from road run-off.
Community Issues		
• Noise	avoidance of exposure to levels which endanger health or quality of life:	change of population disturbed by noise.
• Air quality	protection against recognised health risk for air pollution:	changes in quantity of NO_x and PM_{10} emissions.

Note:
A passenger car unit (pcu) is a term used to quantify all types of road vehicles relative to a car, with one car corresponding to one pcu and a heavy goods vehicle or a bus corresponding to

two pcus. Pcu-kms refers to the number of passenger car units multiplied by the distance they travel and is an indicator of level of traffic movement.

Source: MVA 1999

A useful lesson from the UK experience is the process of distillation of the indicators and impacts in order to focus on the important issues. This distillation was based on:

- the absolute importance of a change in an indicator between the do-minimum and do-something cases; and
- the comparative importance of values of indicators which enable options to be distinguished from one another.

> "*Having condensed and sieved the information, the essence of the assessment of the degree of achievement of the environmental objective is then a matter of judgement. However, the information is presented in such a way that the reasons for our judgements are transparent* " MVA 1999.

7.2.4 Indicators in the Austrian study

Compared to the UK study, the Austrian Team has taken into consideration a wider range of indicators and has sometimes expressed them in different ways due to the different nature of the options being assessed.

Table 7.6 The Austrian example: Objectives/targets, criteria and indicators

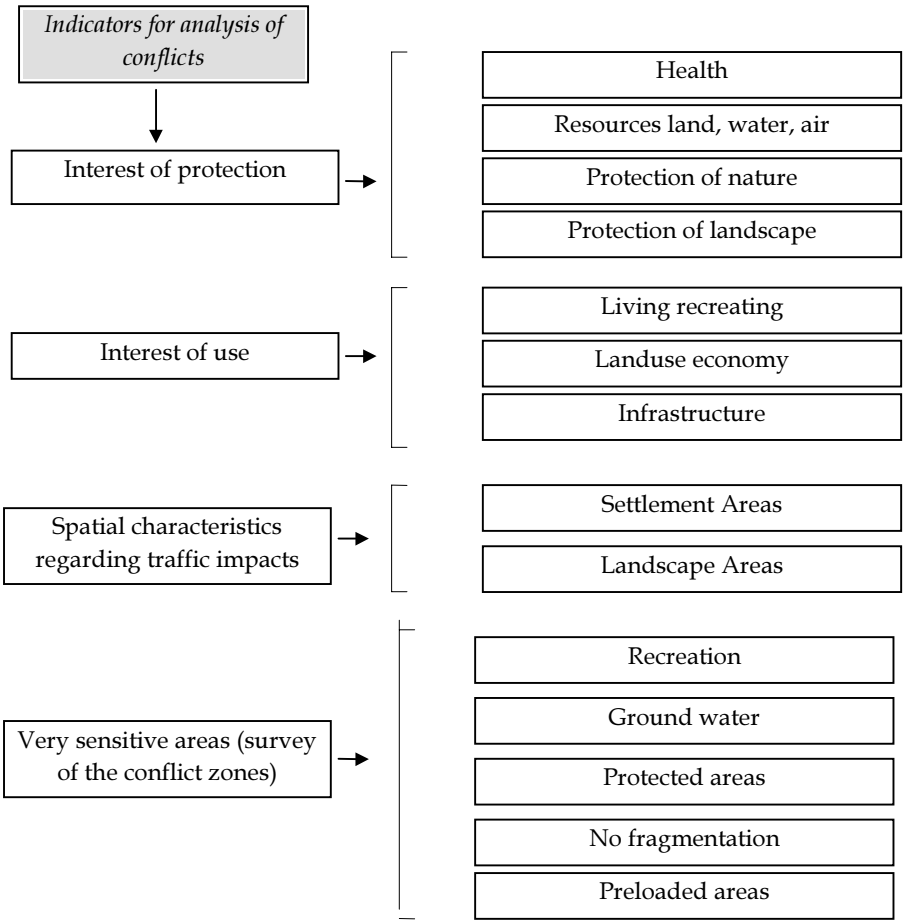
Environmental Targets	Assessment Criteria/Indicators
• reduction of: - greenhouse gases - air pollutants - energy consumption	• emissions of CO_2 • emissions of CO, NO_x, CH, SO_2, particles • energy consumption (MJ) separation by fuels additional direct land use (ha)
• minimal land use	• additional direct land use (ha)
• minimal impact on areas	• indirect land use (ha)
• minimal impact on protected areas	• length of infrastructure (+ impact of traffic) in nature reserves and landscape-protection areas
• minimal impact on recreation areas	• length of infrastructure (+ impact of traffic) in areas for landscape bound, quiet recreation
• reduction of noise-impact	• length of infrastructure (+ impact of traffic) in densely populated areas
• no risks to important water resources	• length of infrastructure (+ impact of traffic) in densely populated water resources
• minimal impact on landscape	• length of infrastructure (+ degree of completion) in sensitive landscape
• minimal fragmentation of areas	• density of the net, length of infrastructure in non-fragmented areas
• no exceeding of impact limits	• length of infrastructure (+impact of traffic) in preloaded areas

Source: Trafico 2000

For example, if we take the issue of water resources, which both studies consider, the UK adopted an indicator which looks only at changes in traffic. This was defined to respond to the fact that none of the UK options include new infrastructure. Originally, the UK Team had considered an indicator for length of new infrastructure close to sensitive water resources. Similarly, the

Austrian Team looked in general at length of infrastructure as well as traffic impacts in sensitive areas (see Table 7.6 and *Figure 7.1*), to account for new infrastructure as well.

Figure 7.1 Using Indicators for Spatial Analysis of conflicts



Source: Trafico 2000

7.3 USE OF GEOGRAPHICAL INFORMATION SYSTEMS - BENEFITS AND OBSTACLES

7.3.1 Benefits

A number of the case studies use cartographical techniques and GIS to assess the impacts of different transport modes. A key advantage here is that the various inputs (e.g. current road traffic and pollution levels plus future predicted levels) can be overlain to show clearly and simply the resulting impacts.

A GIS was for example used to assess the various options in the UK case study, against the environmental characteristics of the region and the criterion chosen for the evaluation. The GIS used outputs from the transport model to calculate and display, for example, changes in atmospheric emissions and road traffic noise arising from the options. The use of the GIS allowed several

factors to be "overlain" so as to determine the relevant impacts of e.g. changes in traffic within areas of valued landscape or tranquil areas. An example of the way in which GIS outputs can be used to illustrate the effects of strategy options is given in *Figures 7.2* and *7.3*. The maps shown in the Figures are reproduced from the UK case study.

@ INSERT MAP 7.2 – Nox….

@ INSERT MAP 7.3 Noise….

Figure 7.2 shows how NO_x emissions would change in each of the zones within the study area as a result of Strategy Option 10 (see *Table 7.1* for definition). The change is relative to the Do-minimum and is presented for the furthest time horizon within the scope of the study which was 2021. It can be seen from the figure that while a number of urban centres experience notable decreases in NO_x as a result of the strategy option, a number also experience increases.

Figure 7.3 shows how Strategy Option 9 (see *Table 7.1* for definition) would change noise levels relative to the Do-minimum in 2021. It can be seen from the figure that the strategy option brings about decreases in road traffic noise across most of the study area.

The use of maps such as the ones shown in this report make it much easier for the assessor to understand how impacts are distributed over a study area compared to a situation where the assessor only has access to data presented in tabular form. In particular it shows exactly where strategy options are having the greatest or least effect.

A further point to draw out is that the GIS outputs from the UK case study were essential in communicating the results of the study during the second round of consultation which was undertaken at the end of the SEA process (see *Section 4.2.1*). It is the opinion of the project team that GIS is a very useful tool for public participation processes. The UK case study also found that the use of a GIS database was invaluable in storing and presenting in different ways the very considerable quantity of data that was generated in undertaking an SEA within a large regional study area.

Overall, the UK, the French and the Austrian experience show that GIS is crucial in facilitating the comparison of transport alternatives and to progress thinking in terms of multi-modality. It enables the effects of a significant number of options to be displayed geographically - thus facilitating understanding and analysis by decision-makers and the public.

7.3.2 Difficulties and obstacles

An important limitation is the reliability and comparability of baseline data and also the need for strategic coverage over long timescales. This generally requires assumptions to be made and in general, the case studies based these assumptions wherever possible on recognised, published guidance or empirical evidence. In some instances however, where guidance or empirical evidence is lacking, assumptions had to be made based upon the reasonable professional judgement of the consultant.

7.4 USE OF MODELLING AND TRAFFIC FORECASTS

7.4.1 *The Austrian experience*

The importance of relevant and realistic forecasts for traffic and transport to an SEA is fully realised in the Austrian case study. Existing data was used as a basis for the transport forecast and a number of published traffic forecasts were analysed against a set of criteria - these included, among others:

- what database is the forecast derived from?
- is the time scale relevant?
- does it forecast commercial and private traffic?
- does the forecast cover the transport routes considered within the corridor?
  etc.

A critical analysis of national and regional traffic forecasts, including those developed by independent researchers and those published by government, resulted in the choice of the most realistic forecast for the SEA study. In the assessment, the method used for each forecast was analysed and clear reasons were given why a forecast was appropriate or not.

In reality however, although the traffic forecast developed by the Federal Ministry with responsibility for transport was considered the most appropriate, it was realised that the forecast method had been developed for a different purpose. The delay in the completion of the Austrian SEA has largely been caused by the need to homogenise the model to meet the requirements of the SEA.

Probably the main difficulty that the Austrian Team has encountered in undertaking the SEA, has been the forecasting of environmental problems - i.e. the state of the environment in 2010, in relation to issues such as pollutant emissions, energy consumption, land take, impacts on land use including forestry, agricultural, recreational space and protected areas, impacts on water resources, habitat fragmentation, spatial planning. Some examples of key problems included:

- gaseous and noise emissions with reference to cars - by how much will an improvement in technical standards offset the increase in car numbers?
- land take - what effect will future urban and industrial development have on land take and on traffic levels?
- habitat fragmentation - what proportion of habitat fragmentation will be attributable directly to transport infrastructure and how much to industrial, commercial and residential development.

To over come these problems, the team have had to use a number of assumptions which have where possible relied on published research. Alternatively, assumptions have been based upon the professional judgement of the study team to what is feasible and representative.

Additional transport and economic criteria were also examined covering for example traffic safety and economic costs. The addition of transport and

economic criteria allowed the assessment criteria to be closely linked to the decision-making process which will need to consider both the environmental and economic consequences of future transport plans.

7.4.2 The UK experience

The assessment has been based upon a simulation model. The geographical impacts, in terms of changes in passenger-car unit kilometres (pcu.kms) or vehicle km of the strategy options, are generated by the model. The results of this are fed into a GIS together with environmental information such as emissions factors, valued landscapes and designated areas etc. to provide the results of the assessment. This process is briefly described in a non-technical manner in the SEA report (see also *Figure 6.1*).

Assumptions
These are generally fully explained and justified with reference to government-published/supported assumptions or recognised empirical studies. However, in some cases, the explanation could be deemed too technical for the non-expert and there are cases where assumptions based on scientific research are not referenced - e.g. with regard to annoyance from noise: "many studies having been undertaken which correlate annoyance with long-term average noise exposure".

Assumptions of "Significance effect"
Assumptions of significance have been based either upon empirical evidence and guidance given in government guidance (the use of a change in 1dB of noise to be significant). N.B. the DETR's Design Manual for Roads and Bridges (DMRB) considers a change of 3dB to be the threshold for annoyance, although still requires changes +/- 1 dB to be identified as part of an EIA. Recognised empirical evidence suggests that a change in noise is perceptible at 1dB - hence this value was used. It was not however possible to base all thresholds of significance on empirical evidence - e.g. noticeable change in traffic flows (in pcu/km) and the population affected by noise being based upon population density within 50m swathes (either side of road corridors) because guidance is not available. These levels of significance have therefore been based upon reasonable professional judgements of the environmental consultants who considered the assumptions "realistic". Limitations of the forecasting and assessment methods are explained and justified in the report.

Spatially coarse models
A key lesson learned during the modelling and assessment process in the UK was that at a strategic level of assessment, only relatively coarse estimates of environmental impact can generally be undertaken. To explain, as is often the case at the strategic level of assessment, a spatially coarse transport model was used in the UK case study, given that this type of model is reasonably informative and comparatively quick to run. Spatially coarse models generally provide only a broad indication of changes in transport behaviour arising from strategy options, expressed in such terms as changes in passenger car unit kilometres or vehicle kilometres across a model zone or a regional study area. Such model output does not generally enable noise impacts to be identified accurately at specific receptor sites or for accurate predictions of air pollutant concentrations at specific locations to be undertaken. These types of prediction require an understanding of traffic flows on specific road links, something that spatially coarse models are not generally configured to provide. Consequently, a much more broad brush level of assessment had to be undertaken using available outputs from the spatially coarse transport model. These outputs nonetheless enabled, for example, changes in average noise emission to be determined and for total emissions (as opposed to concentrations) of air pollutant to be calculated (see Figures 7.2 and 7.3).

In general, it was recognised that at this level of strategic analysis there will be constant restrictions in terms of what can reasonably and usefully be assessed. However, the Team felt that the type of analysis that was carried out was

nevertheless informative and appropriate for the level of decision being undertaken.

It was also considered by the Team that for a study of regional transport strategy options, a multi-modal transport model was an essential tool in undertaking the assessment and giving its results a level of robustness sufficient to enable stakeholders to buy into them. In the case of the UK study, an interaction between a transport model and a land use model was very useful in understanding the effects of strategy options on land use and also the effect of land use policies on transport behaviour. In particular it enabled changing patterns in the location of residential, commercial and industrial areas to be identified and manipulated through strategy tests.

7.5 *THE SWEDISH EMPHASIS ON OBJECTIVES AND QUESTIONS*

After so much emphasis on GIS as "the tool" for strategic evaluations, the Swedish corridor study offers an important example of how SEA can be done even if you do not posses the state of the art technology and, most importantly, the most accurate, up-to-date digitised information.

GIS was originally intended for quite an extensive use, including for cultural and historical baseline data. But it soon became apparent that digital data was very costly and different data policies by the various national and regional administrations meant that a lot of gaps act as impediment to the use of GIS systems. Since the proposed methodology was specifically designed to be simple to use, apply and understand, it did not require complex modelling nor the support of GIS. This was used only for data gathering and for final presentation (see *Table 7.7*). The SEA was mainly qualitative, with the exception of traffic related data (see below).

Table 7.7 Sweden's use of GIS for the presentation of results

Map (heading)	Example of conclusions and results presented
Sensitivity of small lakes and watercourses to acidification	Over half of the corridor consists of areas in which small lakes and watercourses are not particularly sensitive
Sensitivity of the groundwater to acidification	In approximately a third of the area within the corridor, the groundwater is extremely sensitive to further acidification
Areas of natural interest (for conservation, cultural and historic value, and outdoor recreation)	Less than 10% of the area within the corridor is estimated to include conservation areas. Existing National Road 40 crosses conservation areas in several places… Crossing the Ätra valley involves a conflict with areas of cultural value… etc.
Large unspoilt areas	Some two thirds of the corridor consists of such areas (the analysis makes suggestions on alignments which would avoid crossing these areas).
Changes in road traffic. Alternative MV+Zero compared with Zero+Zero (reference)	There is an insignificant increase in the number of vehicle trips. The increase is less than one per cent. The major effects on the roadside consist of re-distributions in the traffic network. Transport mileage decreases by 2.21% on the E20… The largest increase in traffic on National road 40 occurs west of …. Etc.

Map (heading)	Example of conclusions and results presented

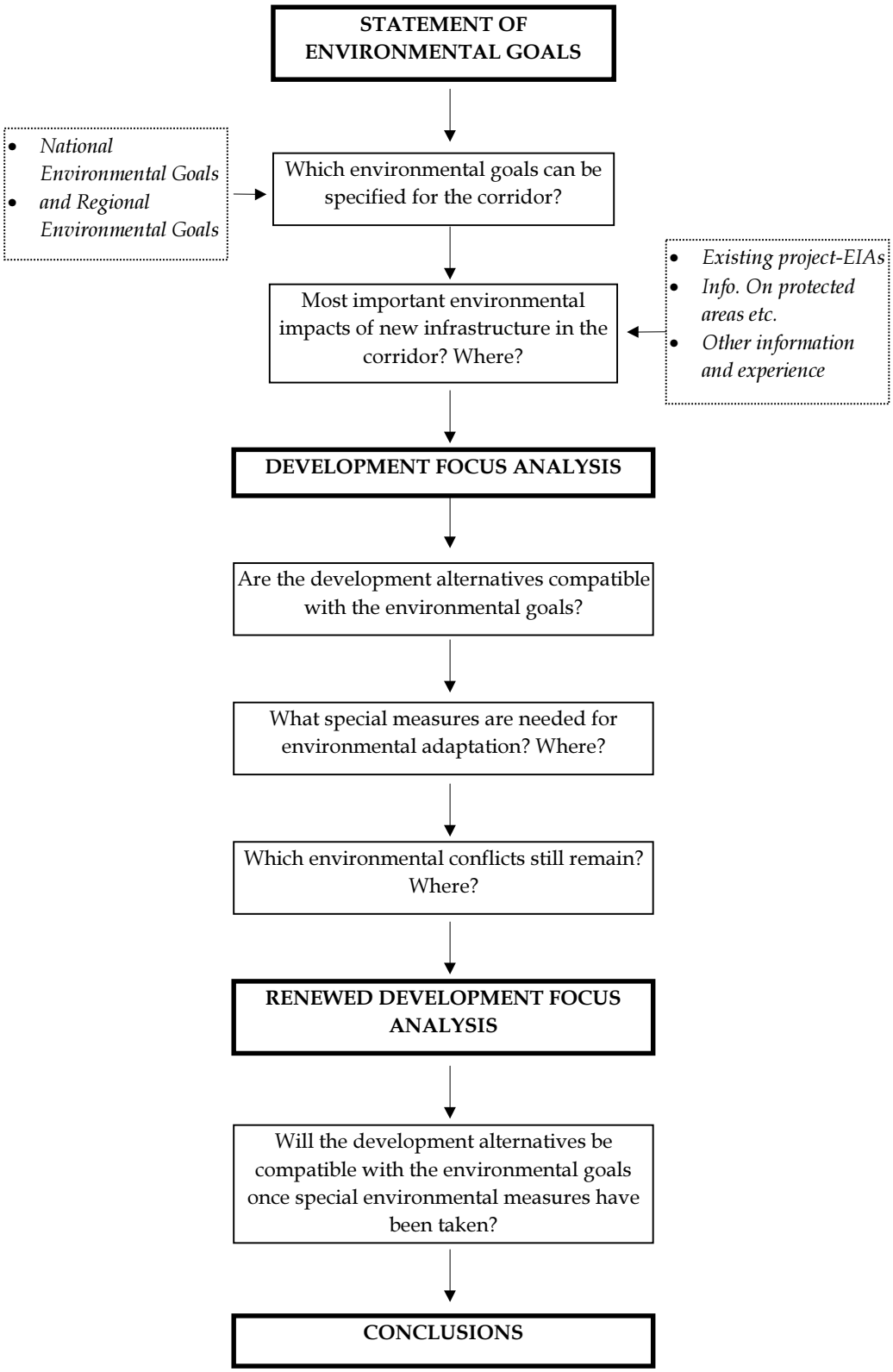
Source: based on SNRA 1998

Analysis and presentation:

- Questions - The main body of analysis is structured using questions (see *Figure 7.4* and *Table 7.8*). This approach was favoured as it was deemed more appropriate to facilitate discussion and consultation. Questions were formulated so that a simple yes/no answer could be given;

- Indicators were also used. However, despite the general support for increasing use of indicators in many aspects of planning and decision-making, the team felt that the use of questions is a more approachable method of assessment and presentation.

Figure 7.4 The Swedish approach based on Questions



Source: SNRA 1998 (with minor adaptations)

Table 7.8 Sweden - example of analysis based on questions

Issues	Example of Questions to assess impacts (for each alternative an answer is given: yes/no/not applicable)
Regional socio-economic consequences	• Greater possibilities to commute from rural areas? • Will the relative dependence on cars increase for those living in the region? • Is public transport favoured in relation to car traffic?
Conservation of natural resources	• Will the infrastructure claim high quality infrastructure land? • Increased dependence on fossil fuels?
Outdoor activities	• Increased accessibility to recreational areas? • Greater quality in local recreational areas?

Source: SNRA 1998

"*The traffic analysis, calculation of emissions and energy consumption, as well as the cost-benefit analysis have taken roughly the same amount of time to carry out as the overall environmental impact assessment*" SNRA 1998

The "**Conflict Analysis**"
This analysis intends to give, for each alternative, a general indication of the degree of *risk of conflict* with key environmental and natural resources objectives (eg. Encroachment and changes in biotopes).

The "**Development Focus Analysis**"
This analysis is intended to indicate the extent to which the various alternatives studied lead towards the attainment of pre-determined environmental objectives. It requires a simple matrix, presenting the objectives as questions: will the alternative

- be designed in harmony with the natural and cultural landscape of the region and strengthen its cultural and historic value?
- contribute to reduce the local and regional impact of pollution on lakes, watercourses and wetlands?
- etc…

Answers are given in the form of "- - -" for extremely negative contributions all the way to "+ + +" for very large positive contribution. In this case study, the analysis was based mainly on general assessments based on existing survey materials and the team's experience. More detailed research would be carried out in a full SEA.

Mitigation measures
The results of the two analyses above lead to the identification and proposal of measures aimed to adapt the proposed infrastructure alternatives in order to reduce their environmental impact. The proposed measures focus on spatial issues (eg. Use of existing alignment, fauna passages, active wildlife control). They are presented in a simple matrix, and are also summarised in relation to their geographical location with the aid of a GIS map.

The "**Development Focus Analysis projected into the future**"
A second analysis of the alternatives' contribution to environmental objectives is run, taking into account the proposed mitigation measures and projecting the implications of the different developments into the future (2010).

Traffic models - use and limitations

Another important aspect of this study compared to the others is its positioning in relation to traffic models. The pilot study confirmed the idea that in the transport world of decision-makers and experts, there can be no assessment without reference to traffic models. Demand forecasts were made for regional and long-distance trips and provided basic information to calculate:

- traffic changes;
- the extent of newly generated traffic in the various alternatives (cf. also *Table 7.7*);
- exhaust emissions;
- energy consumption.

However, the team argued that models are based on past history of transport systems and related traffic flows. The changes triggered by the proposed development cannot be easily forecasted through these models. More research is needed to address demand and potential demand since the success of new infrastructure or of substantial upgradings will depend on new demand (eg. Commuting patterns).

It is very important to note that according to the commissioning body and to the consultants, the quality of the results from the application of the proposed methodology using existing data, was fully adequate.

> "*A study at corridor level gives greater freedom to take up the traffic function which the corridor and respective traffic types are to meet in order to obtain basic input for discussing the role that the connections could play for long-distance and regional/local trips and freight*" SNRA 1998

Exhaust emissions - solving problems

- Sweden - calculation of intersection effects: due to the impossibility of acquiring data on vehicle movements at intersection points within the framework of this project, a general mark-up of 30% was made for exhaust emissions at intersections.

- Sweden - use of Willingness to pay: the evaluation of exhaust emissions was based on WTP for reduced emissions/damage. Different exhaust fume components were weighed against each other using risk factors.

7.6 LINKAGE TO OTHER ASSESSMENTS

7.6.1 Introduction

The assessment of the likely environmental effects of a corridor's transport plan provides decision-makers with just one of the elements needed to take a final decision. Fundamental information is also obtained from technical feasibility studies and cost-benefit analyses (CBA). In developing SEA methodologies, experts have been debating to what extent these should be linked or integrated with these other analyses, or incorporate elements of them.

Each corridor study has included some consideration of technical and socio-economic implications in the SEA. However, the methodological approach and scope of such inclusions varies significantly. In the French case, the socio-economic and traffic studies for the corridor had already been completed by the time an SEA was planned. In general, it is expected that the link between SEA and CBA is secured through the co-ordination of separate teams and the sharing of data. At the other end of the spectrum is the UK example, which has combined elements of economic, transport feasibility and environmental assessment in a single procedure. Italy also discussed costs in an innovative way, this is discussed in greater detail later in this chapter.

The next sections discuss some of these examples in detail.

7.6.2 The United Kingdom study

As we have seen in *Section 6*, the UK study has carried out a very comprehensive corridor analysis, which had a strong land use and economic component. The assessment framework included an SEA coupled by a fully-specified conventional transport CBA.

The final assessment has sought to "*trade-off the CBA results against the environmental impacts. This balancing process has been based on documented judgements made on the basis of successively summarised and distilled information. We have preferred to avoid the use of any quantified weighting and scoring systems which imply unsupported monetary valuations between impacts*". MVA 1999

It is worth noting that the UK study did not value impacts in monetary terms. While monetary valuation techniques are well developed in relation to certain environmental topics, in the case of many environmental topics, they are not sufficiently well developed to undertake such an approach. Thus, it was felt that since monetisation could not be applied on a consistent basis across all environmental topics within the study, a consistent non-monetised approach was the best way forward in respect of environmental impacts. In addition, emerging Government methodology for undertaking SEA did not involve a

requirement for monetisation of environmental impacts and this had a bearing on the study. This is a different approach compared to the Swedish case (see below).

Table 7.9 United Kingdom: CBA issues

Overall Objective	Analysis Approach
Improvement of Safety	For each mode, an estimate of changes in numbers of accidents is made. These are costed and included in the CBA. Their separate presentation is important to show the extent to which the different options would meet the safety objective.
Improvement of Accessibility	A broad assessment of changes to accessibility is made by measuring the benefits or dis-benefits arising from the options. No separate assessment has been made of the degree of achievement of the objective; instead, its achievement is taken to amount to the same as the achievement of the economic objective.
Improvement of Economic Efficiency	An estimate of total economic benefits. The measure used is the Economic Forecast Year Rate of Return, a ratio of 2021 benefits and costs to the capital cost of the option. Furthermore, the land-use model shows changes in jobs by zone (displayed using GIS). As with the environmental analyses, the aim is to distil the important messages about the options. The degree of achievement of the objective is finally a matter of judgement.
Ensuring Equity and Social Inclusion	The impacts on travellers, operators and government is considered. On the basis of the previous analyses, and an analysis of these groups, a judgement is made about the fairness of each option. The land-use model gives some indication of social inclusion/exclusion (eg showing increased polarisation into attractive, high income areas etc.
Ensuring Affordability and Financial Suitability	A financial appraisal enables a judgement on the affordability and financial sustainability of each option.
Ensuring Practicality and Capability for Implementation within the Required Timescale	A judgement as to whether options can be implemented within the timescales over which they would be required. Consultation plays a key role here. A strategy may be capable of implementation in technical terms, but it is practical only IF it will be acceptable to the public at large.
Ensuring Overall Sustainability	A judgement, based on a definition of sustainability and on the assessments against each of the objectives set out at the beginning of the study.
Ensuring Value for Money	A judgement for this impact is based on the Economic Forecast Year Rate of Return of the options.

Source: adapted from MVA 1999

7.6.3 The Swedish study - Cost-Benefit Analysis

The SNRA chose to include a CBA as part of the overall SEA. It was particularly interested to calculate the value of: time savings, safety/changed numbers of anticipated road accidents, vehicle emissions, energy consumption. The study stresses the fact that the costs and benefits resulting from an investment will relate to different parts of society:

- direct costs - relate to traffic authorities, road managers, transport companies;
- road safety and accessibility costs and benefits - relate to road users;
- environmental impact costs and benefits - relate primarily to those living in the immediate vicinity;
- regional distribution effects - relate to the population living in the entire region.

Two simple summary tables show the Costs and Benefits for each of the seven alternatives, providing additional information to decision-makers on:

- Costs:
    - Road investment - construction cost
    - Track investment - construction cost
    - Capital cost
    - Operating costs, rail services

- Benefits:
    - Rail services income
    - Transport costs, goods services
    - Travel time gains, road traffic
    - Travel time gains, rail services
    - Road safety
    - Exhaust emissions.

The Team found that this information was considered particularly interesting by decision-makers, since it compared road and rail alternatives in the same analysis. Indeed, it was specifically requested precisely to see how this could be done, and the result was very much welcomed. The analysis would then have to be balanced with the results of the previous analyses part of the SEA.

The following recommendations were made by the Swedish Team:

- accessibility, traffic safety and regional development issues should be discussed in more qualitative terms than is possible in the context of a standard CBA; it is very important that such issues are expressed in easily understandable terms and that they are presented in a way which supports discussion;

- wherever possible, socio-economic issues should be discussed and compared to related objectives (in the same way as is suggested for environmental issues).

7.6.4 The Italian case study - focus on costs

The Italian methodology took a very different approach to the overall stage of assessing environmental effects. From the beginning it distinguished between *level* of impacts and *risk* of impacts, arguing that EIA evaluations aimed at establishing the absolute value of an impact, and SEAs focus on the level of risk of potential impacts. Thus, the transport infrastructure solution for the

corridor is assessed, not in terms of the impacts it will produce, but in terms of the risk which it triggers in relation to the environmental sensitivity of the area, and of the theoretical possibility of mitigating the effects.

Having clarified this starting point, the Team aimed to define a method which would:

- strengthen the objectivity of the comparison between alternatives;
- compare alternatives' environmental quality, financial cost and level of service provided; and
- increase overall transparency in decision-making.

Such priorities are partly the result of an analysis of existing methods against four criteria considered by the Team to be fundamental for a proper environmental assessment. The analysis, summarised in *Table 7.10*, showed that none of the methods considered could guarantee meeting all four criteria.

Table 7.10 Comparing methodologies for the assessment of programmes and projects

	SEA should meet the following criteria:			
The different methods analysed:	**Be based on quantitative data**	**Compare 'like with like'**	**Guarantee the objectivity of the evaluations**	**Compare environmental effects with their financial cost**
Methods based on economic analysis (quantify the environmental impact in terms of substitution cost)	**100%**	50%	0	50%
Methods of assessment of cause and effect (describe the causes and the significance of impacts)	0	50%	0	0
Methods measuring the loss of overall environmental quality (expressed as the sum of individual impacts)	50%	50%	0	0
Methods based on value judgements (expressed qualitatively by sectoral experts)	50%	50%	0	**100%**

Legend:
100% fully meets the criteria
50% only partially meets the criteria
0 does not meet the criteria

Source: adapted from Benedetto and De Blasiis – Translated by ERM

Therefore, the SEA methodology developed for the Italian corridor addresses the shortcomings of existing methods in terms of the four criteria presented in *Table 7.10*. In particular, the Team focused on the need to guarantee objectivity in the analysis, in response to some difficulties in the cultural and political context in which SEA should operate. The political dimension of evaluations, involving mediation between different interests and stakeholders, is considered a main source of subjectivity. It is seen as particularly relevant in SEAs of plans and programmes, and also important at the scale of project feasibility - when looking at the compatibility with the urban structure.

The underlying assumption is that, as the decision-making level becomes less strategic, the degree of *subjectivity* in a decision's evaluation is also reduced. Thus, once the project is finalised and ready for implementation, the level of subjectivity in the evaluation is greatly reduced. The assessment will focus on technical options, highly specific problems and the conditions, which need to be respected for the project to function effectively.

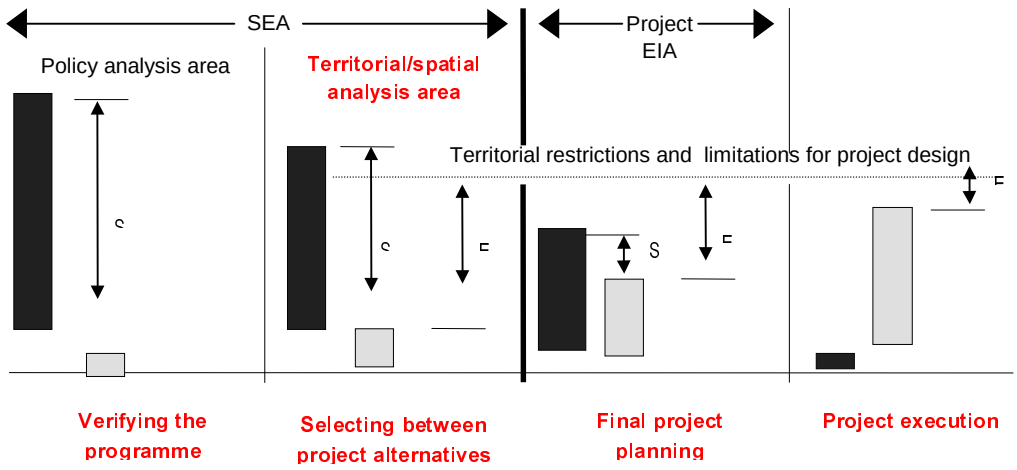
Figure 7.5 summarises the concepts behind this assumption. It shows four key stages in Italy's planning context (programme verification, selection of project alternatives, and their respective assessments, final project planning and project execution), and relates these to SEA and EIA.

The study has carried out two SEA stages:

13 The first stage - looking at the policy context for the corridor at national level and using qualitative methods to verify the corridor initiative's coherence with general sustainability goals and in relation to the overall demand for mobility; and

4 The second stage -which was considered to be the most important by the Team-, focused most of its effort in developing a new method for the "territorial and spatial analysis" phase of SEA. This phase is characterised by a high component of "policy analysis" and therefore, according to the Team's assumptions, with a strong subjective element and great freedom in the choice of technical solutions (referred to as "elasticity" in the *Figure*). It is discussed below.

Figure 7.5 ***SEA and EIA in relation to the phases of a transport project's execution***



Legend:

Area of Policy Analysis

Area of Technical Analysis

S Subjective levels in the evaluation

E Elasticity in the choice of technical solutions/options

Source: adapted from Benedetto and De Blasiis.

One of the explicit aims of the Team was to reduce the common tendency in the transport sector whereby environmental objectives are "met" through mitigation/compensation measures. Instead, this approach forces planners to focus on identifying the solution with the minimum environmental impact (and thus, the minimum need for mitigation).

The method proposed for the second SEA stage centres round the correlation between the *objectives* pursued and the *cost* of pursuing them. It looks at:

- the type of infrastructure and speed;
- the routes;
- the connections with the existing network system.

The underlying hypothesis in the Italian method is the need to define and meet a "zero impact level". Thus, each alternative should be conceived and, if necessary altered through mitigation and compensation, in order to achieve the same theoretical condition of the minimum consumption of existing natural resources (i.e. the "zero impact level").

> The report argued that, in the future, it is likely that increasing pressures on natural resources will require the achievement of a zero-level impact and this method is designed to help meet this requirement.
>
> Italy - Benedetto and De Blasiis, 1999

However, for the pilot study, the Team considered "zero impact" to be unrealistic in the present policy and cultural context. It therefore aimed for "minimum impact" in relation to land-use and general spatial dimensions, as the theoretically optimum choice. The main steps in the process are summarised below:

- **Define the area of analysis:**
  the boundaries of the area likely to be affected by environmental impacts is defined; and areas of importance from a cultural and environmental point of view are highlighted;

- **Identify range of impacts:**
  the range of impacts which should be considered in the analysis is identified in relation to the to topographical characteristics of the area, the sensitive areas within the corridor and the type of alternatives under consideration. This stage produces a detailed check list;

- **Define the reference scenario and minimum impact:**
  the reference scenario is defined by calculating the ideal "minimum impact" resulting from the theoretical combination of the most favourable conditions for the alternatives being compared;

- **Assess minimum impact for all alternatives:**
  the "minimum impact" is quantified for all different project alternatives, and for all project actions which make up the alternatives;

- **Make all alternatives comparable:**
  mitigation and compensation measures are identified in order to reduce each alternative's impact so that it reaches the "minimum impact level" defined *a priori* for the reference scenario. As a result of this calculation, all alternatives are made "equal" in terms of their level of environmental impact;

- **Calculate the cost of each alternative:**
  the environmental impact of a project is therefore proportional to the cost of measures which are necessary to reduce the impact to the "minimum impact level"; and

- **Identify best alternative:**
  the method will consider as the best alternative, the one which, given equal

environmental impact levels (the reference "minimum impact level") will involve the least amount of financial resources to implement.

The Team argues that this analysis avoids the element of subjective judgement intrinsic in other assessment methods, such as multi-criteria analysis or CBA. The emphasis is on being able to "compare like with like", and in this process, the comparison is simply between the different financial costs of various mitigation and compensation measures. Alternatives which present the same level of externalities are compared on the basis of their financial cost of execution.

7.7 CONCLUSIONS AND LESSONS LEARNED

It is worth reiterating that each study developed methods aimed at substantially different types of corridors, planning stages and levels of decision-making. Thus, the approaches to assess potential impacts are not directly comparable across the studies. The following conclusions and lessons learned attempt to highlight some of the strengths (and weaknesses) of these approaches in relation to five aspects of impact assessment:

Objectives

- The use of environmental, transport and socio-economic objectives has been common to all studies and is a well established characteristic of transport SEA processes;

- While some studies used objectives throughout the analysis (be it through complex modelling or more simple matrix analysis), others used objectives to identify indicators and then proceeded to focus the rest of the evaluation around more or less quantified (absolute or relative) indicators;

- Reference to objectives is appropriate when pursuing qualitative *as well as* quantitative analyses. It is very effective in terms of interpretation and communication of results.

Indicators and constraint mapping

- The number of indicators used will depend partly on the type of plan and decision being addressed, however, in general it can be concluded that the use of a limited and tightly focused number of indicators (e.g. ten to fifteen) seems to provide the best balance between analytical assessment and clarity in the overall evaluation and interpretation of the final results;

- The process of selection of indicators will often take place in two stages, a brainstorming and a refinement of the "final list" which can be helped by searching for:

    - the absolute importance of a change in an indicator between the do-minimum and do-something cases; and

- the comparative importance of values of indicators which enable options to be distinguished from one another;

- A wide range of assumptions is considered inevitable at this level of assessment. In all cases, transparency in relation to their formulation and use was considered essential.

Geographic Information Systems

- GIS was widely used across the five studies. Its main advantage is considered to be the ability to compare the potential impacts of different options against a set of environmental (and other) indicators chosen for the corridor area. The ability to overlay different sets of geo-referenced information with data on traffic flows was seen to be particularly useful. GIS-linked databases were also found to be very useful in managing and displaying the considerable quantities of data generated by SEA studies;

- However, by comparing the different studies it clearly transpired that the extensive use of GIS and modelling is not always essential in order to provide adequate and sufficient information to decision-makers. Very much depends on the level and type of plan and related decision; as well as on the planning and evaluation cultures. Sometimes the use of matrices linking indicators and objectives to the different options can be equally effective;

- Consideration should be given to the advantages of GIS and mapping information for presentation, both to decision-makers and to the public during consultations.

Modelling and traffic forecasts

- Identifying, (collecting where necessary) and organising the data and models for transport flows and demand forecasts has accounted for a very significant part of the overall time and resources needed for the SEA;

- A transport model remains an essential tool in undertaking an SEA and in giving its results a level of robustness which is sufficient to enable stakeholders to buy into them;

- For a full understanding of the effects of transport strategy options and of transport orientated land use policies, an land-use and transport interaction modelling is a useful tool. However, this can be very resource intensive;

- Principal use of traffic data includes calculation of: traffic changes, newly generated traffic; exhaust emissions, and energy consumption.

Linking with other evaluations

- Overall, it was felt that consideration of the economic implications of different alternatives was necessary and helpful in providing a balanced

picture when presenting results;

- Methods for inclusion of CBA-type analyses (cost-benefit analyses) varied greatly, also reflecting cultural approaches to planning and long established evaluation processes. For example, not all approaches led to monetary evaluations of impacts;

- The UK study went beyond linking SEA and CBA, since the overall study comprised an assessment framework looking at: objective achievement, transport problem amelioration - including environmental impacts, economic value for money, equity and financial sustainability. This integrated approach required the development of a land-use transport interaction model.

8 THE SEA REPORT

Section Contents

8.1 INTRODUCTION

Table 8.1 presents the elements which should make up an SEA report for a transport plan. The production of such a report is an important part of the assessment process.

The five examples reviewed here, have produced substantially different reports including a mixture of methodology and SEA results. This "double nature" of the pilot studies makes it difficult to comment on their final report since they cannot be considered SEA reports in a strict sense.

Table 8.1 Contents of an SEA report for a transport infrastructure plan

Main sections	Brief description
Executive summary	Brief technical account of the main findings of the SEA.
The decision-making framework	Description of the higher tiers of decision-making, such as spatial, transport or environmental policies, plans and programmes. This section should also summarise the scoping decision.
Environmental baseline	A description of the study area and any foreseeable developments, and the current and foreseeable environmental situation using the indicators employed in the SEA.
Objectives of the plan	Summary of the transport objectives, and description of the environmental objectives, including their legal and political basis. Translation of objectives into indicators and targets which form the environmental criteria for plan assessment and development.
Summary of the proposed plan	Summary of the proposed transport infrastructure plan, indicating in more detail the elements which are relevant for the environment. It is useful to include maps, graphs, etc.
Analysis of alternatives	Overview of alternatives and options which have been assessed including the alternatives that were identified in the scoping phase. If alternatives are rejected, the reason for rejection should be included.
Environmental impacts	Description of the magnitude and significance of impacts, using the selected indicators. Impacts may be assessed quantitatively or qualitatively. It is useful to illustrate with maps, graphs, photographs. If comprehensive assessment is not possible, typical examples of situations that will occur can be described.

Main sections	Brief description
Environmental protection measures	Description of actions that are proposed with the aim of reducing environmental impacts. These may include, for example, (i) a strategy for mitigating impacts at lower levels of decision-making, (ii) weighting methods in lower-level SEA and EIA, (iii) screening guidance for lower levels, and (iv) identification of sensitive areas that should be avoided.
Report of consultation and participation	Report on the steps taken in the assessment phase in order to base the planning criteria on input from agencies and affected groups. Discussion of the way external views were accounted for.
Analysis of uncertainty	Information which, if available, could have contributed to a better comparison of alternatives.
Environmental action and monitoring plan	A plan for monitoring plan implementation (including subsequent decision-making at lower levels of government) and environmental impacts.

Source: European Commission (1999) Draft Manual on Strategic Environmental Assessment of Transport Infrastructure Plans. Report prepared by DHV for DGVII.

Nonetheless, and bearing in mind this peculiarity, it is useful to draw some lessons from the way each case study has reported on methods and results, and the style used to present findings.

8.2 CONCLUSIONS AND LESSONS LEARNED

- SEAs based on an objectives-led approach will tend to present results in connection with these objectives. This makes results easily understandable and helps the reader and decision-maker to obtain an immediate understanding of their wider significance;

- The presentation of results using simple questions like: "Does the alternative contribute to a reduction in the areas affected by noise disturbance?" can help interpretation and discussion by decision-makers and can make the report more accessible to the non technical reader and the general public;

14 The use of maps is considered an effective way of conveying results with important spatial implications (@Figures 8.1 and 8.2 are an example of this, taken from the Swedish report). However, too many maps can cause confusion. If the method makes great use of GIS, consideration should be given to the opportunity of placing most of the maps in an annex, and limiting the use of this presentation tool to a small number of summary figures;

- Although simplification and aggregation are often necessary when it comes to presenting results, it is necessary to present all major issues separately, for transparency and to facilitate discussion (see also *Box 8.1*).

Box 8.1 French study - presenting results

The French final report on which this analysis is based, was produced in February 1999. It includes a main methodological report of over 100 pages (including coloured maps) and a short non-technical report of 33 pages. The final section of the main report provides a graphical presentation of the results, mainly using graphs, which are supposed to summarise the information presented in a significant number of maps in the main body of the report. Having discussed the final report presentation within the Team and the project initiators (SETRA), it transpired that in the future results should be presented more clearly and objectively:

- especially by providing information in the least-aggregated way; and
- comprehensively: showing all types of environmental themes and impacts analysed (whilst in this case, aspects such as air pollution impacts were excluded, see *Section 5*).

In addition, the French Team suggested that results of the environmental and socio-economic analyses should be presented together using Multi-Criteria Analysis.

9 CONCLUSIONS AND WAYS FORWARD

Section Contents

9.1 SHOWING THE WAY FORWARD

The five studies reviewed make a substantial contribution to the body of knowledge and practice in applying SEA to multimodal transport corridors.

Each study shows that there are different ways through which we can assess the environmental implications of a range of alternatives for transportation. Their differences and the range of approaches provide us with a unique insight into some of the fundamental challenges, as well as benefits, of SEA processes.

> *The fact is that the carrying out of an SEA does involve additional time and energy. The pilot study has shown that an SEA can be completed in the drawing up of the master plan without necessarily causing any excessive delay or additional work.*
> *Austria - BMWV and BMJuF, 2000b.*

The methods proposed, and their application to demonstration studies, show that SEA of multimodal corridors is not only methodologically feasible, but also that it can be designed to fit within the national planning process and appraisal culture. This experience supports the arguments for a flexible approach to SEA, which aims to shape and blend the assessment process in harmony with the existing planning and assessment systems.

Difficulties such as data availability and transport demand forecasting remain present in many of the studies. However, rather than signalling a need to postpone the application of SEA, these obstacles call for further practice in SEA, since this enables to seek solutions through the constant refinement of methods, collaborations and investment at national and international levels (especially in the context of transboundary corridors).

It was not the aim of this study to judge to what extent the methods proposed meet all requirements of the proposed SEA Directive. Instead, the focus has been on the identification of lessons which can be learned for the future application of this assessment process throughout the Member States.

> "*The Swedish National Road Administration hopes that consideration of the environment can be integrated in all stages of transport system planning and that*

The way forward, both for SEA in general and for SEA of TEN-related initiatives in particular, will require:

15 The strengthening of political support for SEA;
16 The creation of legal and administrative conditions which enable the effective application of SEA to strategic transport initiatives;
17 Further effort, by the EU institutions and the Member States, to address the problems of international data, including –where it exists- the terms for its accessibility;
18 A continuing effort to exchange and compare experiences throughout different countries, disseminating good practice, but also discussing the problems encountered and possible solutions;
19 Emphasis on the need for each country to understand the role of SEA –and therefore its scope and structure- in the context of their planning and assessment cultures; paying particular attention to the need to integrate SEA in the overall 'evaluation effort' which lies behind any policy or planning process.

9.2 FOUR MAIN CONCLUSIONS

Four general conclusions are worth highlighting here:

- *Learning by doing*
  One clear message is certainly common to all the studies: SEA's development benefits greatly from a '*learning by doing*' approach.

- *Effectiveness and flexibility*
  Ultimately, the effectiveness of SEA methods will depend on the identification of the planning stages which are most likely to respond to an assessment and which provide the strongest lever to influence decision-making. Inevitably, this will vary significantly from country to country.

- *The building of greater awareness and institutional linkages*
  The assessment Teams found that the advantages of carrying out an SEA are as much in doing the assessment as in producing the report and obtaining the results of the analysis. An SEA process can trigger new ways of approaching 'the problem'. The parties involved learn to think in terms of environmental integration and sustainability, and they will set up collaborations and new channels of communication between transport divisions/ministries and environmental authorities (ministries and/or environmental protection agencies).

- *On multimodality*
  SEA can make a positive contribution towards strengthening a culture of multimodality as well as optimising the combination of infrastructure and non-infrastructure solutions. Consideration of two or more modes of

transport does not necessarily lead to a choice between modes (an either/or scenario). Quite the contrary. Especially in those cases where more than one type of infrastructure already exists, such assessment is likely to result in recommendations for the improvement of several modes.

> "*The development of SEA and multi-modal assessment techniques has shown that political support from central government can be forthcoming, especially when integration (and everything that goes with this) forms the central plank of its transport policy*" UK - Purnell 1999

In terms of specific lessons learned, each of the main methodology sections concludes with a summary of key points (see *Sections 3.4, 4.3, 5.6, 6.4, 7.7, and 8.2*). Below we discuss some of the principal findings.

9.3 SOME INSTITUTIONAL IMPLICATIONS

In general, the initiators of the five studies expect SEA of transport corridors to increase in the future. For this to happen, transport administrations at national level will have to support and provide the legal and administrative means to carry out transport corridor SEAs. However, as was pointed out by the Swedish authorities, not all transport corridors will need an SEA, and some criteria should be defined to help regions to establish whether:

- there are real strategic issues to be explored; and
- a real opportunity to act on such issues.

Part of the answer to these questions will depend on the way a country has distributed different responsibilities for transport infrastructure planning and for policy-type initiatives (e.g. fiscal measures, land-use) across its various administrative boundaries (e.g. at national/central, regional and local levels). Greater collaboration across administrative boundaries is likely to be necessary, as has been the case for general regional development plans. In the meantime, some experts take the view that carrying out an SEA on a major transport corridor can have benefits even if it does not link to a specific (legal or political) decision-making process, since SEA can start as an information and raising-awareness tool.

> "*…corridor studies make it possible either not to choose the corridor as part of a certain network or that it be chosen for development with the knowledge that, for example, environmental problems or environmental adaptation may require both a longer planning period and costly solutions, or compromises that are based on existing roads. An early awareness of future problems gives better solutions*" Sweden - SNRA 1998

9.4 TWO CHALLENGES: PUBLIC PARTICIPATION AND ALTERNATIVES

Two of the most interesting and challenging methodological issues were certainly public participation and the identification and selection of alternatives.

Information sharing, consultation, and participation are all essential parts of the SEA process and have the greatest positive impact if initiated at the earliest stages. This also helps stakeholders to familiarise with this relatively new method and thus increases their ability to contribute to the debate. The involvement of a broad range of interest in the process will also bring benefits such as buy-in and credibility to the results of the SEA. It will also widen the range of issues and the perspective from which a transport plan is being assessed.

The experience, albeit limited, from the studies does not appear to support the classic concerns in relation to the feasibility of consultation at the 'SEA level'. The assumption that this may be almost impossible given the scale of the issue and/or the size of the population potentially involved, and the fear that this will be too expensive and time consuming, could all be addressed – so long as there is the political will to do so. Through adequate planning and integration of SEA into the overall planning and assessment processes, the resource implications of public consultation could be contained.

The involvement of stakeholders during the process of identification, discussion and evaluation of strategic alternatives that SEA was seen to have major potential. The so-called SEA stage of selecting alternatives was judged by the various experts to be SEA's greatest and most constructive contribution to sustainability and environmental protection. Not surprisingly, this stage was found to be the most dynamic and intensive phase of the assessment process. Particularly for those studies which looked at infrastructure and policy-type alternatives, and which involved some degree of consultation.

9.5 THE ISSUE OF "TIERING"

Finally, consideration should be given to the different methods proposed in the five studies and their relation to the concept of 'tiering', whereby SEA is expected to take place at different levels of decision-making. This can lead to more than one assessment, which is repeated from the highest level –transport policy- downwards, depending on the planning system and the evaluation culture of the country in question. No matter how many subsequent assessments are carried out, the principal aim should always be to provide each time the necessary and sufficient information to decision-makers.

Thus, for example, the relatively simple and highly focused approach taken by the Swedish team could be considered particularly appropriate for the highest stages in policy and planning. This could be followed by the United Kingdom and Austrian methods, which offer a mixture of political focus and some level of quantified and spatially referenced analysis. Alternatively, or subsequently, there could be an assessment inspired by the French and Italian

methodologies, which seek to provide detailed support to decisions about the environmental and sustainability implications of what could be developed, where.

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