COST350 WG 6
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COST350
Integrated Assessment of Environmental Impact of Traffic and Transport Infrastructure - A Strategic Approach

Part B
SEA and Transport Planning

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COST350 IN RELATION TO STRATEGIC ENVIRONMENTAL ASSESSMENT

1. Introduction

COST350 is involved with the Integrated Assessment of Environmental Impacts of Traffic and Transport Infrastructure. The COST350 Action officially started in October 2001 with the first Management Committee Meeting and was finished in the beginning of 2006. COST350 has been realized within the European programme COST (Co-operation in the field of Scientific and Technical Research). Actions within the COST programme are involved with a European concerted research based on a memorandum of understanding signed by the governments of Member States wishing to participate in the action.

1.1 Positioning of the COST350 Action in relation to SEA

The main objective of the COST350 Action is to establish an operational concept for the assessment and integration of the relevant environmental impacts of plans and programmes of traffic and land-transport in order to support the decision-making process. The specific aim of COST350 is to provide assistance to planners in the early stages of decision-making regarding (land) transport and mobility.

In June 2001, The European Parliament and the Council of the European Union have adopted Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, which will be referred to as the 'Strategic Environmental Assessment (SEA) Directive'.

The objective of the SEA Directive is 'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans … with a view to promoting sustainable development' (Article 1). The SEA Directive applies to plans and programmes, and modifications to them, of which the formal preparation began after 21 July 2004. It also applies to plans and programmes of which preparation started before that date, if they have not been adopted (or submitted to a legislative procedure leading to adoption) by 21 July 2006.

SEA is to be regarded as an instrument for improving the planning process by taking better account of environmental issues and to make the decision process more transparent by means of consultation and participation. Important principles underlying SEA are:

- SEA pertains to the strategic planning level, which is basically involved with the evaluation and decision-making of policies, plans and programmes.
- SEA should be applied to all plans and programmes that may have significant environmental consequences and should start at the earliest stages of planning.

SEA is not a 'snapshot' of the plan once it has been finalised but a procedure that should be linked to and integrated with the whole plan preparation process in several steps.

Specific objectives to be achieved by the application of SEA include:
To provide a high level of protection to the environment
To contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development.
To carry out an environmental assessment of certain plans and programmes which are likely to have significant effects on the environment.

From the above principles it follows that SEA is generally involved with larger geographical scales and higher abstraction levels. This is particularly important from the point of view of both the needs and possibilities regarding the level of detail of the environmental impact assessment.

Important steps in the environmental assessment procedure as defined in the SEA Directive include:

- Preparing an Environmental Report on the likely significant effects of the draft plan on the environment.
- Carrying out consultation on the draft plan and the accompanying Environmental Report;
- Taking into account the Environmental Report and the results of consultation in decision-making.
- Providing information when the plan is adopted and showing how the results of the SEA have been taken into account.

In this respect, the Directive's definition of "environment" includes not only the natural environment, but also some human effects related to health and material assets. Moreover, it requires an analysis of a plan's secondary, cumulative and synergistic effects.

The COST350 Action is involved with the integrated assessment of environmental impact of traffic and transport infrastructure. In the first year of COST350, its Working Group 1 has developed an overall framework for the execution of the COST350 Action, which is referred to as the COST350 Framework Document. In the process of developing the Framework Document it was generally agreed that the focus of COST350 would be to develop an operational methodology in support of Strategic Environmental Assessment related to the planning of transport infrastructure.

From the characteristics of SEA it follows that SEA is primarily to be regarded as a procedure to be closely connected to, and integrated with, the planning and decision-making process. In applying the SEA procedure, a number of methodological requirements arise. It should be emphasized that the focus of COST350 is merely limited to the aspects of SEA. Consequently, the COST350 Action has been positioned as a vehicle for achieving the methodological requirements as implied by the SEA Directive. The particular objective of the COST350 Action is to develop a *guide* that will support the application of the SEA Directive.

Following from the COST350 Framework Document, other relevant aspects of the positioning of COST350 relative to SEA apply as follows:

- Target groups to be considered are the planners involved in plan and programme drafting. The plan making authorities are regarded the most important target group.
- Impacts and indicators will be considered within an overall decision-making context including environmental, economic and social aspects. Actual developments within COST350 will merely focus on the environmental impacts of traffic and transport infrastructure.
- In the development of impact assessment methods, links are to be established between indicators used and methods applied at various stages of the decision-making process, such as SEA and EIA.
- Explicit attention will be given to the aggregation and interpretation of indicators for decision-making purposes.
- Country case studies are to play an important role in COST350, serving as a vehicle for development, and ensuring the accommodation of actual country needs.
- SEA may apply to a variety of strategic planning levels prior to the project level. Methodological developments in COST350 should take into account a range of planning levels that are potentially subject to SEA.

2. The SEA process

The COST350 Action is to specifically focus on the possibilities to meet the methodological requirements following from the application of the SEA Directive.

Legal basis for the programmes and link to the Directive 2001/42/EU
According to the Article 3 of the Directive 2001/42/EU the execution of an SEA is required when the plan/programme is:

- Subject to preparation and/or adoption by an official authority;
- Required by legislative, regulatory or administrative provisions;
- Having significant environmental effects or set framework for projects subject to EIA.

The SEA Directive describes the SEA process as formally adopted by the Council of the European Union. Based on the SEA Directive, the SEA process has been elaborated in more or less detail in a variety of reports and documents. Examples of such reports which were used in the preparation of the COST350 final report include: the SEA manual prepared for the European Commission, a report on SEA guidance prepared by the UK Department of Transport and a synthesis report for the development of SEA methodologies by EPA Ireland. The following provides a summary description of the SEA process, which is based on the following steps:

1. Screening: plans and programs subject to SEA.
2. Scoping: establishment of the analysis framework.
3. Impact assessment.
4. Reporting and presentation.
5. Review and consultation.
6. Implementation and monitoring.

The above steps equally applicable to the whole plan and programme making process and are not unique to SEA.

Concerned parties and form of public participation/information
For the development of a SEA in minimum two parties should be mainly involved: the transport sector and the environmental sector (the respective authorities may vary from country to country).

Public participation should happen by means of affected parties and/or stakeholders, while the public at large should be informed at the end of each step before setting the decisions for the next phase of a plan or program. Affected stakeholders could be public authorities (e.g. Ministries for Interior, Finances, Agriculture, Forestry, Fishery, Economy etc.), regional authorities and regional bodies, provinces and municipalities, transport organisations, social and business organisations, research centres and academic institutes, consumer associations, environmental bodies and NGO's.

For the local LPT in the UK consultations were held with the key stakeholders, interest groups as well as about 100 individuals from the Northamptonshire Environmental Forum to support the individual plan stages of: Problems, Issues & Opportunities; Objectives; Strategies; Implementation Programme and Performance Indicators & Targets. The LTP also reports how the consultation results influenced and assisted in the formulation of the plan.

For the local Italian PUM the users behaviour and users needs have been investigated. An information office was installed to constantly supply information about these needs.

At the urban Brussels IRIS-plan a big contribution came by 5000 household enquiries, company enquiries, enquiries about modal choice motivation, origin/destination enquiries on road vehicles and railway stations and traffic counts of road traffic and public transport passengers.

Duration period of programmes and plans
As a result of the case studies the period of plans and programmes lasts between 5 and 20 years. In the opinion of this Action, a preferable period should be the evaluation of all plans and programmes every 5-10 years with an overlapping of the prognosis (e.g. for plan 2000 a prognosis for 2020 and for the evaluation of the plan in 2010 a prognosis for 2030).

2.1 Screening

The SEA Directive sets out the extent of its application to plans and programmes. The screening step should be executed by the relevant planning authorities in consultation with the environmental authorities and is involved with the basic question: is the plan or programme to be considered actually subject to SEA?

According to Article 3 of the Directive 2001/42/EC the execution of a strategic environmental assessment is required when the following three conditions are met:
- the plan/programme is subject to preparation and/or adoption by an official authority;
- the plan/programme is required by legislative, regulatory or administrative provisions;
- the plan/programme has significant environmental effects or sets the framework for projects subject to Environmental Impact Assessment (EIA).

The first part of the screening relates to the first two conditions and is involved with the assessment of the administrative status and position of the plan/programme within the specific country policy and decision-making framework. Based on the detailed formulation of requirements in Directive 2001/42/EC checklists have been developed in several reports to support this assessment. If the plan/programme meets the first two conditions, an assessment of the potential environmental impacts should take place in the second part of the screening step. In this second part, which is somewhat more subjective and speculative, use could be made of environmental significance criteria related to the nature and extent of the impacts, in terms of e.g.:
- the probability, duration, frequency and reversibility of the effects;
- the cumulative and transboundary nature of the effects;
- the risks to human health and the environment;
- the spatial extent of the effects and value and vulnerability of the area affected.

Furthermore, in the judgement of the environmental significance, a number of relevant questions regarding the nature of the plan/programme would be considered which may include, for example:
- Whether the plan/programme would trigger significant changes in the actions, behaviour or decisions of relevant parties (e.g. related to infrastructure development; land use; use of energy and natural resources; and amounts and types of emissions or wastes produced).
- Whether the plan/programme is linked to other plans/programmes in the same sector or in other sectors (vertical and horizontal linkages).
- Whether the local environment presents constraints on the development of the area covered by the plan/programme.

2.2 Scoping

The aim of scoping is to ensure the proper focus in the preparation and execution of the environmental assessment by stating the objectives, identifying the key issues, specifying the

planning alternatives, etc. The scoping is carried out by the relevant planning authorities in consultation with the environmental authorities and will lead to the establishment of the analysis framework. The analysis framework essentially includes all relevant specifications and decisions regarding the contents, boundaries, approach and priorities of the analysis. Best practice scoping typically includes the aspects:

- Objectives, indicators and targets.
- Establishing the baseline situation.
- Problem analysis.
- Study boundaries related to time and space.
- Identification of alternatives.
- Methods for impact assessment.

Objectives, indicators and targets

Specific objectives to be considered are to be founded in the environmental protection objectives established at the international and national level that are relevant to the planning situation. Objectives are used to define the desirable (environmental) state or development of the system under consideration. Indicators, providing the measuring rods to assess the progress towards achieving the environmental objectives, represent objectives. For this purpose, indicators should be expressed in measurable quantities that can be estimated or forecasted. Following from specified objectives, targets define the actually desired levels or quantities to be achieved within a given time-scale, expressed in terms of the indicators.

One or more indicators represent each objective. In general, there is a structure of objectives and sub-objectives that is reflected in a hierarchical indicator structure. The whole set of indicators according to the indicator structure provide an overall description of the condition of the system to be evaluated, to be considered in the decision-making process.

Establishing the baseline situation

Information on the present situation and the condition of the environmental system is to be collected to establish a baseline situation. In addition, a baseline situation is to be defined for the future context assuming a 'no change' alternative, as explicitly required by the SEA Directive. The present and future baselines provide the reference situation for the forecasting and monitoring of environmental effects and for the identification of problems.

Problem analysis

A problem is defined as a discrepancy between specified objectives and the actual or forecasted situation, as reflected in the indicators and targets. Problems can be expressed in a relative way in terms of unfavourable developments from the baseline situation or in an absolute way by comparing forecasted situations with targets.

Study boundaries related to time and space

The baseline situation, the problem analysis and the impact assessment of alternatives require a specification in time. This specification is involved with the establishment of a base year and a definition of the time horizon, including the specific target years to be considered in the assessment. Short and medium time horizons would typically be in the range of 5 to 20 years. In addition, for certain issues such as climate change longer time horizons may be considered. Spatial boundaries are to be specified in close connection to the planning level and the related geographical scale of the planning alternatives considered. In the delineation of the study boundary, account should be taken of the entire ‘impact’ area where significant direct or indirect consequences of the planning alternatives might be felt.

Identification of alternatives

The SEA Directive requires the explicit consideration of a (broad) range of feasible alternatives that are likely to meet the plan objectives. Based on a quick scan analysis, alternatives, which

may not achieve the desired objectives, should be discarded during the scoping process. Alternatives are generally defined as different combinations of measures. A measure is to be interpreted as a single action to achieve one or more objectives, including specific projects, management schemes, legislative and administrative procedures. Alternatives to be identified should be consistent with existing government policies and take into account other adopted plans and programmes within the same area. Where a planning alternative is likely to have significant adverse environmental effects, additional measures should be considered to prevent, reduce or offset these effects. In addition, account should be taken of possibilities for proactive avoidance of adverse effects and enhancement of beneficial effects.

Methods for impact assessment
Impact assessment methods are to be formulated to determine the effects of planning alternatives in terms of the relevant environmental indicators. The indicators to be considered follow from the specification of the indicator structure, providing the basis for the impact assessment. If possible, but not necessarily, these impacts are to be expressed in quantitative terms. Such quantitative assessments could for example be based on measurements, empirical relationships or results of mathematical modelling. Alternatively, qualitative predictions are to be made which should be based on expert judgment and interpretations and to be supported by evidence, such as references to existing research, discussions or consultation.

For the interpretation and evaluation of impacts, methods are to be considered to generate more aggregate reports (e.g. by type of impact or across spatial units). In addition, the application of Multi-Criteria Analysis techniques may provide a further, useful addition to the evaluation procedure. Such techniques or procedures may be used to provide a ranking of alternatives which have multiple dimensions, expressed in different indicators and measured on scales that are incommensurable.

2.3 Impact assessment

According to the SEA Directive the information to be provided in the Environmental Report should include: 'the likely significant effects on the environment, including aspects such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between these aspects. The above effects are to be reflected in the indicator structure underlying the impact assessment.

The impact assessment should identify the above effects in terms of changes to the baseline situation (the 'without the plan' scenario) for the various planning alternatives. The planning alternatives can then be compared with each other and with the baseline situation for the relevant target years. The impacts are to be assessed in terms of their magnitude, the time period over which they will occur, whether they are permanent or temporary, positive or negative, probable or improbable, frequent or rare, and whether there are cumulative and/or synergistic effects. Furthermore it may be important to assess the distribution of effects: who wins and loses under the various planning alternatives. For this purpose, the environmental effects may be presented in terms of effects upon different social groups or layers within society.

As a result of the impact assessment, a systematic overview is to be presented of the relevant impacts of planning alternatives as defined by the indicator structure, each measured in their own scale. The results should then be further processed to generate more aggregate reports and to provide more specific interpretations. In this respect it is particularly important to provide further indications on the significance of the predicted impacts in relation to e.g. the violation of environmental standards; failures to achieve environmental policies or targets; or impacts on environmental resources of particular value or importance.

2.4 Reporting and presentation

The results of the SEA are to be described and summarized in the Environmental Report that is to be regarded as the key result of the assessment. The Environmental Report should be provided to representatives of all relevant authorities and the public (and also to consulted member states in case of transboundary situations). The main contents of the Environmental Report include:

- Plan objectives, environmental protection objectives and geographical scope.
- Problem analysis (based on current state and 'no change' alternative baseline development).
- Environmental impact analysis of planning alternatives based on the specified indicator structure.
- Evaluation of planning alternatives (including mitigation measures).
- Monitoring programme.

In particular, the Environmental Report should focus on providing the relevant information on the environmental consequences of planning alternatives to be used in the decision-making process. It should be noted that the SEA appraisal does not make the decision about what alternative(s) to proceed with. It merely informs that decision. For this purpose it is essential that alternatives, which are considerably more environment-friendly, should not be eliminated in the early planning stages purely on cost grounds. Reasons for considering or eliminating alternatives should be well documented. Authorities should also document reasons for not considering seemingly attractive or practicable alternatives.

2.5 Review and consultation

The SEA process is aimed at adequately supporting the decision-making process. Review, consultation and participation are inherent to this process. The specific aims of consultation and participation in SEA are to:

- Enhance transparency in decision-making.
- Increase the mutual understanding of parties and stakeholders involved on relevant key issues.
- Obtain information about the relevant environmental effects at an early stage of the SEA process.
- Reduce or avoid unnecessary controversy and delays due to a lack of information and understanding.

Important moments of interaction during the SEA process include:

- On assessment of SEA requirement - relevant authorities.
- On scope and detail of assessment - relevant authorities.
- On Environmental Report and draft transport plan/programme - relevant authorities and public concerned (also in other Member States in case of transboundary situations).

In order to ensure the proper scope and quality of the assessment, the Environmental Report may be subject to an internal review process. Moreover, in order to ensure that he report will be understood by a broad audience, there should be an independent review.

The Environmental Report is made available to the public and the relevant authorities along with the draft transport plan. These authorities and the public must be given an early and effective opportunity within appropriate time frames to express their opinion on the draft plan and the accompanying Environmental Report before adoption of the plan. Following receipt of comments from the public and the parties consulted, the Directive requires such comments to

be ‘taken into account’ during the preparation of the evolving plan. Moreover, the outcomes of the consultation should be made publicly known.

To satisfy the Directive, authorities should state how they have taken the findings of the SEA into account in the decision-making process. This statement should be made available to stakeholders and will cover:

- Any changes to or deletions from the transport plan in response to the information in the Environmental Report.
- Ways in which responses to consultation have been taken into account or reasons why no changes were made.
- Reasons for choosing the plan as adopted, and why other reasonable alternatives were rejected.
- Monitoring measures, to be confirmed or modified in the light of consultation responses.

2.6 Implementation and monitoring

According to the SEA Directive, Member States shall monitor the significant environmental effects of the implementation of plans. For this purpose, an environmental action and monitoring plan should be proposed in the Environmental Report, which should provide:
a framework to monitor plan implementation in terms of plan objectives and environmental impacts;

- Environmental planning guidance for further decisions following from the plan, requiring an SEA or an EIA;
- Guidance on corrective actions to reduce unanticipated adverse impacts.

Monitoring allows significant environmental effects of the plan's implementation to be identified and dealt with early on. Moreover, it allows the actual effects of the plan to be tested against those predicted in the SEA, providing baseline information for future plans. In this respect, monitoring requirements specifically apply during the plan's implementation. But monitoring requirements should also be considered during the choice of objectives and indicators and during the preparation of the plan.

The monitoring programme should commence as soon as the plan is adopted. Since most plans would be implemented over several years it may be necessary to revise the monitoring programme periodically so that it takes account of new methods and increased understanding of the baseline environment. A regular reporting of monitoring results is necessary so that the actual impacts of the plan can be evaluated. For this purpose monitoring results should be made available to the public and to the relevant agencies and authorities.

3. Key aspects considered in COST350

The COST350 Action is to provide guidelines in support of the actual execution of a strategic environmental assessment. Based on the above description of the SEA process, a number of key aspects have been defined for further consideration in COST350. The following provides an overview of these aspects, in relation to the steps in the SEA process:

- Which plans/programs are subject to SEA? (step 1: screening)
- Indicators and indicator structure to be considered (step 2: scoping)
- Specification of planning alternatives (step 2: scoping)
- Availability of appropriate assessment methods (step 2: scoping).
- Applicability of assessment methods in relation to available information (step 3: impact assessment).
- Issues related to the aggregation and interpretation of impacts (step 3: impact assessment).
- Presentation and comparison of alternatives in relation to plan evaluation and decision-making (step 4: reporting and presentation).
- Guidelines for review, consultation, implementation and monitoring (steps 5 and 6: review/consultation and implementation/monitoring).

Further sections elaborate on the above aspects and the specific issues to be addressed in COST350.

3.1 Plans/programmes subject to SEA

The SEA Directive specifies the criteria to be met for a plan/programme to be subject to SEA. Based on the discussions in the early stages of COST350 it turned out that there may be quite different interpretations across countries about the nature of the planning situations that would be subject to SEA. An important reason is found in the differences that exist in the planning procedures and status of plans in the various countries. Other reasons relate to the interpretation of the significance of environmental effects. An important consideration is that experiences with the actual execution of SEA in transport planning are quite limited at this stage. The nature of the plans/programmes to be considered in SEA largely determines the methodological approaches and requirements in the impact assessment. For this reason, attention was given to this question in COST350. Basically this question was addressed by considering a variety of country case studies that would potentially be subject to SEA.

As a precondition for the development of the environmental objectives, indicators and targets it seemed necessary to provide an overview of planning situations that are considered most relevant from the point of view of SEA application. The aim was to elaborate for these planning situations the main problems and planning issues, to consider the impacts and used indicators, to outline the specification of assessment and evaluation methods and to identify the required data and instruments (tools).

Moreover, planning situations should have been considered at different geographical levels which seemed relevant from the perspective of SEA, i.e. the national, regional, local and corridor level.

In total 15 cases in 9 different countries have been identified and described, ranging from the national to local planning levels. Initial case descriptions were structured according to a questionnaire involving a range of different questions. Later on the questionnaire was restructured and amended in order to provide more elaborate descriptions and assessments of specific parts of the relevant case studies for the purpose of providing a more solid basis for the methodological development later following chapters of the report.

Box 1: COST350 Initial Case Studies

The following case studies have been selected:

National level:	Italy – National Transport Plan (PGT)
	The Netherlands – the National Traffic and Transport Plan (NVVP)
	Germany – the Federal Transport Infrastructure Plan (FTIP)
	Portugal (National Road Plan – NRP 2000)
Regional level:	United Kingdom – South Western Region Multi Modal Study (SWARMMS)
	Austria – the Northeast Region of Vienna (SUPerNOW)
	Italy – the Piemonte Region (PRT)
	Portugal – Alto Minho Region
	Spain – Planning Studies
Local level:	United Kingdom – the Local Transport Plan Northamptonshire (LTP).
	Italy – the Urban Mobility Plan Padova (PUM).
	Belgium – the Brussels Capital Mobility Plan (IRIS).
Corridor level:	Hungary – the Danube Corridor
	The Netherlands – the Breda-Utrecht Corridor (BRUT)
	Spain – Informative studies

Based on the case study descriptions of the participating countries a further processing and evaluation of case study results took place from two different perspectives:

1. An evaluation and comparison of case studies from the viewpoint of compliance with the SEA directive based on a structure of SEA compliance criteria.
2. A summary description of case study results, providing an overview of main findings and comparison of case studies.

Box 2.: COST350 Case Study Observations

For the following results one should note that the case studies have been selected at the beginning of the COST350 action in a time, when the EU-Directive was not implemented at the national laws of most of the countries. A comparison on actual SEA studies might lead to different approach.

The following provides an overview of observations within the following categories:

- (Other) general observations.
- Observations cases national level.
- Observations cases regional level.
- Observations cases local level.
- Observations cases corridor level.

General observations

- Although the SEA Directive was not yet effective at the time of the planning project, in some cases the anticipated SEA requirement was an important trigger to the analysis (for example Bel-Flem, Aus-Vien and Danube).
- In all cases there are significant environmental effects (regardless of the fact whether they are actually assessed).
- All cases are involved with a pro-active identification of options.
- In many cases, consultation on SEA requirement has not taken place.
- Provisions for quality assurance and monitoring in the planning process are often lacking or limited. This is also reflected in the fact that the end product in most cases does not include a monitoring programme.

Observations cases national level

- Conditions for SEA requirements and execution are generally met

· Process-related requirements on consultation commitment and provision of information are mostly met (only some limitations with NVVP).
· The orientation on the assessment of environmental impacts is limited. Other compliance criteria regarding scope are all met.
· The future context is generally taken into account, but in all cases there are imitations with respect to the range of alternatives considered and the explicit consideration of environmental objectives and indicators.
· The end product generally suffers from limitations with respect to the environmental problem and impact analysis and the evaluation and selection of alternatives.

Observations cases regional level
· Some of the regional cases considered are not adopted by an official authority and most are not required by legislation.
· The orientation towards actual decision-making is limited.
· Process-related requirements on consultation commitment are only partly met; the requirements on provision of information to relevant parties are generally met.
· Conditions related to scope and approach of the analysis is met in most cases.
· An environmental impact analysis is generally included in the end product; an evaluation of alternatives was not carried out in all cases.

Observations cases local level
· Conditions for SEA requirements are generally met.
· There is only a limited orientation towards the assessment of environmental impacts and the consideration of environmental impacts in decision-making (assessments are often limited to impacts related to mobility, transport efficiency and costs).
· There is less attention to the future context.

Observations cases corridor level
· Conditions for SEA requirements and SEA execution are generally met.
· There is at least some emphasis on the assessment of environmental impacts and its role in the decision-making process.

Box 3.: COST350 Case Study Evaluations

Evaluation of scope and contents of case studies
Based on the summary description and comparison of case studies the following provides an overview of main conclusions within each of the topics: planning process, methodology, results, analysis, and new methodological developments.

Planning process
Common aspects across countries include the existence of a number of geographical levels (including the national, regional and local level) and a planning process involving a number of levels ranging from more strategic to more operational planning levels. By definition, SEA is focusing on the strategic level, which may be considered at different geographical levels. With respect to the definition and interpretation of the relevant hierarchical levels to be considered in COST350. The notions are addressed in the section “Lessons learned” below and the recommendations regarding the relevant hierarchical planning levels are elaborated in Annex B.

In all countries there is generally a complex multi-actor setting involving a range of public authorities on the various hierarchical planning levels and public and private stakeholders. In each country the Ministries of Transport and Environment are (the most) important players.

The need and philosophy of the SEA directive are taken into account in each country but

there is generally no formal and operational incorporation of SEA in the legislative procedures of the planning process. Limitations become manifest in:

· The fact that planning at higher hierarchical levels is often based on a wish list of intentions rather than on the actual evaluation of alternative plans/programs based on relevant effects (such as environmental effects).
· The operational specification of environmental objectives and targets.
· The absence of explicit links between land use and transportation planning.
· The possibilities for involvement of relevant stakeholders.

Methodology

Although there may be differences in terminology, there is quite a bit of general consensus and similarity with respect to:

· The relevant steps in the analysis and evaluation of transport systems and networks, with general steps including: the generation of transport demand; the generation of transport flows between origin and destination zones; the allocation of transport flows to transport modes and networks; the generation of traffic flows on transport networks; and the assessment of impacts of transportation networks and traffic flows.
· The relevant objectives and criteria, with the most common aspects pertaining to: mobility and accessibility, transport safety, quality of living environment and environmental and spatial quality.
· The types of relevant strategies and measures considered, such as: spatial planning and mobility management; use and capacity of infrastructure networks; technical improvements to transport modes; and measures to reduce environmental effects.

Common deficiencies in available methodology and modelling tools relate to:

· Limitations in the specification of environmental objectives and indicators.
· The quantitative (or qualitative) assessment of impacts on strategic planning levels.
· The complexity of quantitative assessments (level of detail of indicators used, data needs, analysis efforts).
· The integration of modelling approaches and tools.
· The combination (aggregation) of impacts.
· The evaluation of different types of impacts: economic, environmental, social, and both quantitative and qualitative (multi criteria analysis methods and tools).

Results

Relevant and desired results of the plans/programs on strategic level generally include:

· Decisions on preferred policies/strategies regarding the future development of transport systems, including transport management and networks.
· Guidelines/directives for developing plans/projects on lower hierarchical levels and in tactical/operational planning phases.
· The monitoring of the actual performance (impacts) of transport systems and networks.

Actual results achieved are in most cases quite limited. Observed limitations are:

· The impact assessment is usually quite selective and often merely descriptive.
· In many cases no clear decisions are taken.
· If decisions are taken, the justification of such decisions is usually not very transparent. For example, a list of preferred projects may be produced of which the contribution to specified objectives is not known.
· The actual influence of environmental aspects in strategic decision-making in most cases seems to be rather small.

Analysis

There is a general lack of an integrated analysis approach and appropriate modelling tools

that are capable of dealing with the strategic analysis level. Another problem is the availability of appropriate data, which is representative for, and can be handled at, the strategic level.

To the extent that environmental impacts are considered there is often no clear distinction between SEA and EIA. There seems to be a tendency to apply EIA indicators on a SEA level, which is in conflict with the level of detail and complexity that can be handled on the strategic level. Consequently, the impacts actually considered are often merely qualitative and usually quite limited.

New methodological developments

New methodological developments should focus on integrated network approaches and meet the following requirements:

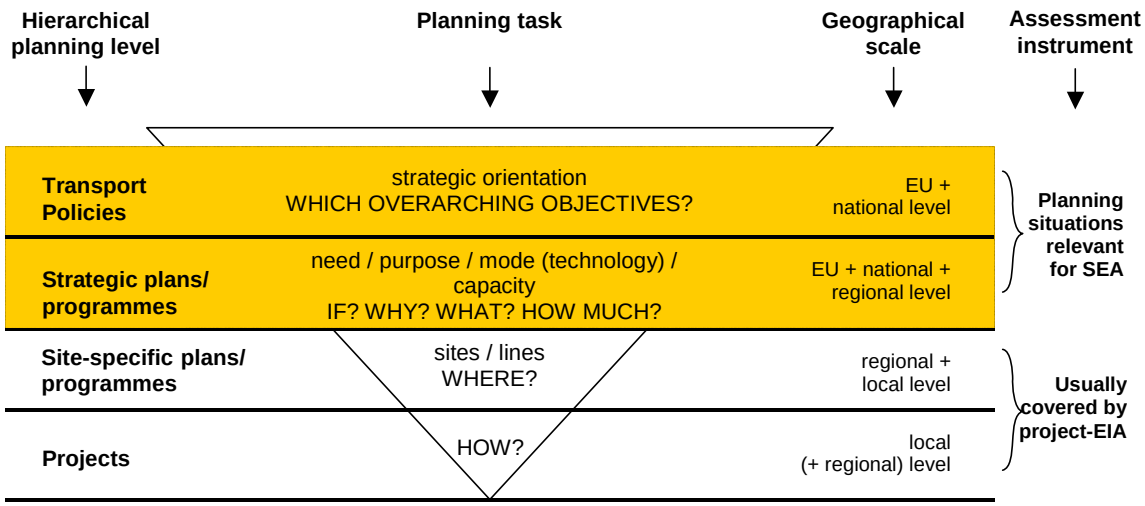
- Use of generally available data appropriate for strategic planning levels;
- Use of relatively simple modelling and assessment principles (both quantitative and qualitative);
- Fast, user-friendly and transparent analysis procedures;
- Include options for integration and evaluation of relevant effects.

From the results of the case studies there are no indications that integrated network approaches, which meet the above requirements, are readily available. However, in some countries there are certain ongoing developments along these lines that could contribute to the methodological developments anticipated in COST350.

Lessons learned

The main work was based on case studies representing various geographical levels. Another access to distinguish planning situations could be based on planning tasks corresponding to hierarchical planning levels. Deriving from contributions of Austria and the Netherlands developed a figure illustrating the four hierarchical planning levels with their corresponding plans tasks and the geographical scales at which they are mainly prepared.

The following figure illustrates the four hierarchical planning levels with their corresponding plans tasks and the geographical scales at which they are mainly prepared. The relevant assessment instruments SEA and EIA are related to them. However, especially the geographical scales may vary. For example, a city at local level could as well prepare a transport policy or strategic plans/programmes.



The SEA assessment methods should follow some minimum standards. They should be transparent, focus on the most relevant impacts, provide a clear picture of impacts without getting lost in irrelevant details, explain all assumptions, declare lack of know-how and data, be adapted to the availability of data; not be too time-consuming and be robust (different experts should come to similar results).

Assessment methods for SEA clearly differ from methods used for project-EIAs. They are in principle more qualitative, less detailed, and follow a broader approach. One should be careful with assessing environmental impacts in monetary terms, as objective, unbiased and accepted transformation rules to "money-values" are lacking for the time being.

EU or national standards e.g. derived from national environmental plans or EU legislation (e.g. concerning noise, air emissions, quality of air and water, etc.) should be taken as benchmarks for SEA. Objective-led SEA therefore should link environmental objectives or targets to assessment criteria or indicators. Criteria and indicators should provide a clear answer if and to which extent the options at stake fulfil or miss the given objectives or targets.

3.2 Impacts significance

The SEA Directive considers significance at two points in an environmental assessment process:

· At the screening stage: only plans and programmes that are likely to have significant effects require an environmental assessment; and

· When assessing impacts: only impacts that are deemed significant by the assessment need to be identified, described and evaluated.

Impact significance is determined through impact scoring which is the process of assigning a quantitative or qualitative value to environmental impacts arising from the transport measures. Given scores reflect significance. In good practice, pre-defined structured frameworks or significance criteria are used to reach transparent, acceptable and auditable results. The practice of defining significance criteria within project level EISs is often not to the highest standards and the application of significance criteria to SEA is at a very early stage of development. There is a lack of guidance available to practitioners.

Though, significance criteria are set for use in impact assessment stage, in order to help determine the significance of the effects of the alternative options, they can also be used to help in the initial determination of the likely significant environmental effects.

Impact Scoring

At the impact assessment stage the predicted impacts are translated into statements of significance. Prediction of the magnitude of likely future impacts taking into account the sensitivity and importance of the receiving environment leads to a statement about the significance of the impact. An impact of the same magnitude is expected to give rise to different levels of impact significance depending upon the likely evolution of the environment without the implementation of the plans and programmes. The magnitude of environmental effects must be seen not only in the context of the environmental conditions (existing pressures, sensitive areas) but also with the specific characteristics of plans and programmes. Thus, significance has to be determined on a case-by-case basis.

Impact significance is assessed through impact scoring which is the process of assigning a quantitative or qualitative value to environmental impacts arising from the transport measures. Assigned scores reflect significance. In good practice pre-defined structured frameworks or significance criteria are used to reach transparent, acceptable and auditable results. Such

frameworks or significance criteria can be prepared for most, if not all, environmental topics. Essentially, the criteria can be established using regulatory norms, “distance-to-target” and other quantitative or qualitative description of the environmental impact.

While the practice of establishing and defining significance criteria within project level EISs is often not to the highest standards, the application of significance criteria to SEA is at a very early stage of development. While assigning positive or negative impact scores may appear to be a simple procedure, it can raise questions of consistency and transparency of the scoring. The issue of who sets the criteria and whether there should be a standardised set of significance criteria applied nationally across all tiers in the transport planning process to provide decision-makers with an equal basis on which to compare plans, remains to be considered let alone answered. Whereas a general framework of significance criteria should be considered necessary, this report advocates that impact scoring should always be undertaken on a case-by-case basis for individual plans and programmes.

Annex II of the SEA Directive specifies criteria for determining the likely significance of an effect.

Impact Aggregation

In undertaking an environmental assessment of transport plans it is clear that the assessment must adapt to the planning context. Hence some transport plans, particularly those at a national scale are likely to have a policy focus, whereas those further down the planning hierarchy could well have a high project content. As a result, the assessments are likely to give rise a variety of impact types. Those with a high policy focus are likely to be dealing with broad trends in the relationship between transport and the environment, while those with a high project focus could exhibit an emphasis upon the impacts derived from the specific transport projects. In both cases, the aggregation of significant impacts is a key task in communicating the impacts of the plan to decision makers and the public.

Where the assessment focuses primarily upon transport policies, the impacts identified may well be explored through a series of causal links each with an implicit assumption of the magnitude and significance of the impact. Such high level impacts involve a representation of multiple diverse and cumulative effects throughout the plan area relying on aggregation undertaken by those undertaking the assessment. This form of aggregation is generally undertaken without any external verification or transparency.

Where the assessment focuses primarily upon transport projects, the impacts addressed are likely to be similar to those in project EIA. Hence the impact on, say biodiversity, would be the sum of the individual impacts that may be created by the individual transport projects within the plan. It is suggested that guidance is required on how individual impacts from potential projects should be aggregated. Such aggregation should recognise that trade-offs may be appropriate and that cumulative effects may be required. For example, loss of a wet grassland in one area may be offset by the creation of similar habitat elsewhere. Alternatively two projects may result in the loss of two areas of wet grassland such that there is little or no remaining wet grassland remaining in the plan area. In such situations, the loss is greater than just the loss of two areas.

These issues lie at the heart of aggregation, while other issues focus upon how individual indicators are perhaps brought together into a single index. For example, an air quality index comprising oxides of nitrogen, particulate matter, hydrocarbons etc. Alternatively, some seek a single basis for reporting the consequences of transport plans and projects based on energy or some form of monetisation. In either form of aggregation, issues of the weights given to the individual indicators comprising the index need to be considered.

3.3 Indicators and indicator structure

In the opinion of COST350 pros and cons should be detected first, then measured through qualitative or quantitative indicators, then prioritised through weights of importance, and finally an attempt should be undertaken to combine environmental, social and environmental and perhaps also territorial, functional, etc.

Compared to the national, regional or corridor level the local transport plans are affecting every single step of the daily life of individuals in a more direct and intensive way than plans and programmes on other geographical levels (e.g. housing, school, business, access to authorities, shopping, leisure). The social well being, the accessibility, welfare and the quality of life are factors of main interest.

The specification of the indicators and indicator structure to be considered represents one of the core questions underlying the nature and methodological requirements of the impact assessment and was therefore given ample attention within COST350. Specific issues to be addressed in the development of the indicator structure relate to:

- The nature of the indicators to be considered.
- Requirements related to the use of the indicators.
- The relation between SEA and EIA.

SEA is aimed at an evaluation of planning alternatives from the viewpoint of sustainable development. Sustainable development is involved with the explicit consideration of environmental, economic and social aspects in a single framework. Obviously, the focus of SEA is on the environmental impacts of traffic and transport infrastructure, distinguishing between the natural environment (such as air, water and soil pollution and impacts on fauna and flora) and the impacts on the human environment (such as health effects, noise nuisance and safety). The issue is which indicators are to be selected and how these should be defined in order to reflect the most appropriate impacts.

Since the SEA aims to support the decision-making process, the impact and indicator structure to be developed should firstly meet the requirements of the relevant decision makers. Consequently, the development of the desired impact and indicator system have to be based on a policy oriented approach. Other, potentially conflicting requirements relate to the need to provide scientifically sound information.

Another important question to be addressed is the relationship between the SEA methodology to be developed and the existing EIA practices. Preferably a link should be maintained between the indicators considered within SEA and EIA, in order to maintain the consistency of the assessment. On the other hand, the use of different indicators would be needed since EIA-indicators would not be feasible at the higher abstraction levels which would be typical for SEA.

The indicators have been envisaged, in the COST350 action, as the main tool to carry out a Strategic Environmental Assessment (SEA) of transport plans, policies and programmes (plans and programmes). The different typology of pollution and impacts, and the complexity of environmental impact mechanisms are so high that the decision-makers need a support in doing their choice that is based on few, simple, but strict and scientific elements. Thus, we propose three sets of indicators for SEA of transport plans and programmes, obtained passing through two main steps:
The definition of a methodological assessment framework;
The definition of selection criteria and valuation method.

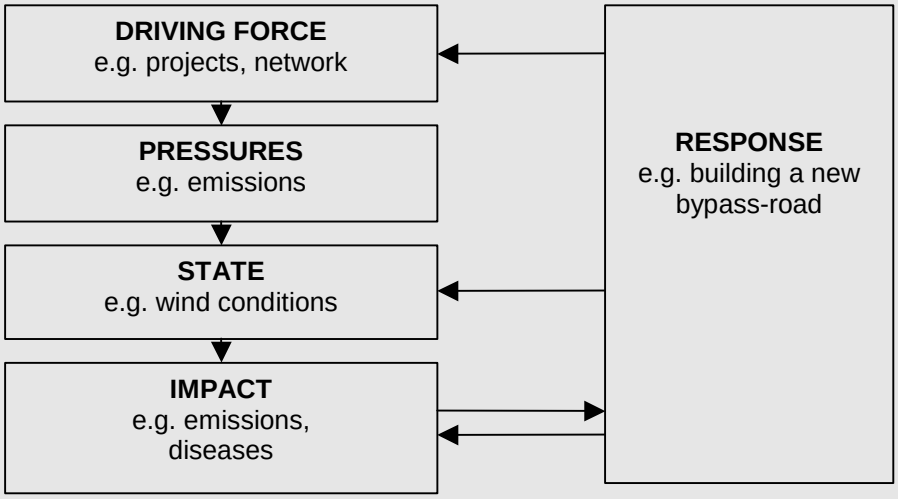
1. Definition of a methodological assessment framework

The work of the European Environmental Agency (EEA) is built around a conceptual framework known as the DPSIR assessment framework:

- D - Driving Force
- P - Pressure
- S - State
- I - Impact
- R - Response.

The scheme offers a basis for analysing the inter-related factors that impact on the environment and is useful for any environmental assessment within EIA or SEA. The DPSIR approach was chosen in the proposed methodology.

Box 4 DPSIR in the Transport Sector



The above figure clarifies the application of this approach in transport planning. Driving force means here the entire traffic network of the regarded region and the new network with all projects becoming part of the plan or program. This force causes effects (pressures, for example emissions), which have consequences on the environment (impacts, for example emissions and/or diseases) depending on the environmental situation concerned (state, for example wind conditions). Part of the answers (of the society, of the administration, of the policy) to these changes of the environment (response) is for example the building of a new bypass-road respectively the whole transport plan/program. The regarded effect on the environment can be also positive, for example noise reduction in town due to the new bypass-road.

To follow this scheme, the first step has been to identify the major environmental targets that are affected by traffic and transport infrastructures. Nine main environmental targets have been selected regarding those mentioned into the SEA Directive (2001/42/EC) - biodiversity, population, soil, water, air, climate, material resources, culture, and land.

The second step has been to show the pressures (due to driving forces) of transport plans and programmes on the aforementioned environmental targets. To this aim, the pressures have been classified according traffic and transport infrastructure. In the field of infrastructure pressures there are land uptake, barrier effects, visual disturbances, material consumption and waste production, and energy consumption. Vehicles contribute to noise, pollutants emissions, accidents, material consumption and waste production, and energy consumption.

The third step has been to describe the major impacts involved by the pressures and menacing the environmental targets. For instance, traffic CO_2 emissions (pressure) involve a global warming (impact) which affects climate (state). The selected impacts are twenty: climate change, toxicity, disturbance from noise, fragmentation of habitats, acidification, etc.

Table 1 DPSIR – Pressure State Impact

State (Enviro factors) / **Pressure**		Biodiversity Fauna and Flora	Population, Human health	Soil	Water	Air	Climate	Material resources	Culture heritage	Landscape
Infrastructure effects	Land uptake	**Land uptake**	**Land uptake**	**Land uptake**	**Land uptake**	**Look to the other environmental factors (Biodiversity, Fauna and Flora, Population …) as the actually affected ones**			**Land uptake**	**Land uptake**
	Barrier effects	**Fragmenta-tion of habitats**	**Fragmenta-tion of habitats**							**Fragmenta-tion of habitats**
	Visual disturbance	Visual disturbance	Visual disturbance						Visual disturbance	Visual disturbance
	Material consumption and Waste production			Material consump-tion and Waste production	Material consump-tion and Waste production			Material consump-tion and Waste production		Material consumption and Waste production
	Energy consumption							Energy consump-tion		
	Hydromorp-hological risks	Hydromorp-hological risks	Hydromorp-hological risks	Hydromorp-hological risks	Hydromorp-hological risks				Hydromorp-hological risks	Hydromorp-hological risks
Vehicle effects	Energy consumption							Energy consump-tion		
	Noise (and vibrations)	**Disturbanc e from noise**	**Disturbanc e from noise**							**Disturbance from noise**
	Pollutants emissions	**Toxicity,** Acidification Photochemi cal pollution Eutrophica-tion	Photochemi cal pollution, **Toxicity** Sensitive pollution	Acidification Eutrophica-tion, pollution of soil	Acidification Eutrophica-tion pollution of surface water		**Climate change**		Acidifica-tion	Acidification Sensitive pollution, Eutrophica-tion
	Accidents	Release of dangerous goods due to accidents	**Accidents**	Release of dangerous goods due to accidents	Release of dangerous goods due to accidents				Release of dangerous goods due to accidents	

In the context of COST350, the responses of decision-makers have not been considered.

The definition of a general assessment framework is necessary to structure global information relative to environmental impacts of transport systems. Regarding the results of the analysis the indicators defined for SEA of transport plans and programmes can be based on two axes:

- The driving forces that totally belong to transport parameters and the pressures, which constitute the link between transport and environmental parameters;
- The impacts, which only belongs to environmental parameters.

2. Definition of selection criteria and valuation method

The selection of indicators is a very difficult task due to the many indicators existing in literature. As the choice of indicators must be supported by a scientific and transparent approach, we should provide a set of indicators which is relevant to SEA of transport plans and programmes

The definition of a set of selection criteria and a valuation method thus appears as a crucial point before proposing indicators, because it makes our choices clear, in terms of the type of indicators we are looking for.

Definition of a set of selection criteria

The defined set of criteria has been obtained through a cross-analysis of the work of the WGs 3 and 4, the guidelines released by European Union, and some remarks coming from WG 5. Firstly, the criteria have been classified in two groups: general criteria and specific criteria. The general criteria refer to global objectives of strategic environmental assessment. Criteria have to show ability of indicators to evaluate environmental performance, as the European Commission recommends it. Five general criteria have been proposed:

- Significance;
- Completeness;
- Simplicity and applicability.
- Scientific validity;
- Transferability.

In addition to these general criteria, specific criteria may be added. Specific criteria are strictly linked to the goals of COST350. Criteria have to show that indicators bring specific information regarding:

- European rules-oriented approach
- Transport-oriented approach;
- SEA-oriented approach;
- Decision-making-oriented approach.

This scheme has defined nine criteria, used to select the indicators presented later. These criteria are the same proposed in the WG3 and 4, and here they are described in a detailed way, listing all the questions they have to answer. Not all these questions are mentioned in the chapters describing the transport and the environmental indicators, as, in each of that case, only some questions are relevant while other are redundant or not significant and vice-versa.

Hereafter the nine criteria are described and explained:

1) Significance

The first criterion wants to verify the relevance for the objective of the plan: a strong relationship (direct or indirect) between the indicator and the objective of the plan, in term of environment, has to be envisaged replying to the following questions:

- How good is the indicator to provide a basis for the evaluation of actions and plans?
- How important is the indicator for the environment?
- How well the indicator provides an early warming of potential problems?

- How well the indicator demonstrates a move towards or away from sustainability?
- How well the indicator follows cover the targets?
- How well the indicator gives a prognosis? Ability to evaluate long term effects of the plan.

2) Completeness:

- How well the indicator covers the different parameter of the DPSIR framework?
- How well the hole set of indicators issues the impact pressures of the project?
- What relation exists between the different indicators (non-redundancy)?

3) Simplicity and applicability:

- How well the indicator can be calculated using easy tools?
- How well the indicator can be calculated, during the updating in the years, using easy tools?
- How is the number of indicators relatives to same topic? (The lower it is, the better it will be)
- How well the indicator can be calculated using simple data that are easily achievable in term of money and time and, above all, that are at a raw level (non elaborated)?

4) Scientific validity:

- How well will it describe the impacts effectively?
- How well will it describe the impacts precisely?
- How big is the consensus on the validity of the indicator?
- How well the indicator can be calculated avoiding errors due to the calculation methods. Hence, this means: how much are the methods reliable in avoiding bias?

5) Transferability:

In time:

- How well the indicator can be used in different time periods (past, present, short and long term future)?
- How well the indicator performs to provide a basis for comparison across time?

In space:

- How well the indicator can be used in different geographical areas maintaining its performance?
- How well the indicator can be used in a standardized way at different geographical scales?

6) European rules-oriented:

- How well the indicator follows the European rules and how well does it cover the targets? (Referred to the relevance to the objectives of the plan)

7) Transport-oriented:

- How is the responsibility of the transport sector in the considered impact evaluated by the indicator?
- How well the indicator shows the contribution of the transport sector in the considered impact evaluated by the indicator?

8) SEA-oriented:

- How good is the indicator to provide a basis for actions and plans?
- How well the indicator assesses the environment on the strategic level?

9) Decision-making-oriented:

- How useful is the indicator for the end-users (decision makers)?
- How well the indicator is comprehensible to the public/decision makers?

Definition of a valuation method

A preoccupation always found in a strategic evaluation is to provide results clear, simple and transparent. It is also crucial that all theories, argumentations, methods, etc. respect these

conditions. For this reason we have built a method, which permits to evaluate indicators, according the list of criteria, following the principal constraints mentioned above.

Thus, each criterion is evaluated considering different questions and a mark is given to the different questions. The magnitude of the response for all the questions is defined such as:

- Ø 1 (negative answer),
- Ø 2 (positive answer),
- Ø 3 (very positive answer).

All responses are given for the indicators selected by the WGs 3 and 4. The aggregation of the different marks, where more questions are considered within a criterion, is based on a simple addition of the different results, giving a final score.

We admit that an indicator should satisfy a minimum of 50% of each criterion (that means 50% of the questions relative to each criteria) to be adopted. If one indicator does not satisfy this minimum of 50% for one criterion (or more), the indicator cannot be selected.

3. Definition of three sets of indicators

As already said, there are numerous of indicators available in the literature and many of them are often used in environmental impact assessment of transport. The references used during the selection are the TERM indicators (Transport and environment reporting mechanism) [Aee, 1999], indicators used in LCA (Life Cycle Analysis) [Guinee, 2002], indicators of OECD (Organisation for economic co-operation and development) [Ocde, 1993], and finally indicators used in different countries involved in COST350.

A very large number of indicators are potentially useful for COST350; thus, there is no need to elaborate other indicators. We have only to select the better ones using the selection criteria and the valuation method developed before with exception for some transport indicators considered as proxy of environmental indicators.

In WG 2 report, we notice that the quality and the quantity of available information useful to assess environmental impacts of transport policies, plans and programs are very different according the different case studies. Following this remark, we have decided to establish different abstraction levels of available information taking into account quality and quantity of information, and to propose a set of indicators for each level.

Definition of three abstraction levels in term of availability of information

Three abstraction levels have been created with respect to the transport planning alternatives to assess and the related information available for the assessment.

Impact assessment Low: minimum data availability

In this situation there would not be a clear specification of the types and location of transport planning alternatives. Basically, there would only be a notion of dimensions in terms of length and width of possible new alignments and of the approximate location of the regions (in terms of large planning areas) where the network expansions might take place. In addition, there can be some rough estimates of the extent of transport flows corresponding to the alternatives.

This impact assessment level corresponds also to a situation where it is not possible to assess the environmental impacts of preliminary transport alternatives in a direct and precise way (that is using environmental impact indicators).

Impact assessment Intermediate: in-between situation

There is no clear specification of planning alternatives but approximate locations of impact areas, but some more selective information on traffic flows is available.

Impact assessment High: maximum data availability
In this situation it is assumed that there is a rather clear specification of the types and locations of planning alternatives. The infrastructure dimensions and alignments are reasonably well known and an assessment of traffic flows associated with the various planning alternatives is available. Given the specification of the locations and dimensions of planning alternatives, site-specific information can be obtained on the land use and levels of activities in the impact area of the new alignments of the transport network. This impact assessment level would correspond with a situation whereby transport-planning alternatives have been specified. This impact assessment level corresponds also to a situation where it is possible to assess in a direct and exhaustive way, as it is done in an EIA (Environmental Impact Assessment) few environmental impacts of transport planning alternatives.

A set of indicators for each of the 3 different levels of information
The theoretical differentiation in terms of the availability of information is a very a crucial point because it makes it possible to identify a relevant set of indicators according the different situations, otherwise it appears very difficult to build an indicator list which is relevant for every abstraction level. We propose, as a result, three sets of indicators according the three abstraction levels.

At the Low level of information, the quantity and the quality of information is not enough to make a detailed environmental assessment of transport plans and programmes. In that context we suggest to identify key indicators more “transport oriented” which make possible to give clear direction on the potential influence of the transport alternative on the environment. These indicators can also be used as a proxy to support decisions when the situation does not otherwise allow. WG4 has thus developed some indicators as, for example, “network extension of public transport lines”, “roads length inside ecologically rich areas”, and “percentage of people living along the infrastructure in respect to the population living in the plan area”.

At an Intermediate level, the availability of information is better and is the data are sufficient calculate some key impact indicators as, for example, “land uptake”, “fragmentation of habitats”, “disturbance from noise”, climate change”, etc.

Finally, at a High level, the availability of information is assumed to be quite complete. We may be able to assess environmental impacts of transport alternatives in a quite exhaustive way. We thus add to indicators of the Intermediate, other indicators as: “acidification”, “eutrophication”, “photochemical pollution”, “hydraulic risks”, etc. At this level we are very close to an EIA of transport projects.

All the three sets of indicators are presented in Table 2. The sets of indicators are proposed to give to decision makers the freedom to use them choosing the best appropriate set in each context and in function of their focus. Thus, when the situation corresponds to Low there is no other solution than using indicators of Low. If the situation corresponds to High, decision-makers are free to use indicators of Intermediate and High, if they want to provide a more precise assessment, or simply indicators of Low if they consider that they only need simple and global evaluation.

Table 2: Three sets of indicators for SEA of traffic and transport infrastructures

	Impact	Indicator, depending on availability of information		
		Low	**Intermediate**	**High**
1	Land uptake	Change of surface transport infrastructure	Valuable area lost-sealed area	Natural habitat area lost Domestic and recreation area lost Sealed area
2	Fragmentation of habitats	Risk of impact on valuable areas	**Importance of existing habitats and planned ecological networks, length and numbers of cuttings, Fragmentation-Index**	Endangerment of populations of (representative) target species
3	Visual disturbance	Risk of impact on valuable areas	Same as high, partly approximated	Claim of valuable areas x effect's magnitude
4	Material consumption and Waste production	None	Consumption of non-renewable raw materials and recycling of waste in construction	Consumption of non-renewable raw materials and recycling of waste in construction
5	Concentration of pollutants in soils	None	Risk of pollution of sensitive soils	Concentration of lead, PAH, pesticides, salt in soil
6	Concentration of pollutants in surface water	Risk of pollution of sensitive water	Same as High, partly approximated	Concentration of oil-derivatives, pesticides and salt in water
7	Energy consumption	a) Level of service, b) Transport volume	a) same as Low, b) same as High, partly estimated	a) same as Low, b) Use of fossil fuels /renewable energy
8	Disturbance from noise	Same as Intermediate, partly approximated	Risk of affecting highly populated areas or sensitive habitats	Number of people affected by noise level oversteps or proximity of sensitive habitats
9	Sensitive pollution	None	Emissions for sensitive pollution	Sensitive Pollution
10	Climate change	Transport volume, weighted by CO2-emission-coefficient	Same as Intermediate, partly approximated	CO2-emission
11	Acidification	None	Same as high, partly approximated	Emission of pollutants with acidification potential
12	Photochemical pollution	None	Same as high, partly approximated	Emission of photochemical pollutants

13	Toxicity	Emissions of toxic or ecotoxic gases	Risk of affecting a highly populated area (human health) or valuable or sensitive habitats	Number of people or protected area exposed to toxic or ecotoxic pollutant emission standards oversteps of heavy metals (Cu), persistent organic compounds (POC), Particulates, NOx (NO2), SOx (SO2).
14	Eutrophication	None	Same as High, partly approximated	Emission of pollutants with eutrophication potential
15	Release of dangerous goods due to accidents	None	Probability of accidents causing ecological catastrophes	Probability of accidents causing ecological catastrophes within vulnerable areas
16	Accidents	Accident risk	Same as High, partly approximated	Number of killed, seriously or slightly injured persons due to accidents
17	Hydromorpho-logical risks	None	Area affected, species lost, people affected, cost of water supply, partly approximated	Area affected, species lost, people affected, cost of water supply

3.4 Specification of planning alternatives

The application of SEA in transport infrastructure planning may potentially cover a wide range of levels and scales, depending on the planning situations in the various countries. The environmental impact assessment of transport infrastructure should be built on the specification of information regarding the transport planning alternatives to be evaluated. Such information includes the characteristics and location of physical transport infrastructure, as well as information on the types and intensities of the traffic flows accommodated.

Important methodological questions relate to the way in which the planning alternatives could be specified and the way in which the required information on transport networks and traffic flows could be provided on various (larger) physical scales. Moreover, the question is to which extent these specifications could be actually made in the earlier planning stages, in which the planning alternatives have only been developed to a rather limited extent. These questions are dealt with in various chapters of the COST350 guide.

3.5 Assessment methods, tools and models

Within the national and international transport planning community a large variety of impact assessment methods have been developed and applied. Obviously, in the execution of SEA, use should be made of available methods. A number of issues are related with the identification of available methods that would be appropriate for use in SEA. The first problem is to get an overview of readily available methods. Another problem is to judge the appropriateness of available methods in the light of specific SEA requirements. Other issues relate to the consistency of different methods to be potentially applied. COST350 provides an overview of approaches and tools following from an inventory of methods used and experiences encountered based on a number of relevant country case studies.

The actors of the data collection (measurements and surveys), in all the countries investigated, are state-based bodies - the Ministry of Transport, Regions, Provinces, Municipalities, Road Administration, etc. – helped, on the operating side, by private consultants who carry out the surveys and analysis. The data contained in the databases is that collected during the measurements and surveys.

Box 5: Surveyed countries transport data coverage.

The geographical cover of the data depends on the planning option level. In the national plans (Germany, Italy, Portugal) the area of interest of the measurements and surveys is the national territory. The focus is on all national infrastructures (roads, railways, waterways, harbour, airports) for Germany and Italy, while mainly on the roads for Portugal. In the case of the Czech Republic, Hungary and Spain, the measurements were focused on corridors closely aligned to the project level. In Hungary, now SEA is obligatory at road network planning on national and local level.

The measured data collected on the demand side, are: traffic volumes (average daily traffic and hourly traffic – peak hour; passengers per day on the lines); vehicle typology (cars, trucks, etc.); car occupancy rates; speed and travel times. On the supply side the data collected by the measurements are, for the private transport: geometric characteristics of the infrastructures; design speed; for the public transport: kilometres travelled, number of vehicles per day, frequency; commercial speed.

No data on public transport is currently collected in Portugal. In the Czech Republic a yearbook containing the numbers of carried persons, public transport performances (passengers*km) is published. The kinds of data collected by the surveys, on the demand side, for private and public transport includes: origin and destination matrix; travel costs; travel times. The kinds of survey used are census and sample survey based on revealed preference and stated preference (for the prediction) and contingent valuation. This data should help in the definition of a database, containing basic information for the application of the transport models.

The most complete databases are built on the National Travel Survey (NTS) that many countries carry out on a regular basis. Their source of transport data is the national population census built on a regular basis (generally every ten years).

Box 6: Surveyed countries National Traffic Surveys and supply/demand databases.

The most important difference on the demand side, among the surveyed countries, is the presence or not of the NTS. Italy and Spain do not have a NTS, so the data is collected on an irregular basis and does not cover all the territory. Measurements and surveys are carried out for the making or updating the plans (national, regional, corridor) on a sampling basis. Germany provides a traffic census every five years, Hungary has a traffic data bank for the national roads and origin and destination data on different levels (national, regional, local), Portugal provides a data base on national level with a zoning system, Czech Republic gives the traffic volumes on the national roads.

On the supply-side, a national road databank is generally available containing the geometric characteristics of the infrastructures, the road capacity and level of service. Data on accidents are also collected in Hungary (national road accident databank). In Italy there data on accidents, but not formalised in a data bank. The transport models used in the different countries are some of the well-known four step models available on the market, all apply broadly the same approach, need more or less of the same data of input and give the same outputs: EMME2 is the most widely used model while Germany, and Italy for the next national plans update, will use VISUM; in some cases national models are used MT for Italy, in the past, and AUTO for Czech Republic.

The input data are, generally: nodes and links of the network; link characteristics: length, number of lanes, design speed, capacity, level of service, travel time and operational costs, etc.); origin and destination matrix; volume-delay functions; turn penalty functions; observed traffic volumes and socio-economic data. The output data are: forecast annual average daily traffic or hourly traffic (peak hour) on the network by typology (private and public transport); travel times and speeds.

The main limits regarding measurements and surveys are rather physiological as they are dependant on the number of sampling points and the number of the interviewed people and the reliability of the answers. Budgetary and administrative constraints mean only limited ad hoc survey can be carried out without an NTS. In Germany and Czech Republic, generally, the roads inside the towns are not considered. In Hungary, detailed databases regarding transport and environment are available, but as yet, with limited application to SEA.
The reliability of models is of course linked to the input data.

In term of the interaction with the environment, importantly it is the transport data that is the input for the environmental assessment. Measurements and survey are carried out on the environment so that descriptive data on the state of environment is available in the different countries but these measurements and surveys are focused at project level in most cases. Transport measurements are mainly concerned with noise and air pollution and consists of: measuring noise by acoustical monitoring and expressing it through the noise indicator as Leqd, Leqn, Leqden; measuring the main air pollutants (CO, NO_X, VOC, SO_2, CO_2, benzene, PM_{10}, O_3, etc.) concentrations at air quality monitoring stations.

The surveys investigate the exposure of the population to the transport pollution particularly: the noise exposure evaluated through the calculation of the number of inhabitants exposed to certain noise levels; air pollution exposure evaluated through the calculation of the number of inhabitants exposed to high values of concentrations (mainly in the urban areas). Surveys also consider the exposition of fauna and flora to the pollutants with attention focussing on the protected areas and the problem of habitat fragmentation due to the infrastructures. Other data collected through the measurements are those of water and soil quality. The databases are built by the same bodies involved in the measurements and surveys and are managed by the public authorities. The area of interest is the national territory with main focus on polluted and noisy areas at regional or local level. The use of the models to forecast the environmental impacts is a common approach in the different countries albeit generally limited to air pollutant emissions and to provide the noise levels.

The selection of the best tools is critical because their ability to consider the interaction with environmental aspects (e.g. air pollution, noise, aesthetics, etc.), land use aspects (settling down of activities), technological aspects (ITS, vehicle technology, etc.), political choices (pricing policies, taxation, etc.) are essential for the tool's reliability in the forecast and the support to decisions.
Assuming the environmental impacts are expressed by way of indicators, it is necessary to identify:

- the transport variables needed to quantify the impact (kind of data, data bases, etc.);
- the tools most suited to quantify the impacts; focusing the attention on the models used to forecast and simulate travel and on the integration efforts made to join transport models to environmental (emission and dispersion models, noise models, etc.), and on the Geographical Information System (GIS) to manage the data and results.

The difficulty is having a reliable calculation of the environmental impacts, due to the lack of the transport models that give the precise and detailed data necessary for the environmental

models. At this point, given these preliminary remarks, *two routes are possible* to be followed in a SEA approach:

- *an EIA-oriented approach*: using the currently available transport data and the transport models to give the input data to the environmental models. This approach is followed in the surveyed countries where the same data are collected, supply and demand models are used and the same output data are given. This approach requires detailed data, which even if available from the monitoring carried out in almost all the European countries, also has a demand for detailed location data on the transport measure (and certainly of that measure). This is, of course, the most easily understood way to carry out a SEA, and nothing has to be invented provided all the information is available.
- *a more strategy-oriented approach*: the data demands of the above could be overcome thanks to the strategic approach that should arguably characterise the SEA. This implies focusing on the SEA of transport plans and programmes selecting or defining new data and indicators useful to individuate the trends of the effects due to the transport planning.

To reach the objective of a SEA that is really a strategic tool to evaluate the effect of transport plans and programmes on the environment, the definition of a ***set of transport indicators*** is crucial because these indicators could assume the "role" of tools to evaluate the environmental effects of a plan becoming "proxy" variables for the environmental assessment of the transport plans and programmes effects. To define which transport indicators are suitable to evaluate the effects of the transport plans and programmes is fundamental.

Remarks
The current transport planning in the different European interviewed countries shows a certain degree of complexity due to the sophisticated models used and requires a continuous monitoring to collect the necessary data. This situation demands a large quantity of data (not always complete at the different geographical levels) and the building of national/regional/local databases spurred by the need for detailed knowledge of the transport, land use and environment. Similarly demanding, the planning has to be based on well-know current scenarios to identify sustainable scenarios for the future. If this approach can be good at project level, it becomes more and more complex when the planning level is strategic and covers higher geographical levels (national).

Where attempts have been made to evaluate plans with the same approach used to evaluate single projects, the SEA becomes a data hungry EIA. If we agree that the strategic approach cannot enter into such great detail, we do not need of all the data currently available, but we have to choose the most strategic transport and environmental data to understand the effects of plans and programmes. The review of the monitored data after the implementation of plans and programmes is important to correlate these with the environmental data obtained by the monitoring. A more qualitative approach leading to a transport and environmental balance could be more useful than long and detailed calculations.

3.6 Key impacts

Six issues were defined (on the base of expert evaluation) as the most relevant ones to be taken into account, if it is possible, as a whole pack (i.e. whenever information is available, the decision makers should take all six issues into account):

Table 3: COST350 Action proposed impact thee level indicators

No	Impact	Indicator at the Highest information level
1	**Land uptake**	**Natural habitat area lost Domestic and recreation area lost Sealed area**
2	**Fragmentation of habitat's**	**Endangerment of populations of (representative) target species**
3	**Disturbance from noise**	**Number of people affected by noise level oversteps or proximity of sensitive habitats**
4	**Climate change**	**CO_2-emission**
5	**Toxicity**	**Number of people or protected area exposed to toxic or ecotoxic pollutant emission standards oversteps of heavy metals (Cu), persistent organic compounds (POC), Particulates, NOx (NO_2), SOx (SO_2)**
6	**Accidents**	**Number of killed, seriously or slightly injured persons due to accidents**

Table 4: Key impacts (TERM):

No	Impact	Indicator
1	**Climate change**	**Emissions, green house gases**
2	**Air Pollution**	**Pot. concentration of particles (PFP)**
3	Noise	Annoyance
4	Accidents	Traffic fatalities
5	Protection of biodiversity (terrestrial)	Unfragmented areas
6	Energy resources	Final energy consumption
7	Land as resource	Land take by transport infrastructure

The main difference between the COST350 model and the TERM model is not on the type of impacts proposed (they are mostly similar), but in the relative indicators corresponding with every impact. In the COST350 approach a set of three indicators are proposed, were every one of them can be selected, according to the level of information available.

3.7 Issues related to the aggregation and interpretation of impacts

Aggregation methods are to be applied in order to facilitate the use of the results of the impact assessment. In addition, a further interpretation of impacts is required, taking into account of synergistic or cumulative effects.

Aggregation of effects should be considered within and across impact categories. Given the various types and scales of impacts within impact categories, COST350 has investigated the possibilities for achieving an aggregation of indicators within the limitations imposed by existing

knowledge. Other questions addressed in COST350 relate to the application of weighting procedures in order to allow for an aggregation of effects across the various impact categories. Such weighting should take into account the different views and value judgements that decision-makers may have in the appreciation of impacts, following from general or specific objectives.

An integrated aggregation – or rather, the joint consideration - of all impacts stemming from a major transport policy decision is fraught with subjectivity. Coming up with a universally accepted method to reduce that subjectivity is still far out in the research horizon. The simplicity of the methods reviewed ranges from comparing scenarios (Do-Nothing vs. forecasting consequences at a horizon-year may provide an aggregated view of impact) or accepting a democratically stated experts' opinion to devising an academically sustained multi criteria model where different weights, opinions and ratings of significance may be tested and then, compounded. Short of those methods, practical experience is proving a used tool to gauge public reaction and the sensitivity of subjective assessments.

Analysis
There is a general lack of an integrated analysis approach and appropriate modelling tools that are capable of dealing with the strategic analysis level. Another problem is the availability of appropriate data, which is representative for, and can be handled at, the strategic level.

To the extent that environmental impacts are considered there is often no clear distinction between SEA and EIA. There seems to be a tendency to apply EIA indicators on a SEA level, which is in conflict with the level of detail and complexity that can be handled on the strategic level. Consequently, the impacts actually considered are often merely qualitative and usually quite limited.

3.8 Issues related to Impact Scoring

There are technical issues related to impact scoring, namely; uncertainty, the risk of double-counting impacts and intergenerational and discounting issues.

Uncertainty
Predictions undertaken in connection with SEA are often fraught with high levels of uncertainty. For instance about how the strategic decision will be translated into actions on the ground, the likely future state of the environment, future technological development, and the possible cumulative effects of other strategic decisions. Uncertainty also exists on the implementation and effectiveness of the proposed mitigation measures. Uncertainty can involve both inaccuracies and lack of precision. One of the aims of SEA is to reduce uncertainty where it makes sense to, and otherwise to record it and cope with it. SEA should not aim, as a general principle, to replicate the level of certainty of project EIA. In many cases, a "good enough" result for decision-making can be achieved despite uncertainties, so that uncertainties do not need to be dealt with specifically. For instance, future social conditions may clearly be better than current conditions; one alternative may be clearly better than another one; the economic benefits of a strategic action may clearly outweigh its environmental costs

Uncertainties and data limitations should be well documented and all assumptions made should be clearly stated. "Qualitative" predictions should not be "guessed": they should be supported by evidence, such as references to research, discussions or consultation. This is crucial to transparency and acceptability of the results. The quality of information or rather the levels of uncertainty in the forecast should also be taken into account within the criteria for assessing significance.

If effects of a plan are uncertain, close to permitted emission limit(s) or cumulative, testing the accuracy of predictions is a useful tool. Where uncertainty affects the outcome of the

assessment, additional tests for the accuracy of predictions should be undertaken. During the implementation stage, appropriate environmental monitoring, as a required by the SEA Directive, may also confirm or otherwise the accuracy of predictions. Any discrepancies can be taken into account in the preparation of subsequent plans and programmes and/or reviews of plans and programmes.

Double counting
There is always a risk that indicators for transportation impacts may experience some degree of double counting. For example, financial benefits from accident reductions are included within the economic appraisal, while the environmental and social indicators may also consider accidents and community safety issues. Also as more topics are examined so the problem of double counting increases as some issues may be at least partly, be included within other topics. For example, the use of natural resources is captured in the construction and operational costs of a particular transport proposal, while air quality, noise and accident costs also relate to health effects.

While double counting should be minimised and efforts to avoid double counting in different parts of the assessment process should be taken, it does not present a fundamental obstacle to analysis provided its occurrence is clearly indicated. A pragmatic approach is needed which allows a meaningful exploration of the issues, even where this brings some degree of double counting. Double counting can, however, be acceptable where it provides additional understanding or explanation. For example, taking the headline economic indicators, decision-makers are not able to judge the relative performance of measures in terms of consumption of resources; a key element of sustainable development as such information is assumed to be aggregated into the overall economic figures.

Intergenerational issues and discounting future impacts
Often the attainment of certain outcomes/targets may only be expected after many years (generations in some cases) but decision-makers need to make decisions well ahead of these timescales. For example, it may take several years for the objectives of a transport plan to be fully realised. Long time frames introduce greater uncertainty, partly because of the greater likelihood of changes in external variables. It is important in these circumstances to avoid focussing on short-term impacts where more significant long terms changes are predicted.

3.9 Monitoring Comparison and presentation of alternatives

The requirements are involved with the specification of specific guidelines related to plan implementation and monitoring (e.g. requirements related to plan execution in order to minimise environmental effects, mitigation measures, effects to be monitored and monitoring procedures to be applied). In COST350, some attention was paid to the further specification of these requirements.

In addition to the environmental impact assessment proper, a number of other aspects are considered in the execution of the SEA process, in particular in relation to the presentation and comparison of planning alternatives. Such aspects include:
- The assessment of other impacts and costs of alternatives.
- Use and consequences of scenarios.
- Presentation of results to facilitate the decision-making process.

The SEA procedure is focused on the environmental effects. Other important effects to be considered in the comparison of planning alternatives obviously are the mobility effects and the related economic and social benefits, representing the prime objectives of transport network expansions. n addition, the costs of the planning alternatives should be taken into account.

Alternative transport planning options are to be considered and evaluated within a longer-term future context. Consequently, there are a number of (potential) autonomous developments that may have a large effect on the environmental and other impacts considered in the evaluation process. Usually, such potential developments are reflected in a number of different scenarios, representing a reasonable range of expectations and related uncertainties regarding the relevant autonomous developments. The evaluation of alternatives should take place within these different scenario contexts.

The basic question is how all of the above aspects should be taken into account in the final presentation and comparison of planning alternatives and how these results are to be used in the actual evaluation and decision-making process. A number of views and guidelines on these issues have been further addressed in the approaches developed in COST350.

The control of plans, programmes, and policies (plans and programmes) and the quantification of their effects are possible only using indicators. Indicators are a measure that provides an indication of the condition or direction over time of performance of a defined process or achievement of a defined outcome.

In that respect, three sets of indicators are defined: one set of indicators for each abstraction level of information availability (WG 3 & WG 4 reports). These indicators make possible the assessment of the environmental impacts of traffic and transport infrastructures, according to the quality and quantity of information available at the transport action (alternative) level. The approach is build as a flexible method, based on using one of the three sets of indicators elaborated according three abstraction levels of information availability. The choice of the relevant indicators' set results, firstly, from the abstraction level of the available information, and, secondly, from the choice of experts and decision-makers responsible for the plans and programmes SEA. Every indicator developed following the proposed methodology is calculated thanks to data coming out from models or measurements. The monitoring of the indicators implies, as consequence, the monitoring of the data used to obtain the aforementioned indicators.

The monitoring can be carried out following two different approaches: the comparison of the results of the indicators with the defined targets, or the analysis of the trend of the indicators. The monitoring of the environmental impacts is often carried out comparing the result of indicators with a target. The trend gives a general idea if the plan goes in the right or in the wrong direction, and if it goes slowly or quickly. This approach is obviously less precise than the previous one, but it can be considered as a proxy to monitor environmental impacts of an alternative, considering that direction and velocity of trends are the most important point of the monitoring. The decision-makers get also both target and trends as different approaches available. We suggest following the trend of indicators to monitor environmental impacts first of all. If authority needs a more precise monitoring and if information is available, it may be recommended to monitor environmental impacts of the transport alternative concerned, using the comparison between indicators and targets.

Temporal specification refers to time interval of monitoring that gives a relationship between indicators result and targets or trends. In the context of plans and programmes SEA, the time interval is balanced between two different points of view. From the environmental point of view, the monitoring should be linked to the time scale of the environmental impacts assessed, in order that the monitoring brings relevant information of the result of the plan. From the point of view of the decision maker involved in the plans and programmes, the time interval of the monitoring should also be sensitive to the effects of the plans and programmes on the environment. In respect to the aforementioned considerations, the choice of only one time interval for the monitoring of all the impacts cannot be appropriate. In consequence, it may be recommended to monitor the plans and programmes' environmental impacts according the time

interval suggested by the EC: three years after the beginning of the plan for the short-term effects, fifteen years for the medium-term effects, and fifty years for the long-term effects.

The information system is characterized by different functions: monitoring; data elaboration and on line database updating; evaluation, revision and reporting. The advantages of such an on line informative systems are clear:

· the information are constantly updated;
· the system is accessible to each interested subject;
· as the system is integrated in a data base network, it allows for the informative cooperation, strengthening the knowledge;
· as the system is conservative in terms of the past experiences, it enhances the ability to foresee and plan the future;
· thanks to the increase of the knowledge, the system becomes the main "map" for the transport system and the relative environmental effects;
· the system improves the transparency of the decisional process and facilitates the other bodies or public participation.

3.10 Review, consultation

The results of the SEA as reflected in the Environmental Report are to be considered in the review/consultation and the implementation/monitoring process. In the drafting and use of the Environmental Report, a number of conditions should be met to provide optimal support to the further SEA process.

According to the SEA Directive, the process provided by the Strategic Environmental Assessment implies two main points:

1. The process of the environmental assessment to be carried out during the drawing up of a plan (art. 4, comma 1), defined as assessment *ex ante* (expected before the event, based on predicted results; forecast);
2. The preparation and the subsequent activation of the system of monitoring (art. 10, comma 1) to evaluation of the process of the plan implementation, defined as evaluation *in itinere* (on the way).

The evaluation *in itinere* allows for the control of the environmental impacts of the plan and proposals for subsequent revisions, if necessary; it has to verify the forecasts when the impacts occur and document this through the activity of reporting. To enforce this point, the SEA directive affirms that the environmental reporting of the *ex ante* SEA has to contain the "description of the measures envisaged concerning monitoring" (annex I, point i). In fact there is a close relationship between the way of carrying out the *ex ante* SEA and the way of managing and evaluating the monitoring information during the *in itinere* phase: the *ex ante* SEA should be conceived and organised as the first act of the monitoring process and of the *in itinere* SEA.

This means that the choice of indicators, the organisation of the information contained in say a database and the source of data are of course provided in the *ex ante* SEA, but they have to be conceived in terms of their ability to be monitored within the plan process. If this does not happen, the risk is that the indicators chosen are not manageable at acceptable costs by the public administration and, hence, the monitoring process has to be defined before so that *ex ante* SEA is conceived to satisfy also the *in itinere* SEA. Unmanaged data would be of little use to decision-makers or the public.

Finally, the last point to be considered for a correct monitoring (*in itinere* SEA) is to set up the techniques to be as automatic as possible and simple to use. This helps in the phase of updating and avoids the use of an interdisciplinary staff of experts to evaluate the trend of indicators. A good solution could be to arrange some tools for the interaction amongst software

dealing with the spatially referenced data, software for the database management, and software for the analytic calculation to have a unique integrated but simple tool. This will favour the management and the control by the administration, and involvement of the public. This last concept implies the involvement of public in terms of the publicity of the results of the monitoring (reporting) and the subsequent discussions.

As the transport plans generally have a duration of about ten years (WG 4 report: survey), they should be updated during this period (in some countries, theoretically, every three years). The monitoring of the environmental consequences of a plan, found out in the environmental report, should be done more frequently to observe the trend of a plan. Considering which impacts should be monitored: there is no need to monitor all the environmental impacts and the choice of environmental impacts to monitor is the responsibility of the authority to evaluate the plan implementation.

As explained above, the control of plans and programmes and the quantification of their effects are possible only using the indicators. The indicators are a measure that provides an indication of the condition or direction over time of the performance of a defined process or achievement of a defined outcome. It is a technical requirement to monitor the implementation of the plan, even if law does not require this. This is important in order to connect the environmental effects to the transport measures.

3.11 SEA results and recommendations

Output of the programmes and/or plans
SEA is improving the whole planning process, but good links between general plans and the project level are necessary. To make a SEA effective it should be carried out quickly. Some risks can be seen emerging from long lasting procedures with the need for too much detailed data or too much single project data and in too vague an outcome of the procedure.

Influence of the environmental aspect on the decision making process
The EU has passed legislation to reduce the environmental impacts from transport infrastructure and traffic. This includes, for example, EU-standards concerning the vehicle noise and air emissions, but also standards relating to the quality of air and water. These standards, which are implemented through national legislation, should be used as criteria when developing a plan.

Based on the available case studies it seems that the actual influence of environmental aspects in strategic decision-making is still rather limited. This is due to the fact that the scope of the actual environmental impact assessment is often limited and/or merely qualitative. Also it is not quite clear how environmental aspects are taken into account in decision-making.

Objectives in terms of reduction of emission of CO_2, local air pollution and noise, but as well as for safety, fragmentation and biodiversity loss are to be defined. Another important set of criteria could relate to the sustainable use of the physical environment, to be further developed in detail.

In the multi criteria analysis the environmental aspects influence the final decision with a weight between 25% and 40%. As Spain is reporting, in the previous selection phase the influence of the environmental aspects could lead to a rejection of corridors that are not compatible with environmental objectives.

In the Italian PRT-plan the concept of sustainability appears as one of the values of the plan and the concept of prevention and mitigation is strongly affirmed, as already described. These

objectives can be reached thanks to a system of values and the design criteria. Concerning the sustainability, the plan affirms that each project and the whole of the transport policy has to be evaluated in term of compatibility with the involved natural and environmental resources, to minimize the impacts from transport activities on the territory, on human health, and in term of safety. After such a declaration of sustainability, the attention goes, as already before, on the impacts due to emissions and noise, on one hand, and the ecological risk on the other hand. But the main focus is, again, not on the policies aimed to reduce the levels of traffic, but on the land use in the protected areas and on the technology to improve the public transport (of course less problematic than private transport), joined to mitigation measures. The final result is a list of projects and some recommendations to minimize the environmental problems, but not any real policy focused to prevention, that is to control the transport demand is provided.

Results

Relevant and desired results of the plans/programs on strategic level generally include:

· Decisions on preferred policies/strategies regarding the future development of transport systems, including transport management and networks.

· Guidelines/directives for developing plans/projects on lower hierarchical levels and in tactical/operational planning phases.

· The monitoring of the actual performance (impacts) of transport systems and networks.

Actual results achieved are in most cases quite limited. Observed limitations are:

· The impact assessment is usually quite selective and often merely descriptive.

· In many cases no clear decisions are taken.

· If decisions are taken, the justification of such decisions is usually not very transparent. For example, a list of preferred projects may be produced of which the contribution to specified objectives is not known.

· The actual influence of environmental aspects in strategic decision-making in most cases seems to be rather small.

Overall conclusions

· Within the various countries and cases there is a lot of commonality in processes and methods applied and the needs felt to (better) take account of environmental impacts in strategic planning stages.

· In all cases, limitations are encountered in the actual assessment of environmental impacts in strategic planning stages.

· Appropriate methodology and modelling tools for strategic assessment of environmental impacts are not readily available.

Based on the lessons learned from the case studies as described in the previous parts of this document, this section summarises the most relevant general recommendations for COST350. Important contributions to these recommendations were based on a paper produced by Dr. Kerstin Arbter's (Technisches Büro für Landschaftsplanung, Wien, Austria) at the request of WG 1 Chair, and on some results from other SEA research.

When starting the planning and SEA process, the planning task and the corresponding hierarchical planning level should be defined clearly. It must be clear, which questions should be answered by the plan or programme.

The planning task (= planning situation) could either be:

(1) Defining overall principles of transport policy;
(2) Defining the transport network;
(3) Choosing specific lines for infrastructure; or
(4) Designing projects with their construction details.

These planning tasks correspond to the following hierarchical planning levels:
(1) Policy level (assessment tool: SEA).
(2) Strategic plan/programme level (assessment tool: SEA).
(3) Site specific plan/programme level (assessment tool: EIA/SEA).
(4) Project level (assessment tool: EIA).

The latest SEA-research results show that in transport planning SEAs, the hierarchy to distinguish planning situations based on planning tasks seems to be more practical than merely defining the geographical scale of plans/programmes (national, regional, local and corridor level). See Annex B for more information on this issue.

In practice, the four assessment levels can be linked, e.g. by giving recommendations which effects should be assessed in more detail and which issues should be addressed at the following planning level (see also Annex B). The SEA assessment methods should follow minimum standards. By way of example, the assessment methods should:

· be transparent, also for layman, in order to gain the support of stakeholders and decision makers;
· focus on the most relevant impacts, which can be assessed robustly at SEA level (leave the "examine everything"-approach);
· provide a clear picture of impacts, without getting lost in irrelevant details;
· clearly document and explain all assumptions;
· declare lack of know-how and data, open questions for the next assessment level and insecurities in the prognosis transparently;
· be adapted to the availability of data;
· not be too time-consuming in order to integrate the results into the planning process;
· be robust (different experts should come to similar results).

Assessment methods for SEA clearly differ from methods used for project-EIAs. They are in principle more qualitative, less detailed, and follow a broader approach. Practice shows, getting away from the use of the well-known EIA assessment methods seems to be challenging. However, at SEA level this is necessary in order not to overload the SEA process and not to get lost in long lasting, detailed procedures.

Criteria and indicators should provide a clear answer if and to which extent the options at stake fulfil or miss the given objectives or targets. Therefore criteria and indicators should be transparently derived from the defined objectives and targets. Others, exploring the extent to which existing environmental problems would be ameliorated or providing information about which societal groups would be affected by considering distributional impacts, could complement these criteria and indicators. In addition to these absolute assessment aspects, the options could also be compared based on their relative scoring (which one is best and which one is worst, and on account of which aspects).

SEA helps reaching (inter) national environmental objectives and conveying these objectives to specific planning tasks. EU or national standards e.g. derived from national environmental plans or EU legislation (e.g. concerning noise, air emissions, quality of air and water, etc.) should be taken as benchmarks for SEA. Objective-led SEAs therefore should link environmental objectives or targets to assessment criteria or indicators.