

Environmental Impact Assessment: Roads and Rail

Handbook • Methodology



TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION



ENVIRONMENTAL IMPACT ASSESSMENT: ROADS AND RAIL HANDBOOK METHODOLOGY

WORKING GROUP: INGER MELLBERG, IRENE LINGESTÅL, MALIN ANDERSSON,
OLOF STENLUND AND MELKER LUNDMARK.

EDITOR: JAN SCHMIDTBAUER CRONA

DESIGN & ILLUSTRATIONS: THOMAZ GRAHL, MELICA

SWEDISH TRANSPORT ADMINISTRATION 2011

PUBLICATION NUMBER 2011:155

ISBN 978-91-7467-226-8

Foreword

The vision of an environmentally adapted transportation system, sustainable over the long term, has deep roots in society. But what does it really mean, and how do we reach it? Environmental questions must be a natural part of road and rail planning in order to achieve sustainability. This makes demands on knowledge, involvement, and systematic working methods, but also openness, where the opportunity to have an influence is provided. The Environmental Impact Assessment (miljökonsekvensbeskrivning, or EIA) is an important tool for answering these needs.

Experience from EIAs in road and rail planning show how important it is that the EIA is integrated into the process from early planning to implementation so that environmental issues are taken care of. This handbook therefore puts great emphasis on describing work with an EIA and explaining how it is intended to be implemented in every phase, from preliminary studies to the construction phase.

Development of the handbook began before Swedish Transport Administration was formed, and has therefore had a somewhat pioneering character. It is especially adapted for planning and of roads and rail, but it is hoped that it can also provide inspiration for Environmental Impact Assessments implemented within aviation and shipping.

Several reports studying how the EIA and the planning process can be made more efficient are under way, which could lead to changes in legislative requirements and application. The handbook will thus need to be updated, providing us with the opportunity to take views on content and applicability from you, the users.

The work has been managed as a project, with a working group and a steering group. The Swedish Environmental Protection Agency; the Swedish National Board of Housing, Building, and Design planning; and the Swedish National Heritage Board have all worked on the handbook and contributed their knowledge and views. Our sincerest thanks to everyone who contributed to the result by sharing their valuable views in seminars and referrals.



Stefan Engdahl

Head of business area Investments

Contents

Guide to Reading	6
Concepts	7
1. Introduction	9
1.1 Purpose and target audience of the handbook	9
1.2 Transportation system planning	10
1.3 Impact assessment and other basis for decisions	11
1.4 Environmental Impact Assessment (EIA)	11
2. Basic EIA methodology	13
2.1 Elements of the EIA process	13
2.2 Scoping	13
2.3 Alternatives	17
2.4 Consultation	18
2.5 Environmental conditions and interests	21
2.6 Impacts and consequences	26
2.7 Environmental adaptation and environmental measures	28
2.8 The EIA document	30
2.9 Environmental follow-up	39
3. EIA – a part of planning and design	41
3.1 Environment – a green thread through planning and design	41
3.2 Collaboration with municipal planning	43
3.3 Environmental tests, reports, and exemptions	44
3.4 Other analyses and planning tools	45
3.5 Conditions for an integrated working method	46
3.6 Initial study	49
3.7 Feasibility study	54
3.8 Design plan	60
3.9 Construction documents	65
Further reading	70

Guide to Reading

This handbook on methodology is one of several parts of Swedish Transport Administration's handbook series on Environmental Impact Assessments (EIA) for road and rail projects. The contents of the various parts form an integrated whole. Other parts of the series are:

- Rules and regulations: legislation, conventions, and goals concerning EIA
- Analysis and evaluation: evaluation methods and analysis tools for various environmental aspects
- Environmental follow-up of road and rail projects
- Summary section: Basic elements of EIA.

This handbook section replaces Environmental Impact Assessments in the Road Sector, Part 2: Methodology (Vägverket, Publication 2002:42E). This handbook on methodology has the following structure:

CHAPTER	CONTENTS
1. Introduction	Purpose of the handbook. Description of the planning system and EIA in relation to other impact assessments.
2. Basic EIA methodology	Description of the elements included in EIA and the contents of the EIA document
3. EIA – a part of planning and design	Of how EIA can be integrated in road and rail planning and design. Concrete advice is given on what is important to consider in the respective phases.
Further reading	

WORDING IN THE HANDBOOK:

FEASIBILITY STUDY and **DESIGN PLAN** are used as common terms for road feasibility study and rail feasibility study, and work programme and rail design plan, respectively. If other types of design plans and feasibility studies are concerned, such as local design plans, this is clarified in the text. **PLANNING** is used for work on preliminary studies and feasibility studies.

DESIGN PLANNING is used for work on design plans and construction documents.

EIA is used for both the process and the document. In other cases, the concepts

EIA DOCUMENT and **EIA PROCESS** are used.

The reader is presumed to be familiar with the general EIA elements shown in Chapter 2 in order to understand the phase-specific advice in Chapter 3. In the margins, there are light green boxes with facts and legislative requirements, as well as blue boxes with examples and advice.

Concepts

Here we describe how certain key concepts are used in this handbook.

Environmental conditions

The conditions that together shape and characterise the environment in a certain area, such as:

- the landscape, ground and geology, water, topography, climate and vegetation
- ecosystems, design plants, animals and habitats
- development and land use
- historical development and traces of this in the landscape
- the environmental situation, air quality, noise, pollution and other disturbances.

Environmental quality

A condition or function in the environment that can be measured or described; for example, air quality, sound quality, or water quality. Environmental objectives, standards, base values, and limit values can be used to express a certain environmental quality that is valuable, desirable, or acceptable.

Environmental interests

Interests issuing from environmental conditions. Natural environment, cultural environment, outdoor life, living environment, and health are examples of environmental interests. Environmental interests can be designated as protected areas in accordance with Chapter 7 of the Environmental Code. They can also become clear through analysis of environmental conditions, where local knowledge can be contributed through consultation.

Environmental aspect

Overall name for environmental interests, environmental impacts, and environmental consequences. The concept, in the context of an EIA, has a different meaning than according to ISO 14050:2010.

Environmental impacts

Change in environmental quality that can be measured or recorded.

Indirect environmental impacts

Impacts that occur as a consequence of the project's direct impacts or through the "opportunities" the project provides. For example, it could be an issue of altered traffic flows in the surrounding traffic network, or housing development that results from the project.

Concepts

Cumulative environmental impacts

The interaction between several different impacts that occur as the consequence of a project, for example noise impacts and barrier impacts. The impacts of a project can also interact with impacts from other ongoing or future operations and projects, for example noise impacts from a road project interacting with noise from a railway (existing or design planned).

Environmental consequence

An assessment of the significance of the impacts for various environmental interests, for example what traffic noise means for the living environment and people's health, or for cultural environmental assets. The assessment covers both a description of the consequence and an evaluation of its size and significance.

Influence area

Area in which it is estimated environmental impacts could arise. The influence area is generally larger than the feasibility study area, which is the area within which alternative measures and solutions are sought.

Null alternative

Reference alternative for evaluating the impacts and consequences of the project. The null alternative describes the future circumstances that apply to the road or rail, traffic, function, and environmental conditions, if the project is not implemented.

1 Introduction



An Environmental Impact Assessment (EIA) makes a difference in a road and rail project. It can raise the environmental issues at the right stage and actively contribute to increased environmental adaptation.

This chapter sets the EIA in its proper context. With an understanding of the planning system, other impact assessments, legal requirements, and the benefit of an EIA, you will be better equipped to take advantage of its full potential.

1.1 PURPOSE AND TARGET AUDIENCE OF THE HANDBOOK

This part of the handbook series on EIA deals with methodology. ‘EIA methodology’ means the basic elements of EIA and their functions, as well as principles for implementing them in road and rail planning.

The purpose of the handbook is to contribute to improved application of EIA and clearer integration of EIA in road and rail planning and design planning. It will support a development towards EIA documents being aimed at the essential and relevant environmental issues in every project.

The emphasis in the handbook lies in describing the EIA process and its connection to planning and design, as this connection is a key to practical environmental benefit. The handbook also gives advice on how environmental issues should be handled in the initial studies and construction document phases, which are not covered by legal requirements in EIA.

The handbook is especially adapted for Swedish Transport Administration consultants implementing EIA, but provides guidance for everyone working with EIA for roads and rail. It conveys Swedish Transport Administration’s view of how EIA should be applied in road and rail planning based on legal requirements, practice, and experiences.

More thorough descriptions and interpretations of legal requirements and regulations, as well as assessment methods during analysis, are found in the other parts of Swedish Transport Administration’s handbook series on EIA.

1.2 TRANSPORTATION SYSTEM PLANNING

In developing the transportation system, the perspective should be that of the spatial or land-use planner. The system must function for various passenger groups and for various needs in society, and must be sustainable over the long term. For this to be possible, management and planning of the transportation system must be implemented in close interaction with municipal planning, and with other partners in physical planning.

The Riksdag has adopted goals for transportation policy. The overarching goal is supported by a functional goal for accessibility and health, environment, and safety (HES) goals. The transportation policy goals are the basis for analysing problems and the need for measures in the transportation system. The HES goals say, among other things, that the layout of the transportation system should contribute to achieving environmental quality goals and increased health. The environmental quality goals consequently have an important role in road and rail planning. Through the project objectives, the overarching transportation policy goals can be concretized and be useful in planning and design planning.

Transportation planning is implemented gradually at different levels, from the national to the local. Among other things, it covers analysis of conditions, goals, strategies, needs, and potential measures, as well as target achievement and consequences. Environmental assessment and EIA are tools used in all planning steps to contribute to an environmentally adapted, sustainable transportation system.

The planning stage that precedes the project level is usually called strategic planning. This can result in different types of plans, for example, a national plan and regional plans for the transportation system, problem and flaw analysis, and analysis of the choice of measures. Strategic planning covers larger physical areas that make possible, as well as analysis of regional and national consequences. Initial study, feasibility study and design plan are the project stages regulated in the Road Traffic Act and in laws regarding rail construction. The Initial study are mainly an inventory phase that is to provide knowledge of conditions, needs, and potential measures. The initial studies also provide the opportunity for consultation and garnering support.

An feasibility study is carried out when alternative extensions need to be studied. The feasibility study must contribute to a localization that is suitable as regards the conditions of the area and the needs that exist.

The goal of the design plan is to study the detailed layout of the project and show what land is needed to build the road or railway. The design plan shows how the project is to be implemented and what requirements are to be incorporated into the construction document.

In the construction and operation phase, the commitments found in the design plan and the provisions of the Environmental Code are to be fulfilled. Environmental follow-up may be needed to ensure that the requirements and goals established in the design planning are achieved.

The 'four step' principle is applied in transportation planning. It sets road and rail planning in a larger context and opens up to a broader and more impar-

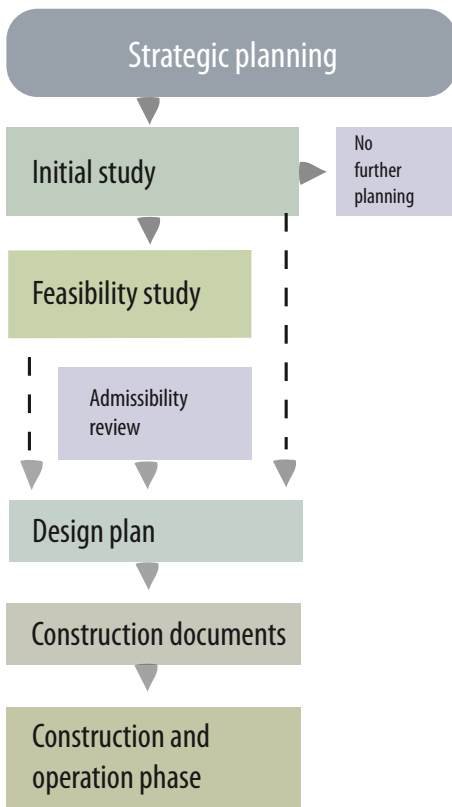


FIGURE 1.
THE DESIGN PLANNING SYSTEM

tial analysis, even outside the transportation system. The type(s) of measures to be implemented, for example, traffic regulation measures (step 2) in combination with reconstruction of road or railway (step 3), are analysed early on in the planning (strategic design planning as well as preliminary studies). These measures are then further planned – for example, in the feasibility study or a design plan.

1.3 IMPACT ASSESSMENT AND OTHER BASIS FOR DECISIONS

In planning, ongoing decisions are made on types of measures, corridor choice, and design. This puts demands on bases for decisions, which are developed with the help of various methods. Some examples of methods are target achievement analysis, overall effect assessment, impact assessment, risk analysis, and public financial calculations.

EIA is one of several impact assessments that are implemented in a project. One difference from other impact assessments is that there are legal requirements for EIA that regulate the process and the contents of the document. The goal of impact assessment is to analyse and show the project's consequences for various interests. The consequences can be sorted into various groups. See Figure 2.

The analyses are carried out as a part of planning and contribute to the development of alternatives. Showing the project's consequences is an important basis for decisions in every phase. A broad impact assessment, of which EIA is a part, can be summarized and shown as an overall assessment, which gives an overview of the all the project's consequences.

THE 'FOUR STEP' PRINCIPLE
MEANS THAT MEASURES MUST
BE EXAMINED IN THE
FOLLOWING ORDER:

1. Measures that affect transportation needs and the choice of means of transportation
2. Measures providing more effective use of existing road and rail networks
3. Improvement measures
4. New investment and larger reconstruction measures

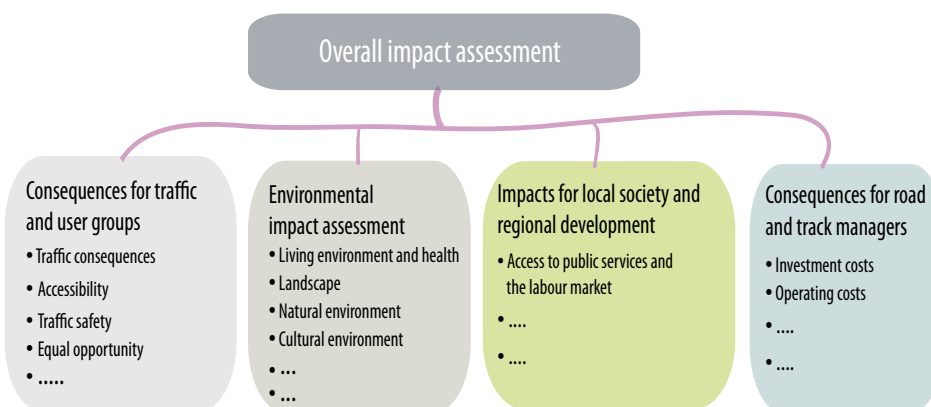


FIGURE 2.
EXAMPLES OF THE AREAS WITH IMPACT
ASSESSMENTS IN A PROJECT. THE
ENVIRONMENTAL IMPACT ASSESSMENT
IS A PART OF THE OVERALL IMPACT
ASSESSMENT.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The purpose of an EIA is to contribute to environmental adaptation of a project and, through consultation, provide those concerned with knowledge and the opportunity to affect the project. The work on an EIA involves identifying and describing the environmental impacts of the project, working for environmental adaptation during planning, and showing a basis that can be used for an overall assessment of the consequences for people's health and the environment.



Regulations on EIA in road and rail planning

Regulations on EIA are found in the EU directive on the assessment of the impacts of certain public and private projects on the environment (Directive 85/337/EEG). The directive has been incorporated into Swedish law, primarily through Chapter 6 of the Environmental Code.

The formal requirements for EIA apply to road and rail projects being planned according to the Road Traffic Act and the Railway Construction Act. In these laws, there are references to the regulations on EIA in the Environmental Code. This means that, in principle, the same EIA requirements apply to road and rail planning as for operations that are harmful to the environment.

Figure 3 shows the scope of the legal requirements for EIA. The requirements for consultation and a consultation circle are found in the Environmental Code, the Road Traffic Act, and the Railway Construction Act. During consultation, the county council decides whether the project should be considered as giving rise to significant environmental impacts. Some projects (that the government has passed regulations on) must always be considered as giving rise to significant environmental impacts. No special decision is needed for these projects. If the project is considered as having a significant environmental impact, there are clear requirements for the contents of the EIA document. This also involves widening the consultation circle. The county council must accept the EIA before it is brought into the feasibility study and design plan, respectively.

Initial studies

Consultation

The county council's decision on significant environmental impacts

Feasibility study

Consultation, with an expanded circle in connection with significant environmental effects

EIA document

The county council's acceptance of the EIA

Public notice and display (in connection with significant environmental impacts)

Design plan

Consultation, with an expanded circle in connection with significant environmental impacts (if not previously implemented)

EIA document

The county council's acceptance of the EIA

Public notice and display

FIGURE 3.
LEGAL REQUIREMENTS FOR EIA

EIA of good quality

A good EIA is characterized by being practical, effective, knowledge-based and open to participation.

Practical means that the EIA is useful as a basis of knowledge. The scope is adapted to the project and the conditions in the environment. This is reflected in the EIA document, where the project's environmental consequences and key issues are easy to deduce. The proposals of the Environmental Impact Assessment for environmental adjustment is useful and can be implemented in practice.

Effective means that the EIA influences planning and design solutions. This also means that resources, in the form of time and money, are put into the right things in the EIA and result in an EIA of good quality.

Knowledge-based means that the EIA is implemented systematically and professionally. The EIA is developed according to good scientific practice and is implemented with appropriate methods and techniques. It is objective, balanced, and credible.

Open means that consultation is a natural part of the planning and design planning process of the EIA, and that it is transparent. Viewpoints brought forth are put to use and contribute to the project's environmental adaptation, as well as the basis for decision.

2 Basic EIA methodology

How much environmental benefit the EIA provides depends on how well the elements that build it up are implemented. The elements form an internationally-recognized practice for EIA in projects. The purpose of this chapter is to provide you with insight into these elements, and what significance they have in the EIA process as a whole.

2.1 ELEMENTS IN THE EIA PROCESS

The basic EIA elements form the building blocks that hang together to form the EIA process. See Figure 4. The elements are adapted according to the needs in the current planning phase. The EIA process is dynamic and iterative, with both larger and smaller amounts of feedback. In practice, this means that the elements can run parallel with each other and be implemented to various degrees throughout the entire process.

2.2 SCOPING

Proper scoping means that neither time, money, nor space are reserved for issues that are not significant for the project. This leads to a focused basis for decisions that is easier for decision makers to take in, and which simplifies the review by the county councils, the public, and others concerned.

The EIA must be focused on the issues that are essential for the choices and decisions to be made within each respective phase. Thus a scoping is made concerning environmental aspects, timeframes, and geographic scope at the beginning of each new phase.

Scoping of environmental aspects

Scoping work takes place incrementally during the entire EIA process. A broad approach method at the beginning of the process can tightened up afterwards as the analysis of the environmental aspects that are most essential for the project deepens.

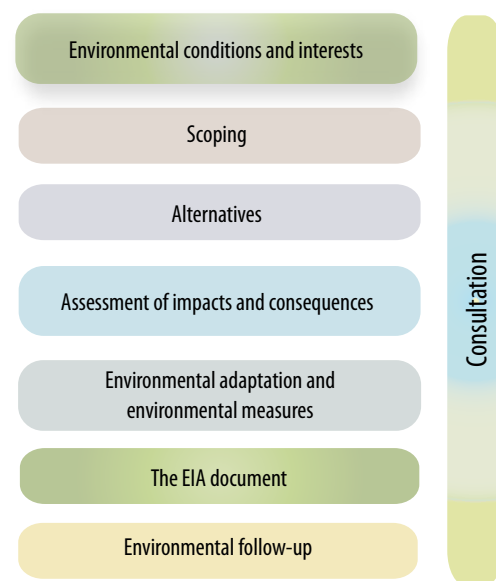


FIGURE 4.
BASIC EIA ELEMENTS



It is useful to make a distinction between scoping (“include or not”) and focusing (“emphasize what is essential”). Scoping means that the environmental impacts that are not significant for the project and its surroundings are not investigated and not described in the EIA document (apart from justifying the scoping). In focusing, the more essential impacts and consequences among all the ones investigated are emphasized. This way, both scoping and focusing contribute to a project-specific, practical EIA.

The scope of the project and the sensitivity of the surrounding environment are the factors determining the environmental aspects that need to be investigated further. This means that even a smaller project can involve the need of in-depth feasibility studies, if the project is located in an area with a sensitive environment.

Three important factors affecting EIA scoping:

1. *The character and possible impacts of the project*

The type and scope of the project, the size, and whether it is a new or existing extension, are important features.

Key issue: What characterizes the project, and what direct and indirect environmental impacts are likely to arise?

2. *The environment affected*

Based on the environmental aspects included in the Environmental Code, the environmental conditions, qualities, and interests in the landscape, living environment, and health.

Key issue: What characterizes the environment, and how could this be affected by the project?

3. *The significance of the impacts and the need for continued feasibility study*

Analysis of the project’s consequences, as well as assessment of knowledge requirements based on the project’s character. For example, could the railway’s barrier effect be significant for outdoor life, for animal movement, or any other interest?

Key issue: What environmental impacts could have significance for any interest(s), and must thus be investigated further in the EIA?



SITE VISITS PROVIDE THE BASIS FOR SCOPING OF THE EIA

The purpose of the scoping element is to analyse all environmental aspects and assess which of them need to be investigated further in order to ensure that sufficient environmental consideration is taken in the project. It should also contribute to the EIA document being useful for decisions. A good starting point is the environmental aspects indicated in Chapter 6, §3 of the Environmental Code. Comprehensive information collection is often required, as are site visits, consultation, and expert support, so as to be able to evaluate various environmental aspects and to justify the scoping.



The precautionary principle must always be applied. The risk of negative consequences, possible positive consequences, gaps in knowledge, and uncertainty are cause for further studies. The public's need for information, concern from the people affected, and the municipality's deliberations on economising land and water must also be taken into consideration in the assessment of what is to be investigated further as part of the EIA.

In consultation, issues on which environmental aspects need to be further investigated, and which do not need to be, are discussed. The County Administrative Board's has a particular responsibility here to work to give the EIA the objective and scope needed for the permit review. The County Administrative Board's justification for the decision on significant environmental impacts is a basis for determining which focus and scoping of the EIA is appropriate.

There are various types of tools to use in scoping work. A matrix, for example, can be used both as a working tool and to show the grounds for the scoping that was made.

ENVIRONMENTAL ASPECTS	Possible environmental impacts			Can consequences arise?	Discussed more in-depth in the EIA?	Grounds for scoping	Basis for scoping
	Large	Small	None				
Natural environment		X		YES	YES	The project entails noise disturbances in an area of great value for bird life	Nature 2000 area, consultation with the county council
Air quality			X	NO	NO	The air quality along the current road, as well as in the null alternative, is good since the substances lie well under the applicable air quality norms. The project involves no changes to air quality in comparison with the null alternative.	Air Quality Management Association 2010 air quality measurements. Traffic forecasts for the project.
Noises		X		YES	YES	The base value is exceeded at present, in the null alternative, and by the project.	Noise calculations carried out using the Nordic calculation model 20 Oct 2010
Etc.							

FIGURE 5.
AN EXAMPLE OF THE FORMATION OF A MATRIX THAT CAN BE USED FOR SCOPING ENVIRONMENTAL ASPECTS. NOTE THAT ALL ENVIRONMENTAL ASPECTS INDICATED IN THE ENVIRONMENTAL CODE SHOULD BE INVESTIGATED AS LONG AS IT IS POSSIBLE TO ASSESS WHICH ENVIRONMENTAL CONSEQUENCES THE PROJECT IS EXPECTED TO ENTAIL.



Scoping of impacts over time

The EIA analyses both when any environmental impacts will occur (during the construction or operation phase) and when environmental consequences will primarily appear (in the short, medium, or long term). It differentiates between various environmental consequences. A number of environmental consequences will occur directly (for example biotope losses as a consequence of land encroachment), which others will occur further into the future (traffic-dependent climate changes, for instance).

In order to analyse short-term and long-term environmental consequences, knowledge of both existing and future environmental conditions is needed. Concerning traffic-dependent environmental consequences, it is often practical to choose the same date for the null alternative as for the traffic forecasts being carried out. Sometimes it may be justified to use one supplementary horizon year or another, for example time limits for environmental goals that have been set. Normal timeframes in infrastructure projects are building times, start of operations, and 20 years in the future.

Scoping of influence area

Initially, a preliminary evaluation of the scope of the area that could be influenced by the project's environmental impacts (influence area) is carried out. This is, in general, larger than the area within which alternative locations, designs, and measures are investigated (the feasibility study area), since a number of environmental impacts could have broad geographic distribution. Examples of such impacts are fragmentation impacts for large mammals and impacts on water quality in a drainage area.

The EIA should also take into account and describe the essential indirect and cumulative impacts. This often requires the study of a larger geographic area. For railways, this could be a question of follow-up investments such as power supply (new power lines and signal boxes) and external roads (diversion and new construction). For roads, it could be a question of the opportunity for the development of new business centres.

Cumulative impacts could be increased fragmentation as a consequence of road or rail projects alongside another planned construction.



FIGURE 6.
THE FEASIBILITY STUDY AREA (PINK) COVERS THE AREA WHERE ALTERNATIVES ARE SOUGHT. THE INFLUENCE AREA (GREY) IS THE AREA THAT COULD BE INFLUENCED BY THE PROJECT'S ENVIRONMENTAL IMPACTS

2.3 ALTERNATIVES

Analysing alternative solutions is fundamental to planning and design planning. The alternatives must satisfy the goal or purpose of the project, must be reasonable based on various perspectives, and preferably entail positive consequences and limited negative consequences.

The transportation policy goals, the 'four step' principle, and the regulations on economising land and water are starting points for seeking alternatives, which should occur in close interaction with overall municipal sector planning. The EIA contributes to the work and provides a broadened perspective on which options exist regarding general concepts, location, design, and scope. It is constructive for the project's environmental adaptation to have a broad perspective when seeking alternatives. Documenting important choices of path and the grounds for them provide increased transparency in the process.

Studies of alternatives have different objectives depending on which stage is current:

Initial study

In the initial study phase, an impartial analysis of alternative measures in the form of general concepts is carried out. The alternatives may have different characteristics depending on the purpose and goal of the project. Alternatives are analysed according to the 'four step' principle. The strategic planning and initial study are especially significant for analysis of measures in accordance with steps 1 and 2.

In many cases, these measures are also environmentally advantageous (for example, signal measures or speed limits).



Feasibility study

In the feasibility study phase, focus lies on finding a suitable geographic location for a new road or railway in the landscape. Decisions in the feasibility study phase on the terrain corridor and technical standard (for example, road type, street overbuild, or tunnel) furnish the conditions for the work in the design planning stage on designing the facility in detail.

In order for it to be possible to evaluate alternative locations and make a decision, a general study of technical solutions and designs is necessary, in some cases even during the feasibility study phase.



Design plan

In the design planning phase, alternative studies deal with the placement of the extension and adaptations to the surrounding local environment. Various design alternatives for the project are also included. This can concern the choice of bridge type, overpasses or underpasses, or the railway and choice of materials, as well as various ways of compensating for negative environmental impacts that could not be avoided – noise protection measures, for example.



FIGURE 7.
ALTERNATIVES FOCUS ON VARIOUS ISSUES
IN DIFFERENT PLANNING STAGES.



The concept of alternative is an established one within EIA methodology. It has a broad significance extending over everything from smaller decisions on design details to the choice of line layout (corridor) and measures according to the first step of the four-step principle. The decisions on alternatives that have greatest significance for the environment are often made early on in the design planning phase. The fundamental principle is to always illustrate and include environmental aspects in all phases when various alternatives are brought up, and to emphasize alternative solutions that offer good environmental adjustment and contribute to the environmental quality goals. If there is a risk of substantial damage to national interests, it is especially important to analyse alternatives.

Null alternative

The null alternative is used as a reference alternative to assess the impacts and consequences of the project's alternative solutions. The null alternative includes taking normal measures for existing roads or rail. Municipal design plans that are adopted provide a basis for formulating the null alternative.

The goal is to include future environmental changes that will occur even if the design planned project is not carried out; for example, nitrogen dioxide content as a consequence of the concentration of residences near the road. There can be various time perspectives for when environmental impacts and consequences can arise, which means that different null alternatives may need to be described. See also Section 2.5.

Choices of path in planning

Besides being a basis for decisions on alternatives, the EIA is of great significance in work on seeking and investigating alternative solutions. Knowledge from the EIA contributes to being able to adapt, design, and place demands on alternatives through its being available in the smaller decisions on the project's location and design that are continuously made.

It is this collection of smaller decisions that together result in a project proposal (in feasibility study or design plan). These decisions can be of crucial significance for the project's environmental effect. The EIA work must be able to influence this type of decision through highlighting environmental conditions, requirements for environmental considerations, and the environmental effect of the alternatives. It is therefore important that the EIA work is properly integrated into planning and design.

CHAPTER 6, §4 OF THE ENVIRONMENTAL CODE:

“Consultation should relate to the location, scope, formation, and environmental effect of the operation or measure, as well as the content and design of the Environmental Impact Assessment.”

2.4 CONSULTATION

Consultation is a part of the project's planning and design planning. The EIA handbook only takes up consultation as a part of the EIA process in accordance with Chapter 6 of the Environmental Code, and does not go further into methods, planning, and conducting consultation in general.

Consultation can fulfil several different functions in the work on the EIA.



Through consultation, the public and other consulting parties are given knowledge of the environmental effect of the project, and of opportunities to influence the project and the basis for decisions. Consultation contributes to good quality in the EIA, if knowledge, viewpoints, and values are properly taken into consideration.

In the EIA process, consultation contributes to:

- support for the EIA's focus and scoping
- obtaining knowledge of environmental conditions (qualities and shortcomings)
- assessing environmental impacts and evaluating environmental consequences
- developing alternatives, environmental adaptations, and protective measures
- insight into and knowledge of the project
- assessing the need for environmental follow-up.

Consultations deal with various questions depending on when in the process it is carried out. Early in the process they are focused on issues on the environmental conditions of the area and on qualities and needs connected to various interests (for example, the ecological function of the landscape and the living environment). They are also focused on alternative solutions, as well as scoping of the EIA. Consultations in later phases are more focused on the environmental consequences of the project and the need for measures.

Consultations with the public and organisations aim at capturing the questions that those concerned think are essential, taking knowledge and viewpoints into consideration, and providing information on environmental issues in the project. Consultations with the authorities aim at things like getting their views on interests that are important for the EIA to deal with, getting knowledge on “general environmental interests” and environmental problems and on any other environmental assessments, and gradually establishing support for the EIA.

Roles and responsibilities

Swedish Transport Administration, as the responsible agency for the operation, has the formal responsibility for consultation. This means, among other things, that Swedish Transport Administration must be the party distributing invitations to consultations, participating actively in communication with consulting partners, and standing behind the contents presented during the consultations and the consultation review.

The consultants contribute knowledge during the consultation and in the concrete consultation work. It could be a question of producing a basis for a presentation, presenting the project and the EIA, writing memoranda, and compiling viewpoints received into a consultation review.

It is important that the consultant and the client create a joint picture of the purpose of the consultation, what type of consultation to carry out, when the consultation is to occur and who is to be invited. The division of responsibilities and labour must also be made clear. This could be described in a communications plan that is produced early on in the process.

CONSULTATION

When the project is not regarded as entailing significant environmental impact, consultation regarding EIA must be held with the following parties concerned:

- County Administrative Board
- regulatory agencies
- municipalities
- individuals
- non-profit associations (natural and environmental protection)
- the public

When the project is *regarded as entailing significant environmental impact*, consultation must additionally be held with:

- state authorities
- organisations



The County Administrative Board has a clear role in the consultation. It must work to give the EIA the objective and scope needed for the permit review. This means that the County Administrative Board must be active in the work on delimiting the EIA. To achieve this, the County Administrative Board needs to have a basis worked out in detail prior to the consultation. The County Administrative Board also has the opportunity during the consultation to place demands that other comparable ways of reaching the same goal be shown. After everyone concerned has expressed themselves during the consultation, the County Administrative Board will check if the project can be regarded as entailing significant environmental impact. The grounds for the decision on which environmental impacts are regarded as significant forms the foundation for continued work on the EIA.

Basis and set-up

In order to achieve the goal of the consultation, a basis adjusted for the target audience needs to be produced before the consultation. The scope and content depend on the phase and the character of the project. Photomaps, maps, and illustrations are suitable bases for a consultation. They make geographic orientation easier and can provide an understanding of alternative corridors, proposals for measures, or other things that are to be discussed. In later phases, computer models that make it possible to travel along the road or rail and experience the landscape from various perspectives could be useful.

A draft of a description of the area's environmental qualities and shortcomings can also provide a basis for discussion of various alternatives and measures. A preliminary list of contents can illustrate what the EIA document will contain and how it is to be laid out.

The form of the meeting should be adapted to the goal of the consultation. A traditional general meeting is not always the most suitable form of meeting. If the goal is to obtain a joint picture of the project and environmental conditions, a guided tour (walking tour) could be a suitable form of meeting. An open house contributes to more people being able to speak and get answers to their specific questions. Consultation methods that give the participants space to develop proposals can contribute to a constructive design planning process in larger projects, where there are different opinions on alternative solutions.

Further reading on consultation methods can be found in the literature list at the end of the handbook.



Consultation review

Consultations that have been carried out are documented in a consultation review that encompasses all issues, not just the environment. Among other things it describes how environmental issues were dealt with during the consultation, what was presented, who participated, what viewpoints were brought forward, and how they were taken charge of. In the EIA document it must be indicated which consultations were held and with whom. Viewpoints that concern the environment are collected, and reference can be made to the consultation review.

FIGURE 8.
A GUIDED TOUR OF THE AREA WITH OPPORTUNITIES FOR DIALOGUE ON ENVIRONMENTAL CONDITIONS, THE PROJECT, AND ITS LOCATION

2.5 ENVIRONMENTAL CONDITIONS AND INTERESTS

Analysis of environmental conditions and interests forms the basis for searching for alternatives and evaluation of impacts and consequences. A properly implemented analysis is therefore a prerequisite for successful environmental adaptation in the project. The analysis leads to a description of the environmental situation and the landscape, and of the qualities and functions that are significant for various interests, for example, outdoor life and the cultural environment. Environmental conditions are described based on both the current situation and how future development may look.

The work encompasses evaluating the knowledge requirement, gathering information on environmental conditions, and analysing the basis with regard to the interests and which future development potential exists. See Figure 9.

Evaluation of knowledge requirements

The knowledge requirement is affected by the character of the project and its expected environmental effect, as well as by the planning stage. For the description to be useful in planning, it must be focused on the project. It must convey conditions and qualities in the area that may be affected by the project. Conceivable alternatives (extensions and layouts) and possible impacts are considered in the evaluation of the knowledge requirement. See Section 2.2 on scoping.

The knowledge base produced is used in several different contexts within the EIA process, for example, to:

- identify and scope environmental impacts and environmental consequences
- formulate project objectives for the environmental qualities to be attained
- contribute to the project's location and formation
- analyse alternative solutions
- formulate environmental measures and compensatory measures.

Consultation with the County Administrative Board, municipality, and other partners contribute to a common picture of the knowledge requirement and specify the focus of analyses, inventories.

Information collection

Accessible information and bases from previous planning phases are supplemented and deepened with knowledge from field studies and consultation. The municipality's comprehensive plan is an important source of information on environmental interests and the balancing of these various interests.

For an effective process, the gathering of knowledge for various requirements – landscape analysis, the EIA, and design programmes, for example – must be arranged.

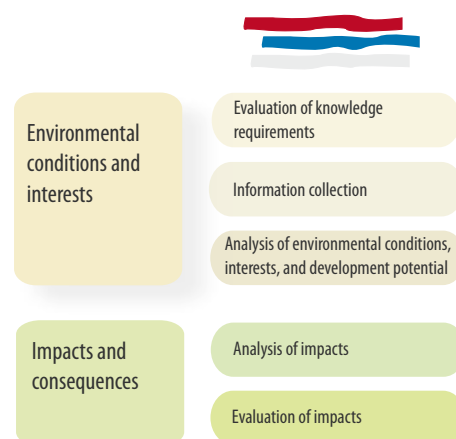


FIGURE 9.
ELEMENTS IN THE WORK ON ENVIRONMENTAL CONDITIONS AND INTERESTS, AS WELL AS THE EVALUATION OF IMPACTS AND CONSEQUENCES



Close collaboration between different competences within the project makes it easier to exchange knowledge and to coordinate information collection. Apart from information on environmental conditions, information connected to road or rail projects is required – for example traffic conditions, curve radii, speeds, and other technical standards. The knowledge is needed to analyse the environmental situation in certain respects, for example, estimating noise and air quality.

Analysis of environmental conditions, interests, and development potential

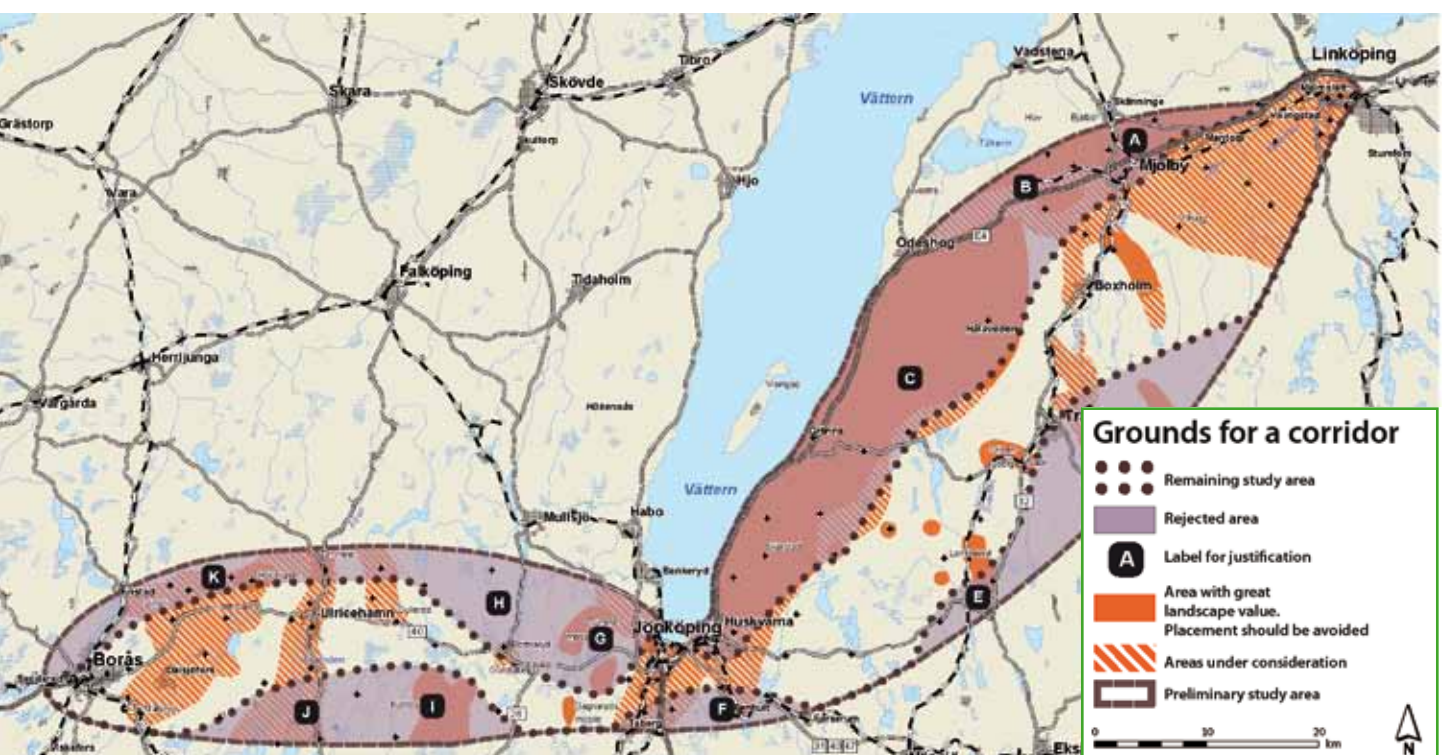
To get an overall picture of the landscape and environmental situation, different expert competences must participate in the analysis work. In the analysis, the project's possible impacts must be taken into consideration and adapted to the planning phase and the decisions to be made. Through consultation the analysis will gain support from the public, other parties concerned, the County Administrative Board, the municipality, and subject matter experts.

The analysis deals with mapping and understanding the environmental conditions in the area and assessing their significance for various interests. This shows what values there are in the area, but also shortcomings and problems. An important part of the analysis is understanding what qualities and functions are connected to the interests and which of them could be affected by the project. For example, it could be a question of visual qualities for those living in the area and those using it for recreation, of the needs of different animal species for ecological functions and biotopes so that the species are protected, and of health-related problems.

Qualities and functions identified in the analysis must be assessed so as to get a picture of their significance in a larger context.

The assessment makes the future evaluation of consequences easier. The bases for the assessment may be regional and local environmental objectives, the balancing of interests involved in the municipality comprehensive plan, the effect on vulnerable and threatened species, and protective value.

FIGURE 10.
IN THE INITIAL STUDY FOR PART OF THE
GÖTALANDBANAN RAIL LINE FROM
GÖTEBORG TO STOCKHOLM, AN OVERALL
ANALYSIS OF LANDSCAPE CHARACTERISTICS
AND NATURAL AND CULTURAL VALUES WAS
CONDUCTED. THE RESULTS SHOW AREAS
THAT DO NOT TOLERATE A HIGH-SPEED RAIL
TRACK. THESE AREAS FORMED THE BASIS OF
GEOGRAPHIC SCOPING PRIOR TO THE FEASIBILITY
STUDY PHASE.





The level of detail in the work may need to be changed in order to see the project both in an overarching and in a more detailed context. For example, barrier impacts and other cumulative impacts may, in many cases, need to be analysed from both a local and a regional perspective.

Evaluation of development potential

The development potential – that is, what is needed for existing qualities, functions, and values to be developed constructively or for shortcomings to be fixed – is analysed based on the description of the current situation. In other words, how sustainable development could be achieved for the relevant environmental aspects. This makes it easier to understand the significance of the project's impacts and how negative consequences could be avoided.

Whatever is needed to retain and constructively develop values, or alternatively fix shortcomings, can be formulated as a project objective.

Examples of analysis of different environmental aspects

A general description of the area analysed in the EIA, as well as which issues are important in analysis and reporting, is given here.

Landscape analysis

A landscape analysis is carried out in the early planning phases, chiefly in cases where 'new' roads or rail extensions may be considered. Landscape analysis must provide knowledge of the landscape from a holistic perspective.

It should provide an understanding of natural and cultural conditions, and what function and significance the landscape has for people, animals, and design plants. The analysis includes various aspects such as geology, topography, land use and vegetation, physical structure and scale, cultural-historical and ecological contexts, and visual experience and character. Experts in several subjects therefore need to collaborate on the analysis work.

Analysis and description of the landscape must be adapted to the project's goal, which also encompasses scale and level of detail. It must capture the aspects given expression in the European Landscape Convention. Swedish Transport Administration's interpretation is that the character and function of the entire landscape must be described, even what is sometimes called 'everyday' landscape. The value of the landscape needs to be described from several different perspectives. Ancient monuments, settlements, and cultural-historical relationships provide knowledge of historical development. The values connected to experience can be visual and can create an identity. The landscape may even be a resource for various interests, for example, those living in the area. It is especially important to let residents and those who use the landscape participate in the evaluation.

The analysis covers how the landscape has changed up to the present, its development potential, and its likely development under the null alternative. Historical development is significant for understanding today's landscape with its structures, elements, and land use, and to see "where the landscape is going". For more information, see Swedish Transport Administration's publication: *Infrastructure in the landscape – Landscape analysis advice*.

EXAMPLES OF EVALUATING DEVELOPMENT POTENTIAL

- A field with high biological diversity may require continued cultivation so it does not become overgrown with weeds. In this case, protection of values places demands on accessibility to pastureland and the opportunity for continued use of the land.
- An area important to water supply requires conditions for continued good water quality through eliminating sources of pollution such as salt spreading, contaminant spills, and accidents within the protected area.

THE EUROPEAN LANDSCAPE CONVENTION:

"Landscape means an area as perceived by people, whose character is the result of the influence of the action and interaction of natural and/or human factors"



Analysis of living environment and people's health

Important factors connected to living environment and health are air quality, noise and vibrations, structure-borne noise and electromagnetic radiation, but also barrier impacts and community recreation. Standards and target values are significant for the evaluation, and environmental quality standards for air quality must always be discussed in the EIA. Assessment of health conditions, however, must not be limited to exceeding or falling short of the base values and limit values; it must illustrate the actual disruptions, which groups are or may be subjected, and their sensitivity. It is especially important to analyse synergy impacts

when people's health and living environment are being studied. For example, research has shown

that it is more disruptive to be subjected to both road and railway noise at the same time than only to noise from one means of transportation. It is also important to weigh the health impacts of all the various environmental aspects together, for example air quality, noise and vibrations, and barrier impacts.

Analysis of climate, energy, and economising resources

Climate impacts from road projects originate largely from traffic emissions in the operation phase. This differs from rail projects, where materials consumption and energy use in production of railways are responsible for the largest climate impacts. The choice of measures done in the early planning phases provides good opportunities to influence the climate impacts. Climate impacts, however, need to be analysed in all planning phases, in order to see how they can be minimized.

Proper management of land and water is based on the provisions concerning the management of land and water areas of the Environmental Code, among other things. These specify that priority must be given to land use that management from a general point of view. The regulations cover land and water areas of value or significance for agriculture and forestry, nature, culture, outdoor life, reindeer management, commercial fishing, aquaculture, and extraction of valuable substances and material, as well as facilities for industrial production and communication. Certain areas are of national interest, and these should be protected against measures that can physically damage the value or render usage more difficult.

Land and water analysis from a management perspective must cover the aspects taken up in the Environmental Code, with a focus on the conditions and qualities that the project may affect. The areas of national interest that risk



being affected must be described so that an damage and physical damage can be assessed.

Ground and surface water are important resources regulated by things like the European Council Water Policy Directive and environmental quality standards. In order to be able to guarantee good water quality and access in the future, the issue must be analysed early on in the project.

The concept of management is broader than the management regulations of the Environmental Code. The use of material and energy is extensive in road and rail projects. The issue of materials must therefore be analysed and described from several different starting points, for example the materials requirements for implementing the project, transportation during the operation and construction phase, and stock and withdrawal of material.

Swedish Transport Administration's goal is to minimize resource consumption and energy use from a life cycle perspective.

Environmental conditions and interests in the null alternative

The Environmental Code includes requirements that an EIA must contain a description of the consequences of not implementing the project – the null alternative. The null alternative is described for a certain year in the future, that is, a 'horizon year'. Operation and maintenance of existing facilities are included.

An assessment of future environmental conditions, land use and traffic must be shown in the null alternative.

The description of the existing environment – the current situation – provides a starting point for the assessment of likely future developments without the project.

To create a picture of the future environment in the null alternative, two main questions must be answered:

What will affect the influence area in the future?

Examples could be other road and rail projects, developments like new residential or economic areas, changes in traffic or socioeconomic conditions, and trends like depopulation and overgrowth.

The basis for analysis of future impacts can be found in municipal survey design planning, for example, or in-depth survey design plans, design plan programmes, and baseline traffic flow projections.

What does this entail for changes in the existing environment, and what significance do these changes have?

Examples can be future disturbances from traffic, changes in land use and other developments that are significant for the existing qualities and functions.

Which horizon year should be adopted for the null alternative varies with conditions, and should be discussed among consulting parties in order to garner support.



2.6 IMPACTS AND CONSEQUENCES

Analysing impacts means investigating which measurable or recordable changes in environmental quality the project may give rise to, as compared to development in the null alternative. It is important to start from where you are in the planning process in each planning phase, to adjust the level of detail, and to focus on the impacts regulated in the decisions to be made in the respective phases.

Changes over time

In assessing the project's impacts, the expected duration of the impacts is analysed, since this affects the evaluation of their significance and thereby also the need for measures. Impacts can be short-term and temporary (clouding of water courses, for example), reversible (damage to vegetation during the construction phase), or permanent and irreversible (rock excavation).

Direct and indirect impacts

The impacts of the project are either direct or indirect. Direct impacts are, for example, land encroachment, noise and vibrations from tunnelling, and clouding of water courses. Indirect impacts are consequences (often called secondary impacts) of direct impacts, as well as impacts where the project is a precipitating factor for other projects or events. This could be an issue of the project affecting land use over a longer period through making building development or external nonresidential establishments possible.

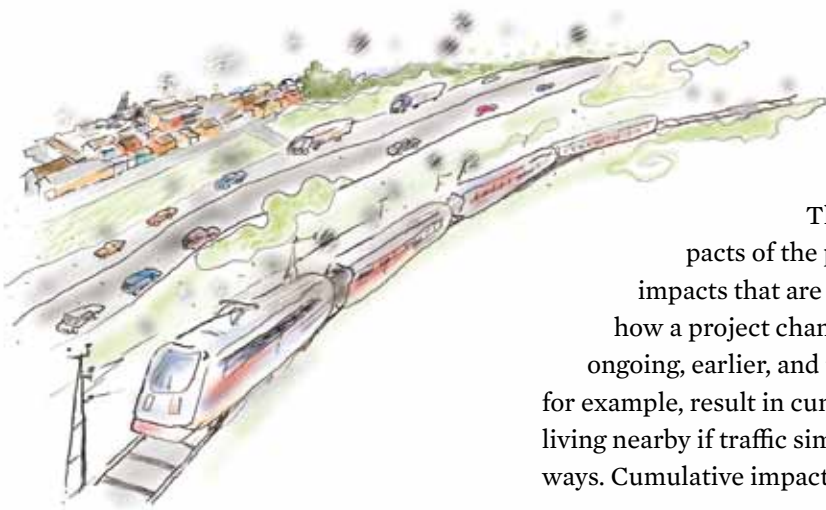
In work on the EIA, the question must be posed whether the project could give rise to other projects or events that could have significant impacts. Factors that need to be observed in analysing indirect impacts are, for example, whether traffic flows will be changed in the surrounding road network, and if the project is being implemented as part of a larger development plan. Indirect impacts that are identified must be assessed and weighed together with the direct impacts.

Projects can include measures that do not lie within the land area established, for example reconstruction of side roads. The EIA must include analysis and reports on the impacts of these measures so as to obtain a holistic picture of the project's impacts and consequences.

Cumulative impacts

The EIA must also deal with the cumulative impacts of the project. Cumulative impacts are direct or indirect impacts that are cumulative, interactive, or additional. They show how a project changes the existing environment along with other ongoing, earlier, and future operations and measures. A project may, for example, result in cumulatively increased noise disturbance for those living nearby if traffic simultaneously increases on nearby roads or railways. Cumulative impacts can also show how impacts from projects can

FIGURE 11.
CUMULATIVE IMPACTS FROM SEVERAL
SOURCES OF NOISE THAT ARE ADDED
TOGETHER AND STRENGTHEN THE
DISTURBANCE EXPERIENCED



affect quality or a value in the environment. The conditions for survival of a frog population can, for example, be limited if there is a cumulative effect of biotope loss, changes in hydrology, and changes in land use.

Analysis of cumulative impacts is important for getting a true picture of the consequences for various interests. When dealing with cumulative impacts, the focus shifts from which environmental impacts the project entails to how existing and future environmental conditions and qualities are changed by both the project and other operations. This means a clearer connection to a sustainability perspective, since the starting point is the development of existing qualities and values.

Assessment of consequences

The EIA must explain to the public, reviewing authorities, decision makers, corporate promoters, and other project participants what the consequences of the project will be and the different alternatives being studied. Consequences deal with the significance of the impacts for various environmental interests, for example, what traffic noise means for the living environment and people's health, or for the value of the cultural environment. The project's impacts are compared against the conditions so that existing environmental assets and qualities remain and are developed. The assessment of consequences must answer the question of what significance the changes have.

The consequence analysis is based primarily on the adaptations and measures that are established and implemented in the project, but other, further measures that are possible and reasonable to implement are also described. If there is any uncertainty as to whether environmental measures will be implemented, it should not be taken into consideration; alternatively, an assessment of the consequences with and without the environmental measures is made. Those reading the EIA document must always understand which environmental measures have been considered in the consequence assessment.

Legal and bylaw requirements express society's appraisal of various interests and indicate which levels for certain environmental requirements are acceptable, and which are not. In the EIA, the impacts must be evaluated with regard to the relevant regulations. This applies, for example, to the provisions concerning the management of land and water areas in the Environmental Code, protected areas, recognised base values and limit values, and environmental quality standards. Evaluation methods and bases for assessment must always be checked with the county council and other regulatory agencies.

An important basis for assessment of conservation interests (natural environment, cultural environment, and so on) is the specific qualities of an area and their descriptions, for example in conservation design plans and descriptions of national interests. The same applies to protective values as established by law.

The starting point is that the project must contribute to national environmental objectives, even if there must always be considerations between different goals. To be useful as a basis for assessment, the environmental objectives need



FIGURE 12.
CUMULATIVE IMPACTS THROUGH RESIDENCE DEVELOPMENT OVER TIME THAT RESULTS IN INCREASED FRAGMENTATION OF THE LANDSCAPE.

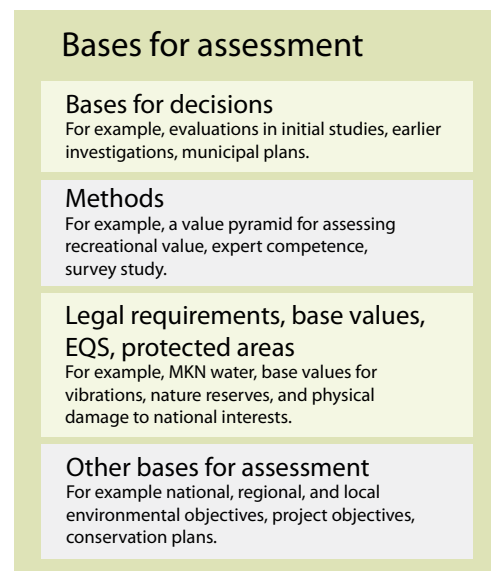


FIGURE 13.
IN ANALYSING THE PROJECT'S CONSEQUENCES, THE BASES FROM WHICH THE ASSESSMENTS WERE MADE NEED TO BE CLEAR. OFTEN THIS IS AN ISSUE OF COMBINING DIFFERENT TYPES OF BASES FOR ASSESSMENT SO AS TO BE ABLE TO EVALUATE THE PROJECT'S CONSEQUENCES.



SUPPORT IN ANALYSING THE PROJECT'S ENVIRONMENTAL CONDITIONS, IMPACTS AND CONSEQUENCES

- Description of environmental conditions and interests

What characterises the influence area?

What impacts could the project entail?

- Evaluation of environmental conditions

What qualities and values are found in the area?

- Assessment of development potential

What is required so that qualities and values remain and are developed?

- The null alternative

What development is likely in the influence area if the project is not carried out?

- Analysis of significance for the project

What demands do qualities and values place on the project's location and layout?

- Analysis of impacts

What impacts could the project give rise to?

- Assessment of consequences

What significance do the impacts have?

Do they play any role?

- Environmental adaptation and environmental measures

How can adaptation be implemented, and environmental measures taken so that negative impacts can be limited or avoided?

to be concretised with regards to the project and area environmental conditions. For this reason, regional and local objectives can be more useful as a basis for assessment. Project objectives for the environment that are anchored in environmental quality objectives can form a basis of assessment for evaluation of alternatives.

Apart from assessment of environmental objectives, standards, base values and expert knowledge, it is important to get an idea of how people who are affected by the project assess the impacts that may arise. This could be an issue of how changes in the landscape are perceived.

Uncertainties

Assessments in the form of predictions always contain uncertainties. These may be connected to future development and the possible impacts and consequences of the project. Uncertainties should be minimized as much as possible. This can be done through deepening knowledge where there are gaps. It is important to make remaining uncertainties and gaps in knowledge clear so that decisions are not made on improper grounds. In choosing a horizon year for the null alternative, uncertainties must also be taken into consideration and described. In certain situations, uncertainties can be made clear through describing a range for the null alternative. Another way is to describe two null alternatives which, for example, could depend on whether a certain development takes place or not. The project's consequences can be compared with current conditions and conditions in the null alternative in order to minimize uncertainties. Uncertainties can also be handled through describing scenarios, for example scenarios in the surroundings that would affect the area in question in various ways.

In the assessments, it is important to be aware of uncertainties and to document them privately so that they can be shown in the EIA document.

Overall assessment

The EIA must make possible an overall assessment of what significance the different impacts that may arise could have for people's health, the environment, and management of land and water areas. This means that an assessment must be made of the overall influence of the individual environmental aspects. This is no less important for conveying which consequences have great significance for the project and how different aspects interact.

2.7 ENVIRONMENTAL ADAPTATION AND ENVIRONMENTAL MEASURES

The EIA must show how the project can be adapted to the environment and propose possible alternative solutions so that negative impacts can be avoided, limited, or ultimately compensated for. This applies both to those impacts that are a consequence of construction and those that are a consequence of operation.

The planning process includes taking into consideration several diffe-



rent interests, which in some cases can be incompatible. For example, noise protection can improve the living environment but make the cityscape less attractive. This means different interests always need to be balanced against each other. The more interests and needs that can come in early on in the process, the greater the opportunities to take them into consideration. If environmental issues are dealt with in later phases as demands placed on a nearly complete solution, the final result in many cases will be worse, and the costs higher, than if the issues were dealt with in an earlier phase.

Figure 14 illustrates this in the form of a curve that shows that the later something is considered, the more resource-intensive it will be.

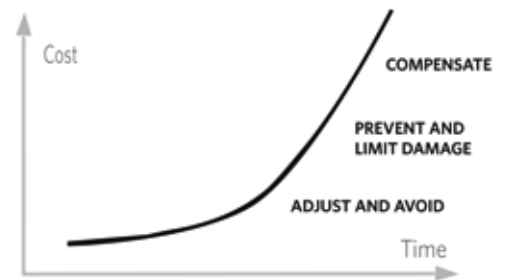


FIGURE 14.
'MEASURE CURVE' THAT SHOWS THE GREATEST ENVIRONMENTAL EFFECT AT THE LOWEST COST IS OBTAINED THROUGH ENVIRONMENTAL ADAPTATION OF THE PROJECT.

1. ADAPT AND AVOID

Environmental adaptation means that environmental conditions are taken into consideration and noted when studying the project's location in level and side view, its construction, and technical solutions. If the landscape's conditions and values are taken into consideration and the project's location and layout are adjusted in the early phases, this can contribute to special environmental measures not being needed later on in the process.

The focus lies on retaining and developing environmental qualities. There may also be shortcomings and problems, for example, a lack of biotopes and barrier impacts from existing roads or railways. With special layout measures, the shortcomings can be redressed by creating ponds, spawning grounds, shade, and opportunities for passage.

2. PREVENT AND LIMIT DAMAGE

Special environmental measures may need to be carried out in order to prevent and limit negative impacts and consequences that cannot be avoided through adapting the project's location and layout. These are often called damage prevention measures.

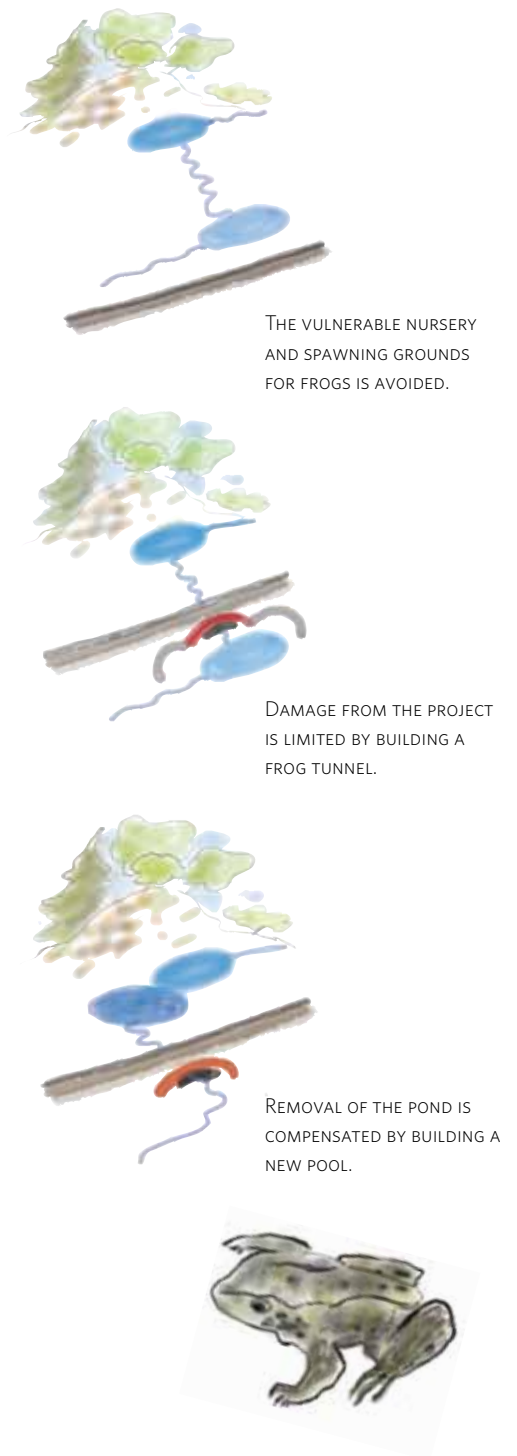
3. COMPENSATE

Compensatory measures occupy an exceptional position and are implemented when damage and serious consequences cannot be avoided. The compensation should apply to the same interest and environmental quality that is damaged. The purpose is for the environmental quality not to be decreased from an overall perspective. Compensation for consequences regarding quality or function should preferably be carried out in the same location.

If this is not possible, the measures may be implemented in another place. Voluntary agreements with landowners and other similar people are often a condition for compensatory measures outside the design planned area. Examples of such measures could be preserving fish in aquatic environment other than the one that is damaged.

Note that in this description the term 'compensation measures' is not used, as it has a meaning within environmental law. See the Environmental Code.

Compensation measures with this meaning are, however, included in the category of compensatory measures as they are described here.





Different types of environmental adaptation and environmental measures

Assessment of the need for measures is based on what impacts and consequences could arise and how likely they are to occur. When needs for environmental adaptation or environmental measures have been identified, cost-effective solutions that can be taken to achieve a certain function are then sought. Sometimes it may be appropriate to show several possible solutions in the EIA.

To capture cumulative impacts, there should be close interchange with other parties who can contribute to such things – the community, landowners, or those running the operations, for example. The focus lies on environmental quality and how it is affected altogether. In the EIA document, the environmental measures and the reasoning that must be carried out by other parties can be listed as “other measures”.

Changes to technical solutions can yield positive environmental impacts. Examples of combination solutions that satisfy both technical and environmental requirements could be when surplus volume is used for loading berms, pedestrian passageways are enlarged to also function as passage for fauna, or the road profile is lowered in order to reduce noise propagation.

Environmental considerations taken in the choice of location and layout of the project must be documented.

EXAMPLES OF ENVIRONMENTAL ADJUSTMENT AND ENVIRONMENTAL MEASURES DEVELOPED DURING EIA WORK FOR HIGHWAY 27, BORÅS TO VÄRNAMO VIA GISLAVED:

- Adaptation of bridge over the Nissan River to make passage under the bridge possible for outdoor life.
- Layout of the bridge over the Nissan and side ditch so that direct release of road surface water is avoided.
- Installation of individual roads on the bridge over Highway 27 so as not to restrict the opportunity for continued use of land on both sides of the road, since it is not possible to create headroom with a gateway.
- Sinking the road profile past Henja from approximately 3 metres to approximately 1 metre to limit the impacts of the road on the surrounding landscape, with a view to such things as noise disturbances for bird life and the living environment in Henja.

Feasibility and functional requirements

The description of environmental measures in the EIA must include purpose and function. As a rule, it is more practical to describe the measure as a functional requirement; that is, what is to be achieved or ensured. When there are requirements that a certain function is to be achieved, the design can concentrate on how it can be implemented. Functional requirements give space to cost comparisons between alternative solutions that fulfil the function being aimed for.

The more a measure is described in detail, the more important it is that it is projected to such a point that feasibility and economy are ensured. With narrow sections, complicated locations, or points that are otherwise critical, the projection must be run to the point that solutions for the functional requirements can be ensured. This places demands on interaction between the various technical areas, but can generate new solutions that give more environmental benefits for the money. Cost assessment of environmental measures must be done as early as possible. This makes a comparison between the cost, function, and benefit of various measures easier.

2.8 THE EIA DOCUMENT

The EIA document is a formal basis for decisions that provides guidance in the choice of alternatives and for confirmation of the design plans. The document is not legally binding and may therefore contain alternative options for action. Adaptations and environmental measures decided upon must be described in the design plan in order to be legally binding.



The County Administrative Board approves the EIA document before the feasibility study or design plan are put on display. Prior to the decision, the County Administrative Board needs to have access to the initial study and the material produced in the feasibility study or design plan.

The approval means that the County Administrative Board takes a position on whether the EIA document contains the information and has the focus and scope needed to fulfil the requirements in Chapter 6 of the Environmental Code.

Focused EIA document

The EIA document needs to have a good structure and be focused on the issues that are essential for the project in order to be easily readable and to function as a basis for decisions. It should be easy to understand which consequences are significant and which measures are required to meet applicable environmental requirements and to obtain proper environmental adjustment.

The principles and framework for the EIA document are discussed early on in the process, both in the design group and with consulting partners. A draft of the table of contents can function here as a basis for discussion and thus contribute to obtaining a picture in common of the document's contents.

The structure of the document is adjusted and adapted, as new knowledge and new needs will come out during the course of the work. Decisions on scoping and focusing on the most essential environmental aspects for the project must give an impression of the focus and scope of the EIA document.

The knowledge base developed must be adapted to the needs of the project before it is worked into the EIA document. One way of minimizing the scope of the EIA document without losing important knowledge is to use a working paper. Only the conclusions and the most essential information from inventories and analyses in the EIA document are brought in.

Some general information for the reader is necessary, but the scope should be limited so that it does not encumber the document and contributes to important project-specific information being pushed into the background. More detailed material can be put into appendices or in separate background documents that can be referred to in the EIA document. This can meet the need for more in-depth and detailed information in some target groups. Another way of keeping the scope of the EIA document down is working more with maps and illustrations.

Quality of the EIA document

The quality of the EIA document is largely determined by the quality of the preceding EIA element. A quality review must always be carried out before the document is submitted to the client for review. A person who did not take part in the work on the EIA should participate in the quality review. The issue of time and budget for the quality review is taken up in connection with the discussion on starting points and frameworks for the EIA.





Contents of the EIA document

The EIA document must reflect the contents of the EIA process. This means that the environmental consequences that were in focus during the process must also be mirrored in the document. In the feasibility study, emphasis lies on comparison of alternative locations, standards, and to a certain extent the framing of principles. Public interests are the starting point. Emphasis in the design plan lies on the consequences of the action chosen, environmental adaptations that have been worked in, and alternative proposals for environmental measures and environmental adaptations.

In projects where the County Administrative Board has made a decision on whether the project is **not** regarded as entailing **significant environmental impact**, the EIA document must contain the information needed to fulfil the purpose in accordance with Chapter 6, §3 of the Environmental Code. This means that the EIA document is adapted to what is needed with a view to the type and scope of the project.

In less complicated projects with little environmental effect, the document must be brief but still useful for the project's formation and choice of technical solutions. The focus and scope of the EIA document must garner support in the county council. By showing a clear scoping, the descriptions can concentrate on the issues that are significant for the project's environmental adaptation.

CHAPTER 6 OF THE ENVIRONMENTAL CODE

The purpose of the EIA is to make an overall assessment of the impacts on people's health and the environment possible.

In projects that are regarded as entailing **significant environmental impact**, the content requirements indicated in Chapter 6, §7 of the Environmental Code must also be shown.

In Road Administration regulations on EIA (VVFS 2007:223) there are further requirements on the contents of an EIA regardless of whether the project can be regarded as entailing significant environmental impact or not, as well as for the various planning phases. This applies formally to road projects, but can be advantageously applied also to rail projects.

The EIA document should, in general, include the following contents

Non-technical summary

The summary should be brief and easy to read. It contains a summary of the different parts of the EIA document. A general map needs to be included so that the summary can be read separately.

Project accounts including location, layout, and scope

The purpose and objective of the project, and any connections to other projects, must be shown. Descriptions can be referred to in the design plan or feasibility study documents, since the EIA must always be shown alongside these. Current and future road and rail traffic are described, as are their locations, scope, and layout. When the project is to be implemented (construction phase), operations and reconstruction that are not part of the project but arise as a consequence – for example, reconstruction of parallel roads – must also be described.

Alternatives, including null alternative



The alternatives that were studied during the process must be shown. In the EIA document for the feasibility study, both the corridors included in the feasibility study and the corridors that were crossed off during planning are to be shown. Alternative layout, detailed location, and technical solutions are described in the EIA document for the design plan.

The grounds for selecting or rejecting alternatives, as well as how environmental consequences have been noted, must be included in the report.

The description of the null alternative comprises, among other things, the horizon year, the traffic situation, and other conditions. Illustrations of alternative layouts, and map materials or photomontages that show alternative extensions, increase readability and reduce the scope of the document. Alternatives and environmental measures that are significant for visual experience of the landscape should be illustrated so that it is clear how it could look. For example, it could be a question of design plantings, noise protection, and the alternatives of a bridge or loading berm. The formation programme can be referred to.

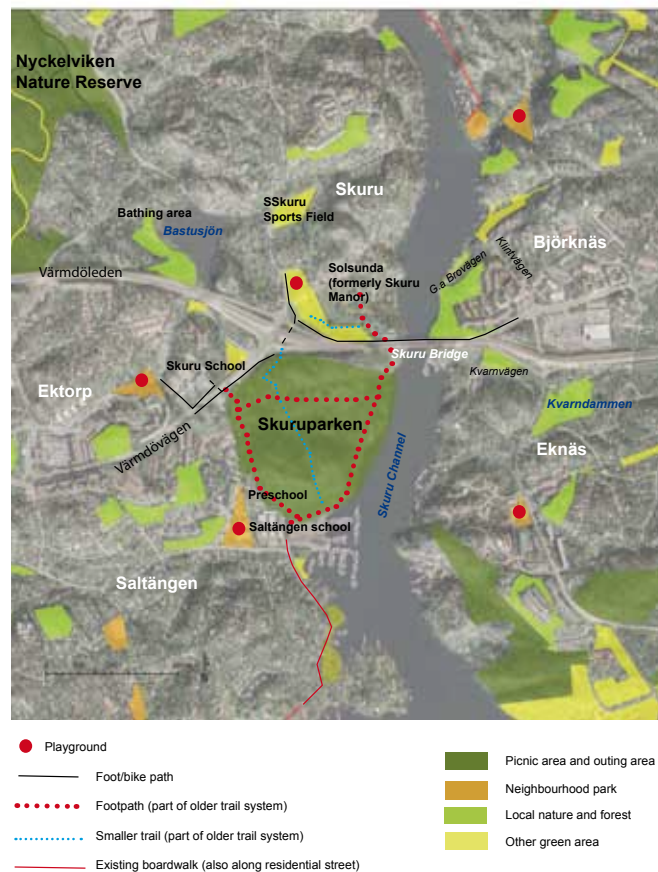
Environmental conditions and interests

The description must include the environmental conditions and interests needed to understand the assessment of the project's impacts and consequences. It should provide knowledge of the conditions as well as qualities, connections, and functions that are significant for various interests (values), but also shortcomings in the influence area.

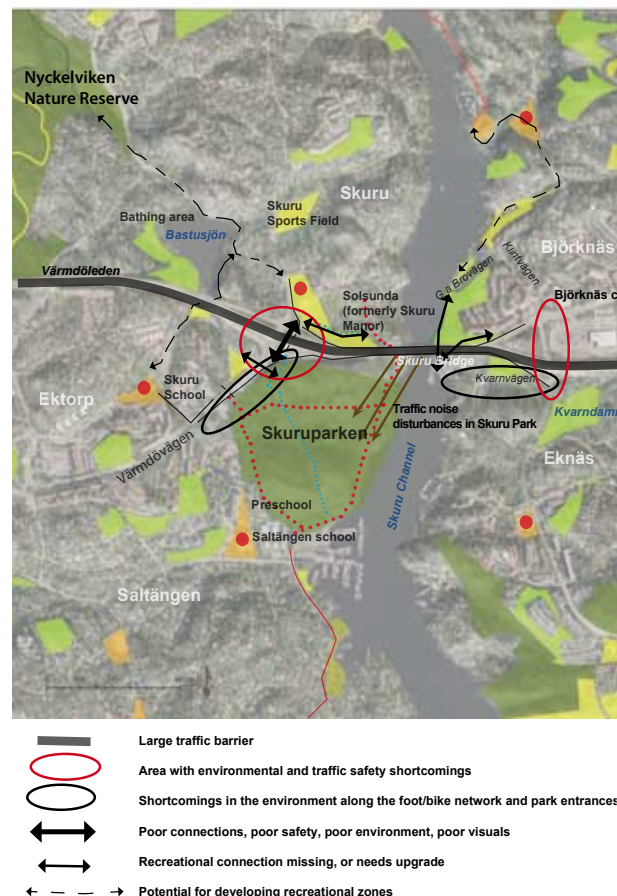
Most of all, it should illustrate the environmental conditions that the

FIGURE 15.
IT IS GOOD IF THE REPORT – IN THIS CASE CONDITIONS FOR OUTDOOR LIFE – SHOWS BOTH QUALITIES AND SHORTCOMINGS, AS WELL AS DEVELOPMENT OPPORTUNITIES. A COMBINATION OF ILLUSTRATION VIA MAPS AND PHOTOGRAPHS MAKE THE REPORT EASIER TO UNDERSTAND. SOURCE: WORKING PAPER FOR THE SKURU BRIDGE (ROAD FEASIBILITY STUDY)

RECREATION – EXISTING CIRCUMSTANCES



RECREATION – SHORTCOMINGS AND DEVELOPMENT OPPORTUNITIES





project may affect (what is called a directed description). The scale should be adjusted according to the phase. Conditions and qualities that will not be affected are normally not shown.

Public interests, such as national interests, designated regional and local interests, and protected areas (for example, Nature 2000 and nature reserves) must also be shown. This report focuses on significant qualities connected to the project, and not only on area limits. The reader should be able to understand which environmental quality standards and national, regional, and local environmental objectives could be affected by the project.

The descriptions are kept project-specific, but if needed general descriptions can be referred to – for example, for protected and designated areas. In the EIA for the feasibility study, important conditions for environmentally adapting the extension and layout in the continued planning are shown.

Scoping

In order to describe the primary impact, a report of the scopings in time, cause, and space implemented during the EIA process is needed. Work on the EIA document is simplified if notes are continuously kept on how the scoping was done, what basic data formed the basis for it, which actors took part, and what the grounds for the scoping are.

The section on scoping should show:

- Scoping of environmental aspects

Description of the environmental aspects that are not reported further in the EIA, as well as the basis and justification for this.

- Which environmental aspects were regarded as essential

Justification for which environmental aspects were assessed as especially significant and which therefore have great weight in the document.

- Level of detail and type of issues based on the design planning phase

Report of which types of issues that are not described more thoroughly with regard to the design planning phase.

- Scoping of influence area as well as horizon year for the null alternative.

Description of the influence area with justification of the scoping made.

It is important that the reader can understand the justification for the scoping and what knowledge it is based on. The report must therefore indicate what consultations, studies, and analyses formed the basis in the scoping, with references to sources. This could be done, for example, in table form as regards environmental aspects. In the ensuing assessment of impacts and consequences in the document, only the environmental aspects brought up in the scoping are dealt with.

Environmental impacts and environmental consequences



In the EIA document, the project’s direct and indirect impacts are shown, as are the consequences for people’s health, the environment, and management of land and water. Both negative and positive consequences are to be described.

The document must focus on essential impacts and consequences, and on those that are project-specific. The report is adjusted to the respective phases. The impacts must be quantified to the greatest extent possible. If there is a risk of cumulative (concurrent) impacts that entail consequences, these must also be described.

The report must then differentiate between the impacts and consequences that originate from the project and those that originate from the project along with other ongoing and planned operations and measures.

The impacts and consequences of the alternatives are shown in a comparable manner and are linked to the null alternative. The report will be clearer if tables, illustrations, and maps are used.

In order for the assessments to be transparent, both objective and evaluative descriptions of how qualities and shortcomings are judged to be influenced by the project are shown. The grounds for assessment, methods, and sources used in the assessment of impacts and consequences are to be shown. Phrases such as “the measure does not impact the natural environment” or

Large impact	Moderate impact	Small impact	Insignificant impact	Positive impact
Significant impact on core areas or migration routes of national interest, or significant impact on the opportunities for Saami communities to cross over to and use important lands. The impact is seen as so extensive that it has effects on fundamental parts of the Saami community’s yearly cycle.	Significant impact on core areas or migration routes of national interest, or significant impact on the opportunities for Saami communities to cross over to and use important lands. The impact is regarded as causing significant negative effects for any winter pasture group.	Small impact on the opportunities for Saami communities to cross over to and use important lands.	Little or no impact on the opportunities for Saami communities to cross over to and use lands.	Improved opportunities for Saami communities to cross over to and use lands.

“the procedure entails moderate consequences” may not be used without justification as to why these conclusions were drawn. By showing both impacts and interests on a map, the consequences can be clearly illustrated.

A number of assessments must be specially adapted and clearly shown with regards to legislative requirements, for example assessments of physical damage to national interests and favourable protection status for Nature 2000 areas. The consequences of the project may need to be shown both with and without measures. This applies especially to environmental measures that are not established or decided on. Residents affected by noise, for example, will want to see in the EIA as a design plan how the noise situation will appear both with and without protective measures. It should be clear which uncertainties exist in the assessments of consequences.

FIGURE 16.
EXAMPLES OF REPORTING OF BASES FOR
ASSESSMENT (FROM THE PITEÅ-SÖDRA
GÄDDVIK RAILWAY FEASIBILITY STUDY).



ces. Scenarios may be one way of showing future uncertainties.

Environmental adaptation and environmental measures

The purpose of the measure must be clear in the report, as must the impact it is estimated to have and what environmental impacts remain. It should be clearly indicated which measures are worked into the project, and consequently also in the design plan, as well as the measures that are only proposed and consequently need to be investigated further in coming phases.

The measures must fulfil the environmental need (function) and must be technically and economically feasible to implement. If it is possible to implement different environmental measures for a certain purpose, the EIA should show the alternative measures as well as their impacts and costs. The significance of the measures must also be shown, with regards to legal requirements such as environmental quality standards, rules of consideration, and ambitions that have been raised for the project such as environmental objectives.

Overall assessment

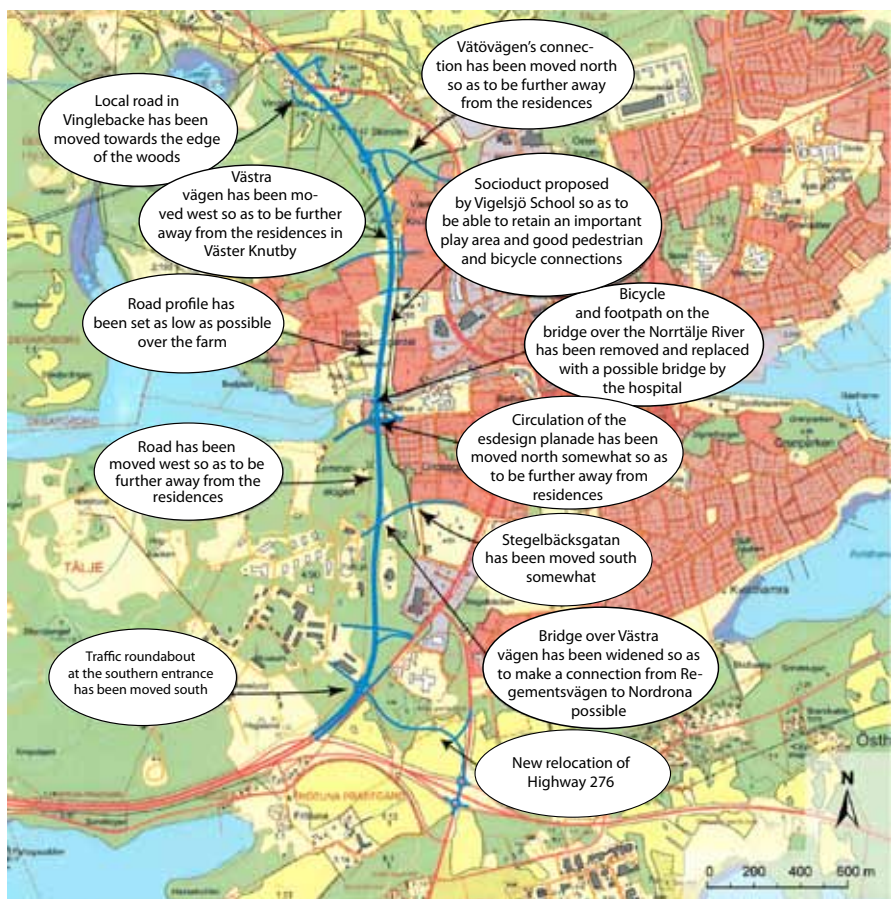


FIGURE 17.
EXAMPLE OF SUMMARY OF CHANGES
OWING TO VIEWPOINTS FROM CON-
SULTATION (FROM THE WORK DESIGN
PLAN FOR THE HIGHWAY 76 PROJECT
IN NORRTÄLJE).

An overall picture of the environmental consequences of the project is shown at the end of the EIA document. This is intended to facilitate an overall assessment of what the project entails for the environment, people's health, and economisation of land and water. The information may be presented in various ways. In general, this is a matter of describing consequences clearly and evaluating them from the relevant bases for assessment.

ENVIRONMENTAL ASPECTS ENVIRONMENTAL INTERESTS	Alternative 0	Alternative 0 +	Alternative A	Alternative B	Alternative C
Landscape character	Impacts with justification based on the bases for assessment shown.	Impacts	Impacts	Impacts	Impacts
Cultural environment	Impacts	Impacts	Impacts	Impacts	Impacts
Natural environment	Impacts	Impacts	Impacts	Impacts	Impacts
Outdoor life	Impacts	Impacts	Impacts	Impacts	Impacts
Health	Impacts	Impacts	Impacts	Impacts	Impacts
Etc.					

In the investigation phase, the report can be done in the form of a table with brief descriptions of the effects and consequences of the alternatives for various environmental interests. Figure 18 shows one of several ways to show an overall assessment for investigation. The consequences of the various alternatives must be shown in relation to the null alternative. Readers must be able to make this assessment on their own based on the facts shown. The report can be supplemented with an illustration (colour scale or similar) that shows an evaluation of the consequences.

Quantified results must be supplemented with justifications in text form. The overall assessment can be supplemented with a report on how the project will succeed in meeting the environmental objectives set. See Figure 19. The report on environmental objectives must be clear in the design documents.

In the design planning phase, the overall assessment in the EIA document can be made up of a brief text that provides an overall picture of the consequences of the project for the environment, people's health, and economisation of land and water.

Consequences must not be summed up in an assessment of which alternative is best or worst from an environmental perspective. On the other hand, interaction between various impacts can be shown so as to illustrate the overall consequence for a given environmental interest – for example, people's health. This includes assessing the current opportunities for preserving the environmental qualities or values and developing them with regard to the current situation and likely future development (development potential).

It should be possible to understand whether environmental measures are included in the assessment shown.

Continued work and follow-up

Evaluation of impacts

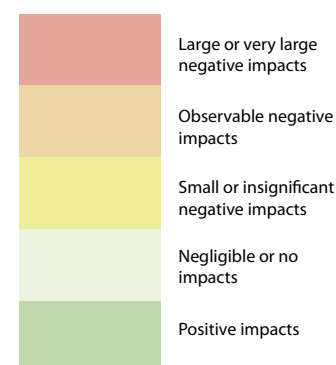


FIGURE 18.
FUNDAMENTAL EXAMPLE OF OVERALL ASSESSMENT FOR FEASIBILITY STUDY. THE REPORT PROVIDES AN OVERVIEW OF THE ACTUAL CONSEQUENCES, THE SCOPE OF THE CONSEQUENCES (EVALUATION), AND THE BASIS FOR THE ASSESSMENT. THE REPORT ON ENVIRONMENTAL ASPECTS SHOULD BE RANKED WITH REGARDS TO HOW ESSENTIAL THEY ARE.

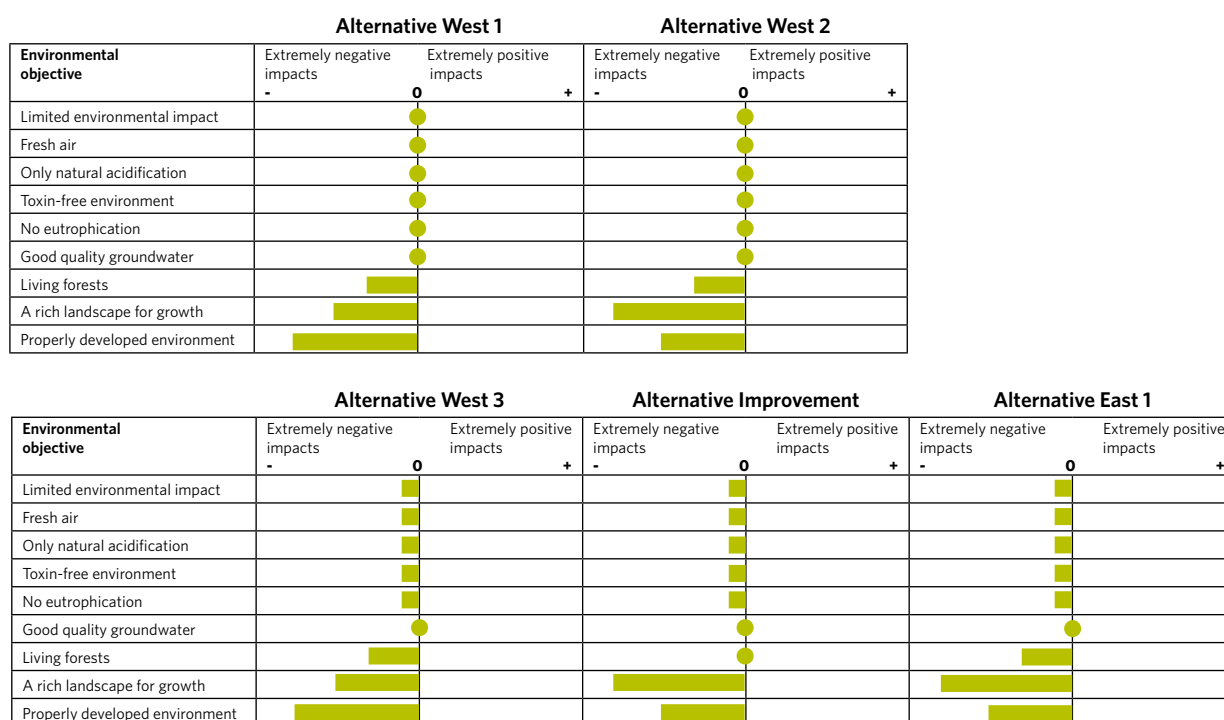


FIGURE 19.
EXAMPLE OF REPORTING FULFILMENT OF ENVIRONMENTAL OBJECTIVES FROM ROAD FEASIBILITY STUDY, CONSULTATION DOCUMENTS, HIGHWAY 45, VATTNÄS-TRUNNA SECTION, ORSA MUNICIPALITY. THE ASSESSMENTS ARE SHOWN IN THE FORM OF AN EFFECT PROFILE WHERE THE CONSEQUENCES ARE EVALUATED FROM "VERY NEGATIVE" TO "VERY POSITIVE". THE EVALUATION IS BASED ON THE NULL ALTERNATIVE, WHICH MEANS THAT THE CURRENT SITUATION REMAINS. DESCRIPTION OF THE TEXT OF THE ASSESSMENTS IS SHOWN IN PARALLEL.

The report must cover which questions need to be investigated in a later phase so as to resolve possible conflicts, prevent damage, and improve the environment. This contributes to a proper EIA process where the right issues are dealt with in the right phase, and to no questions being lost between different phases. Future permit and exemption applications are shown, as are the existing needs for supplementing the basic materials for these applications. The need for follow-up of the impacts and consequences of the project, as well as the justification for follow-up, must also be shown.

Design and layout

The EIA document can either be shown as an independent document or integrated as a discernible part in the overall project report. In the latter case, it must be clear that the section on the EIA is only a basis for decisions and that it is consequently not binding.

The construction of the document and graphic layout are of decisive significance for readability. Competence in graphic design and information should be included in the work. It should be easy for the reader to find the project's most essential environmental consequences and understand the background to the results.

Maps and illustrations are used to make clear where the project is located geographically, to convey the environmental conditions of the project, and show where the primary environmental consequences will appear. Permission is required to use map materials and pictures. The sources must be indicated in the document.

Map materials must often be adapted as regards colours, lines, and more so that what is conveyed is clear. The presentation scale must be adjusted to

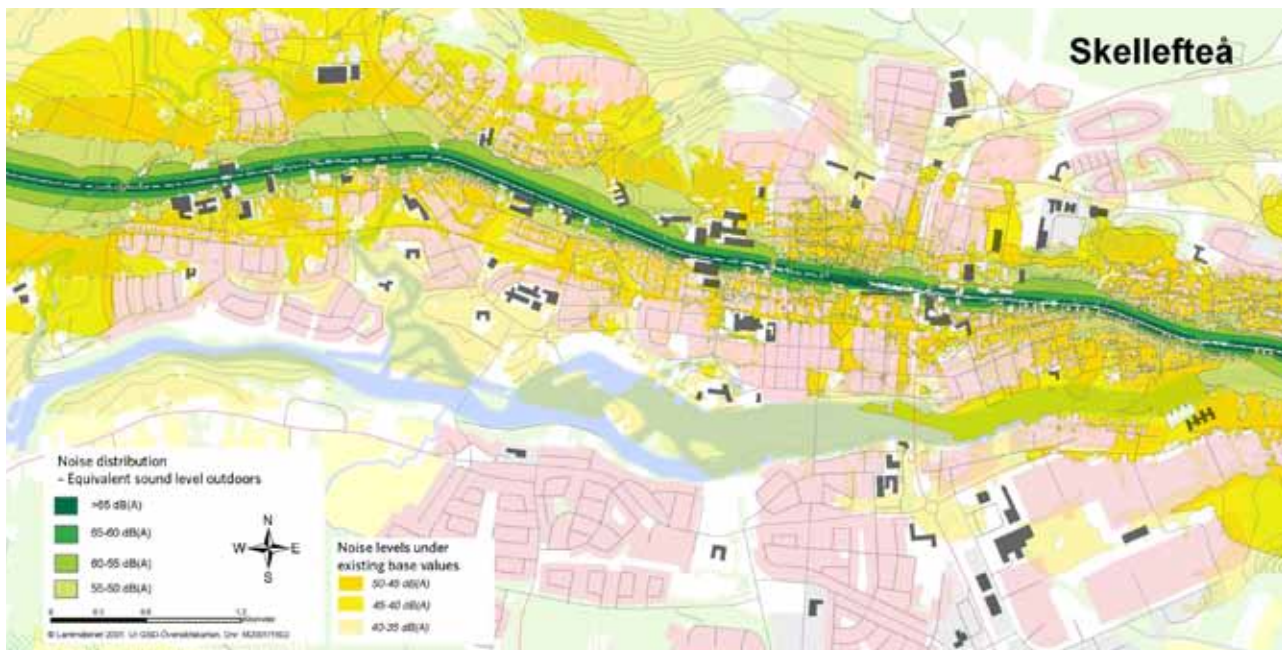


FIGURE 20.
EXAMPLE OF CLEAR PRESENTATION
WITH COMPASS ROSE, SCALE, PLACE
NAMES, AND CLARITY IN ILLUSTRATION
COLOURS.

the respective phases. A common presentation scale in an feasibility study is 1:20,000 – 1:50,000 and in design plans 1:2,000 – 1:10,000.

The maps should be designed so that it is easy to orient oneself, for example, through indicating north, the scale, and place and street names. Towns and locations named in the text must be found on the maps.

Texts and illustrations must interact so as to improve readability. A key to the symbols and text captions, with place and message indicated, must be included as support for the reader. Pictures with no connection to the text should be avoided.

2.9 ENVIRONMENTAL FOLLOW-UP

Environmental follow-up includes measurements and observations of changes in environmental quality, as well as evaluation and analysis of the results.

Environmental follow-up is chiefly carried out in the construction and operation phase in order to deal with uncertainties and to check the project's environmental adaptation. The regulations of the Environmental Code regarding EIA for operations and measures do not include environmental follow-up. It is included, however, in international EIA practice, among other reasons for the purpose of following up and evaluating the actual consequences of a project. The requirements of the Environmental Code for knowledge and self-monitoring may also mean that environmental follow-up is necessary.

For environmental follow-up to have significance for the project's final environmental adaptation, environmental measures are taken if the results of the follow-up show they are necessary.

Sometimes environmentally securing design documents and completed facilities counts as environmental follow-up. This includes following up on environmental measures being established and implemented.

There are similarities and differences between checks in the construction



Environmentally securing design documents and completed facilities

Ensures that environmental measures decided upon are communicated between design phases and that they are implemented.

Checking environmental quality during the construction phase

Ensures that a certain environmental quality is achieved during the construction phase. Checking takes place with measurements and observations in accordance with an established control programme.

Effect follow-up

Ensures that the impacts and consequences of the project fall within the framework of the assessments that were made. Used as a basis for decisions around further environmental measures, as well as providing feedback on different types of effects and measures.

FIGURE 21.
DIFFERENT TYPES OF ENVIRONMENTAL
FOLLOW-UP USED FOR ROAD AND RAIL
PROJECTS, AND THEIR PURPOSES

TIPS PRIOR TO ENVIRONMENTAL FOLLOW-UP:

- Base the need for follow-up on uncertainties in assessments, the significance of the impacts, the need for self-monitoring and handling of risks.
- Show the purpose and goal of the follow-up, as well as how the results are to be used.
- Make sure that the preliminary data (reference value) is gathered properly well in advance.
- Clarify responsibilities and financing of the environmental follow-up.
- Garner support for the environmental follow-up with the regulatory agency.

phase and effect follow-up Both include measurements and observations of changes in environmental quality, but the effect follow-up lasts longer as a rule, and also includes the operation phase. As a rule, more in-depth and comprehensive analyses of results are made in effect follow-up, and an important aim – apart from environmental adaptation of the project – is providing knowledge feedback. Checks during the construction phase are an important tool for handling the environmental risks identified in the project.

The EIA document must contain a clear description of the need for follow-up and the grounds for it. A more in-depth description of how the environmental follow-up is to be implemented, however, is made in a special control or environmental follow-up programme. Preparations for implementing environmental follow up must be found throughout the entire EIA process. Data on what applies before the project starts may need to be gathered through measurements and observations even during the design planning phase.

The collection of preliminary data is to be coordinated to the greatest extent possible with the collection of knowledge of the environmental conditions or with other knowledge gathering in the project. The environmental follow-up programme should be worked out in consultation with the regulatory agency.

Advice on environmental follow-up can be found in the “Miljöuppföljning av väg- och järnvägsprojekt” (Environmental follow-up of road and rail projects) handbook.

3 EIA – a part of planning and design



Perhaps the biggest challenge of EIA is successfully integrating environmental issues in the planning and design process. To achieve this requires dealing with the right issues in the right phase, and close coordination and connections between the processes and knowledge transfer between the phases. This chapter will provide you with knowledge of how to achieve an effective integration of the EIA.

3.1 ENVIRONMENT – A GREEN THREAD RUNNING THROUGH PLANNING AND DESIGN

EIA is support in the project for ensuring that sufficient consideration of the environment is taken during the planning process. The environment must run like a green thread through the planning process, from the early strategic phases up to operation of the new facility. In order to properly integrate environmental issues, dealing with the right issue in the right phase is required, and at the same level of detail as other design documents. What follows is an overall description of how the environment comes into the various phases of the project.

In strategic planning, the main focus lies on environmental issues of a global, national, and regional character. The analyses include, among other things, measures that can influence the choice of mode of transport. The knowledge gained from the environmental assessment and EIA in this phase must be taken into consideration in the EIA at the project level in order to obtain a smooth, efficient process.

A more in-depth analysis of needs and measures is conducted in the initial study. This also includes measures for using existing roads or railways more efficiently. In the initial study, consultation provides opportunities to obtain knowledge of the environmental conditions of the project and to detect and deal with conflicts early on. Environmental analyses in the initial study aim at calling in and illustrating significant environmental issues, and influencing the choice of measures. The initial study also provide a basis for formulating goals for environmental adaptation of the project.

In the feasibility study, the EIA above all takes up issues of significance for location, both for finding a suitable corridor and for comparing alternative corridors. The consequences for public environmental interests carry a lot of weight in the feasibility study. The EIA also illustrates environmental

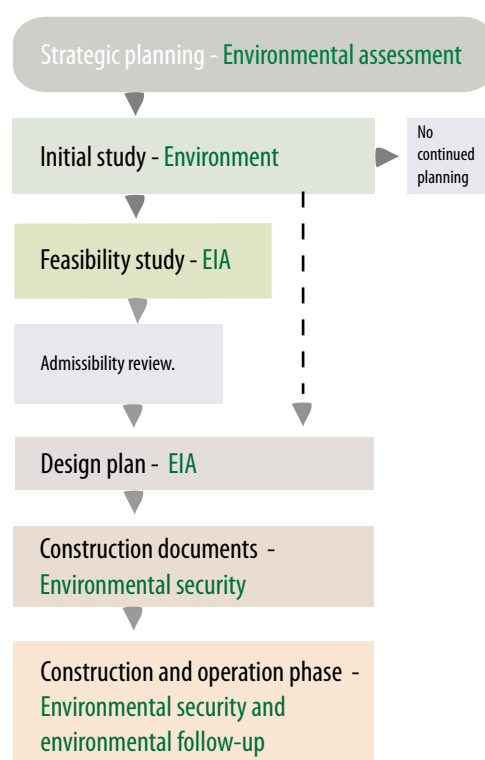


FIGURE 22.
ENVIRONMENT IN PLANNING AND DESIGN.



measures and adaptations that can be implemented in order to minimize negative consequences of the alternatives studied.

In the design planning phase, the EIA must contribute to the project being designed and implemented in a way that is adapted to the environment. Decisions on environmental adaptation and environmental measures are described in the design plan. When the facility and environmental measures are designed, the operation phase must also be taken into consideration. A life cycle perspective can contribute to less energy consumption and carbon dioxide emissions. The land area established in the design plan must preferably include the environmental measures decided upon; otherwise voluntary agreements with landowners are needed.

In the construction documents and in the construction phase, the design plan's ambitions and requirements for environmental adaptation must be ensured. It is therefore especially critical that knowledge is transferred between the design planning phase and the construction phase. Technical solutions and environmental measures are design planned in detail during the work on the construction documents, and knowledge of the purpose and function of each environmental measure is then needed.

Environmental follow-up aims at, among other things, checking that the environmental adaptation of the project has been implemented, and that assessments of the impacts and consequences correspond. It must also provide increased knowledge.

The operation phase is of great significance in order for environmental measures that have been implemented to fulfil their function over the longer term. Design plantings, surface water and passages for animals are examples of environmental measures that require special handling. It is therefore important to include care requirements in the EIA and to hand them over properly to the management organisation. During the work on construction documents, more in-depth analyses of environmental risks that need to be dealt with and fixed are carried out.

Project objectives

Project objectives are a tool that provides guidance and opportunities to direct the project throughout the planning, design, and construction phase. They show how the project must contribute to transportation policy goals. The project objectives for the environment are a part of the project's common goals and have a clear connection to the environmental quality objectives that are relevant to the project. The objectives are formulated based on site-specific needs and conditions, and convey the qualities that are essential for the project to achieve.

The project objectives for the environment must serve as a guide for the project, and thus has support from the EIA process. Among other things, the analysis of the project's environmental conditions, interests, and development potential form the basis for selecting the project objectives for the environment. Project objectives can, in turn, supplement the grounds for assessment in the EIA in analysing the environmental consequences of the project. Target achievement analysis can also supplement the picture of which environmental adaptations and environmental measures need to be implemented in the project.

The road lies in an area with great natural and cultural environmental value and has great significance for outdoor life. The project objectives were formulated with the help of value descriptions developed for natural and cultural environments, as well as the national environmental quality objectives that were regarded as relevant for the project. The objectives are expressed as a quality with exdesign planatory texts:

Conditions for open landscape exist

To fulfil several of the project objectives, it is of decisive significance that the conditions for practising economically profitable and sensitive farming do not worsen, which permits keeping the landscape open for use and conservation of species-rich meadowland and pasture.

The objective entails a new or reconstructed road not worsening the physical or economic conditions for practising agriculture with its current scope and focus. Available cultivated agricultural land is not substantially reduced. The road does not form a barrier to agriculture and does not isolate unprofitable units. The objective of conservation of agricultural land can also be justified from the standpoint of economisation of resources.

The area is attractive and available for outdoor life and tourism

The area is attractive and available for outdoor life and tourism

The objective entails a new or reconstructed road not changing the character of the landscape in the area as a whole to such an extent that its attractiveness for outdoor life enthusiasts decreases. Target points of significance for outdoor life can be reached on foot or by bicycle. The thoroughfares that can be used are direct and readily available. The value and accessibility of especially attractive areas is protected, and they can be experienced without substantial road traffic noise.

Especially attractive areas are listed below. These are described further in the EIA.

- Siljansleden (bicycle trail) - Orsasjön beaches (national interest, water activities, swimming)
- Enån (proposed for Nature 2000) - Turistvägen (picturesque views over Orsasjön)
- Skeer (Folkets Park) - Kårgärdesprofilen (geologic value, included in Stenriket)
- Lindänget (Nature 2000, bird-watching)



EXAMPLE OF PROJECT OBJECTIVES DECIDED UPON FOR NATURAL AND CULTURAL ENVIRONMENT IN ROAD FEASIBILITY STUDY FOR HIGHWAY 45 BETWEEN VATTNÄS AND TRUNNA.

3.2 COLLABORATION WITH MUNICIPAL PLANNING

There is a strong connection between transportation and housing structures. Collaboration between Swedish Transport Administration and the municipality contributes to more coordinated planning and makes it easier to implement measures according to the 'four step' principle. It also makes it easier to adapt a road or railway project to public interests and to anchor the project proposal in the municipal design plans.

The comprehensive plan describes future development with regard to the public interests in a municipality. It shows how the municipality wants to manage land and water areas in the longer term in accordance with provisions concerning the management of land and water areas in the Environmental Code. The comprehensive plan is therefore of great significance for transport planning.

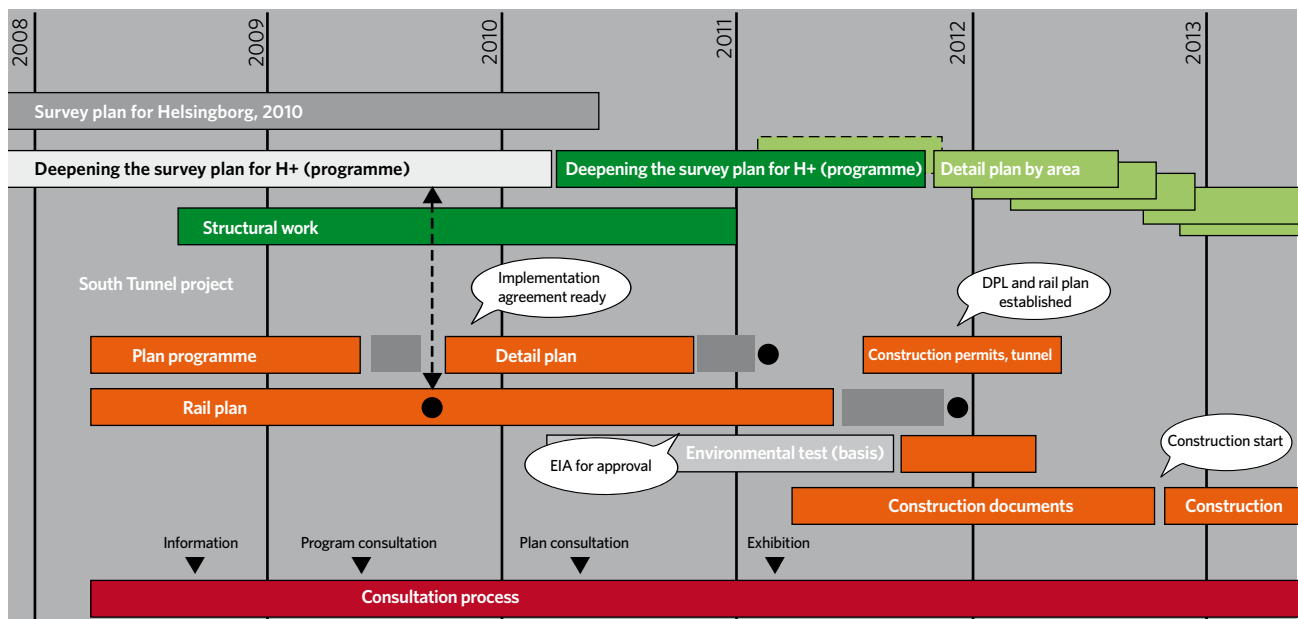


FIGURE 23.
EXAMPLE OF TIMETABLE FOR THE SOUTH TUNNEL IN HELSINGBORG, WHERE THE EIA PROCESS, WITH CONSULTATION, COMPILATION OF BASIC DATA, AND MORE, WAS IMPLEMENTED SIMULTANEOUSLY FOR THE MUNICIPALITY AND FOR SWEDISH TRANSPORT ADMINISTRATION. A JOINT EIA GROUP WAS CREATED AND MET REGULARLY.

A road or railway project can involve the need to develop or change a detailed plan (if the project does not conform to the detailed plan). An EIA for a detailed plan is worked out if it is regarded as having significant environmental impact. The EIA processes should then be coordinated so that duplication of work is avoided and things are made easier for those affected by the project. In certain projects it may be appropriate to create a joint EIA group. If either the detailed design plan or the road or railway design plan has already been developed, there should be a feasibility study into which parts of the EIA could be reused – for example, the knowledge base that was developed.

3.3 ENVIRONMENTAL TESTS, REPORTS, AND EXEMPTIONS

Certain activities in the project may be subject to authorisation or subject to declaration according to requirements in the Environmental Code or other environmental legislation. It can, for example, apply to water-related operations or environmentally hazardous operations. The project can also entail consequences for species, areas or biotopes, and exemptions covered by general protection regulations according to the Environmental Code, for example regulations on ancient remains, nature reserves, and biotope protection. In the EIA process it is important to chart early on whether there are such areas or species, so that negative consequences can be avoided. When it is not possible to fully avoid such, exemptions may need to be applied for. The starting point is firstly avoiding negative environmental impact, subsequently adapting, and finally applying for permits, exemptions, or reporting when it is not possible to avoid negative impact.

Environmental tests are often a critical factor in project timetables. Therefore, issues that are connected to any environmental test need to be analysed in parallel with other environmental issues in the EIA for the project. This analysis needs to be initiated early in the project, both so as to be able to adapt the measures so that negative impact can be avoided, and so as to produce the right basic data in time for any environmental test.

This applies, among other things, to permit applications for Nature 2000. There are opportunities to make planning and design more efficient if the EIA for the environmental test can be based on the same knowledge base as the EIA for the project. For example, inventory of protected species should be at a level of detail such that the basic data can also be used as basic data in any application for an exemption from species protection regulations.

Work on producing a basis – for example, for water-rights judgements and permits for environmentally hazardous operations – is to be initiated in the design planning phase at the latest so as to avoid delays in the subsequent phase. It is also appropriate to hold consultations for any environmental test alongside consultations for the project. This helps avoid the ‘consultation fatigue’ that can easily occur. Even the county council looks favourably on dealing with both EIA for projects and environmental tests at the same meeting. This gives them greater opportunities for coordinated management.

3.4 OTHER ANALYSES AND TOOLS IN PLANNING

Analyses for various areas are carried out in the planning. Coordination between these is needed so that the work is efficient and the knowledge is properly taken into consideration in the project. See also Section 1.3. Formation programs, risk analysis, and traffic analysis are examples of analyses that coordinate with the EIA. See Figure 24. This means that certain issues can be investigated as part of the EIA but shown in other project documents, or that certain aspects in the EIA can be investigated in a related analysis but shown in the EIA document.

For the work on various analyses to be effective, it must be clear who (for example which technical area) is responsible for the analysis and how the coordination is to take place. The basic data and knowledge needed for several analyses should be produced in common so as to avoid duplication of work. A landscape analysis is, for example, a basis for both the EIA and the formation programme. The results of an analysis may be needed for other analyses. One example is traffic data that is the basis for estimating air quality and noise in the EIA. It is also important that input data used in the national economic calculations agree with the EIA.

The EIA should focus on issues connected to the environment and health so as not to be too exhaustive. A clear definition of what is included in the concepts of environment and health, however, is lacking. Every result from various analyses that is to be shown in the project documents must therefore be discussed in every project. In the documentation it must be clear which issues and consequences are to be shown in the EIA and the other project report respectively.

Reporting principles for the project must garner support from the County Administrative Board. In certain cases it may be advantageous to combine reports of certain analyses, even if parts of the results belong in the EIA – the risk analysis, for example. References can then be made in the EIA to the relevant parts of the risk analysis. Alternatively, certain results can also be described in the EIA.



OPPORTUNITIES FOR COORDINATION BETWEEN THE EIA AND ENVIRONMENTAL TESTS

- Basic data
- Inventories
- Consultation

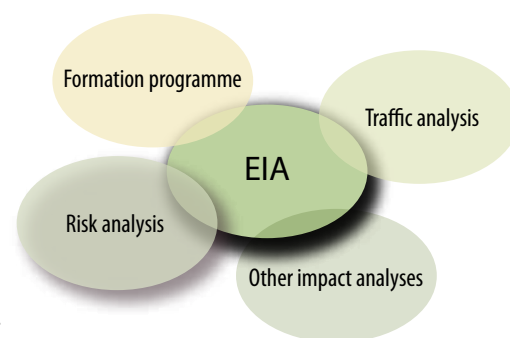


FIGURE 24.
VARIOUS ANALYSIS AREAS THAT
COORDINATE WITH THE EIA

AN ENVIRONMENTAL COORDINATOR SHOULD:

- understand which environmental issues need to be illustrated and what knowledge should be produced in the EIA work
- staff the EIA group with people who complement each other as regards expert knowledge and experience
- put together, lead, and direct the EIA work so that it has the proper scope, focus, and depth from a holistic perspective
- be able to communicate with the person responsible for the environment – and the project leader – with the client, as well as with experts from other technical areas in the project group.

EXAMPLE OF WORKING PAPER:

In work on the railway feasibility study for the Hamnbanan from Eriksberg to Pölsebo, which was carried out during 2010, the consultant required a working paper be shown for both environment and technology, respectively.

The working paper was produced after the initial inventory phase and after the search for alternatives.

The results were presented at a joint project meeting.

The method gave the project participants a common picture of the project's development, and technology and environment could easily be integrated into the project.

3.5 CONDITIONS FOR AN INTEGRATED WORKING METHOD

In order to successfully integrate environmental issues and the EIA in the planning process, there must be an environmental coordinator in the consultant's EIA group. Also of significance is that the environmental coordinator has a clear role, that the right environmental competences are brought into the project, and collaboration takes place across competence borders both within the consultant's project organisation and between the client and the consultant.

Competence within the consultant's EIA group

The overall competence in the consultant's EIA group and coordination with the other project groups is essential for environmental adaptation of the project. A person with overall responsibility who coordinates the EIA work (an environmental coordinator) is therefore needed. What knowledge and experience, and which personal qualities, are needed for the role depend on how comprehensive and complicated the project is. In general, the environmental coordinator should have broad knowledge within the environmental field and experience in work on EIAs in road or railway projects. It is also an advantage if the coordinator has general technical knowledge and understands the advantages and disadvantages of various technical solutions. Creating a proper work climate in the EIA group and bringing about collaboration between project management and other technical experts is also an important function.

The EIA group's summary must be adapted to the environmental impacts the project could give rise to. In smaller projects, the environmental coordinator alone can often deal with large parts of the EIA work, with support from environmental experts in the critical areas. In larger projects, a group that includes experts from several areas of competence is needed.

Experts in various subject areas contribute in the parts of the EIA work that require special analysis. It is important that the purpose of the analysis to be carried out is clear so that the results are useful. Within the EIA group, good knowledge and experience of road and railway design planning is needed so that analyses and assessments can be adapted to the project.

Editorial and graphic design competence is also needed in the EIA group, since this has great significance for how its contents are presented. Good knowledge of GIS is also needed, as is the ability to present analysis results with the help of maps.

Collaboration across competence borders

People with different competences need to work in common on proposing solution and working out alternatives during the design planning process.

The environment is one of several technical areas that affect the development of the project. Participants in the project group should have the ability to modify requirements and suggestions from their area to meet the requi-

rements of others without important and necessary functions being lost. This assumes understanding of other technical areas, and also a certain basic knowledge of these. All participants in the project need to understand, and consequently also stand behind, the reasons and considerations that lie behind the final result.



Organisation, roles and responsibilities

The client's project organisation and the consultant must make work on the EIA and development of the project easier. Environmental competence must be included in project management and at project meetings. This is necessary for environmental issues to be taken into consideration in the decisions made, and for the EIA group to obtain continual information on what's happening in the project.

Planning the project's various meetings (internal consultant meetings and meetings between client and consultant) and who participates is of great significance for integrating the working method. It is important that they understand each other's starting points between the various technical areas, and that solutions and alternatives are discussed from various angles of approach. In each project, opportunities must be provided for participants from all the technical areas to gather together and discuss the project. The person in charge of the project at the consultant should also participate in the EIA meetings in order to follow the work on the EIA and function as a link to the other parts of the project. It is also good if the person responsible for the EIA at the client participates in the consultant's EIA meetings.

An important factor in bringing about properly functioning communication and collaboration is that the client and the consultant have natural entry into each other's organisations. If the organisations, for example, reflect each other, natural contacts are created and both organised and spontaneous balance occurs.

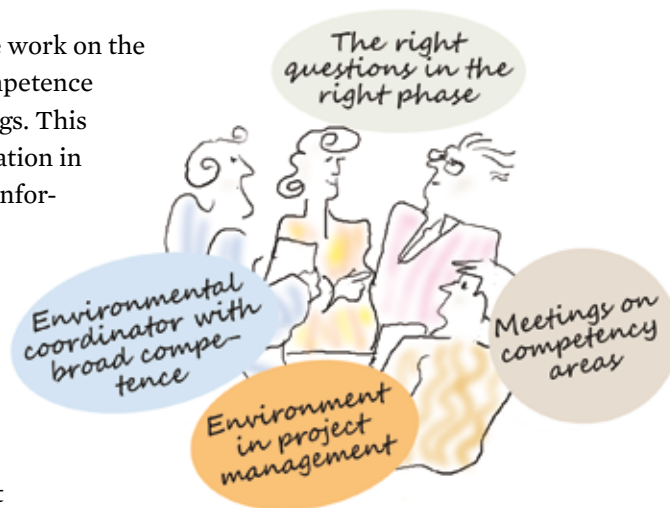


FIGURE 25.
CONDITIONS FOR AN INTEGRATED
WORKING METHOD

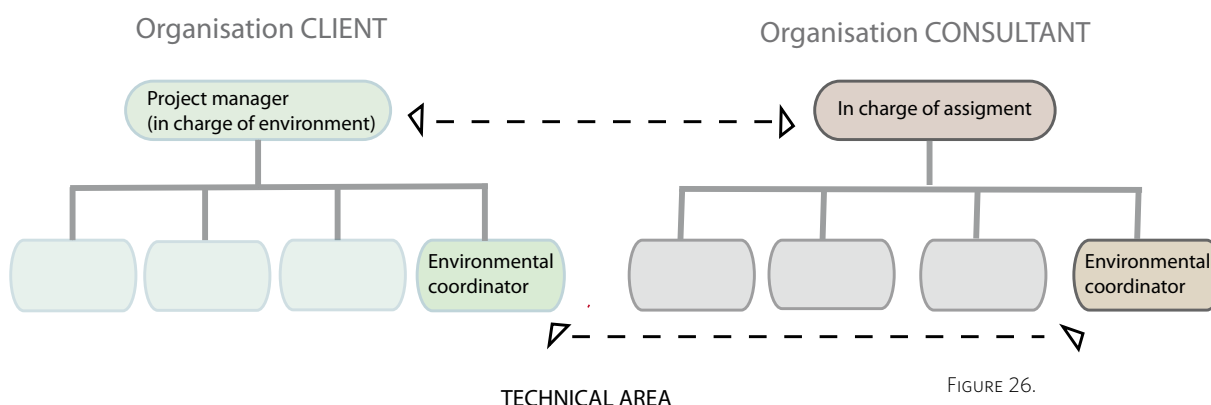


FIGURE 26.
ORGANISATIONAL CHART OF HOW THE
CLIENT'S AND CONSULTANT'S ORGANISA-
TIONS CAN REFLECT EACH OTHER. THE
DOTTED LINES SHOW COMMUNICATION
BETWEEN CORRESPONDING LEVELS IN THE
CLIENT AND THE CONSULTANT.



Roles and responsibilities must be clear for participants in the EIA work, both between client and consultant and internally in the client and consultant, respectively. This contributes to everyone knowing what is expected of them.

The roles of the client, the consultant, and the county council in EIA work are described in the table below.

<i>Actor</i>	<i>Role</i>
SWEDISH TRANSPORT ADMINISTRATION	Swedish Transport Administration is responsible for what is written in the EIA and for integrating the EIA into the project (environmental measures worked in, and so on) and for all formal contacts with the authorities and other consulting parties.
CONSULTANT	<p>The consultant is responsible for ensuring that the contents of the EIA are sound, transparent (that is, sources and uncertainties are clearly shown) and objective. The EIA consultant's organisation is responsible for assessments in the EIA based on its expert role.</p> <p>The consultant produces the basic data and can be the rapporteur in consultations.</p> <p>The consultant must safeguard their integrity and work professionally according to international EIA best practices.</p>
COUNTY Administrative Board	<p>The County Administrative Board initially has a service-focused role through giving advice and guidance on such things as scoping and content in the EIA. All viewpoints from the County Administrative Board should be coordinated by a designated administrator.</p> <p>After the initial consultations, the County Administrative Board takes on a traditional agency role.</p>

3.6 INITIAL STUDY



The purpose of the initial study phase

The initial study are an inventory phase based on the 'four step' analysis that was initiated in strategic planning. The purpose of the initial study is, based on the purpose and objectives of the project, to carry out consultations, to collect existing information, and to analyse needs and problems as well as conditions and values in the area. The initial study also include working out goals for the project and continued work, proposing solutions, and describing possible environmental measures. The initial study are a basis for the County Administrative Board's assessment of whether the project can be regarded as entailing significant environmental impact.

THE CONCEPT OF MEASURE is used in this section for the general concepts that are investigated in accordance with the 'four step' principle and must not be confused with environmental measures. Measures in this phase deal with seeking alternative general concepts and combinations thereof in accordance with the 'four step' principle.

Environment in the initial study phase

In the initial study phase, the EIA process is initiated through consultation and the County Administrative Board's decision on significant environmental impact. There are no formal demands on the EIA document in the initial study, but the environmental issues must be illustrated and taken into consideration during the selection of measures and must provide proper grounds for continued design planning.

Previous choices of measures are of great significance for environmental adaptation. The work with the environment in the initial study must therefore contribute to an open, impartial analysis of measures according to the 'four step' principle.

Values and shortcomings in the influence area, as well as the qualities that are to be achieved in the project, must be illustrated and must be the starting point for developing measures. The environmental consequences of measures studied must be described clearly in the initial study, as the basis for choice of measures and the focus on the EIA in the subsequent phase.

The consultation carried out has an important role through contributing to dialogue and anchoring in an early phase, before there are deadlocks. It must be characterised by openness, with the opportunity to influence the identification of conditions, needs, and measures.

Work with the environment in the initial study phase includes the elements described below, and the results are shown as a part of the initial study document.

1. Starting points and framework

In order to be able to plan and organize the framework for the project, the project group must be properly versed in its starting points. They need to know the background, what analyses were carried out in previous phases, and existing material that affects the project and environmental conditions. It could be an issue of the national transportation plan with the EIA as well as idea studies, thoroughfare analyses, and need, market, and capacity studies carried out as a basis for the selection of measures. They also need to know which measure analyses were carried out previously according to the 'four step' principle.



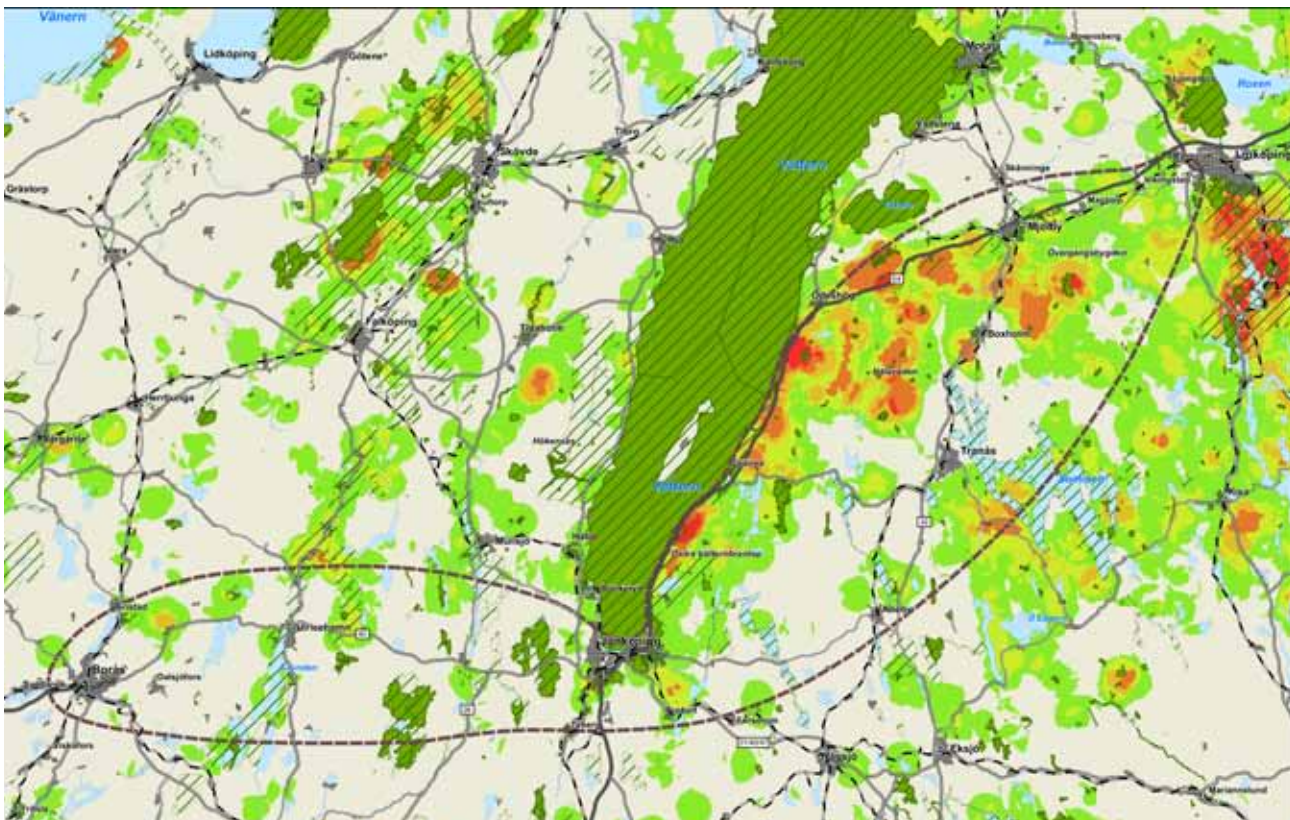
The structure and focus of the initial study are to be planned in an early phase. This is an issue of, for example, which analyses need to be carried out in order to gain knowledge of problems, needs, and conditions, on the size of the feasibility study and influence area, and which steps of the 'four step' principle the measure analysis should include. This is also an issue of organisation and the need for competence. The environmental issues must be included in these discussions so that they are taken into consideration when setting up the framework for the preliminary studies work. How the work with environmental issues is to be integrated into the rest of the preliminary studies work is also an important part. It is then an issue of environmental competence being included in the project organisation and participating in the project meetings.

The consultation has a central role in the initial study phase, and planning its focus, scope, and circuit with regard to the needs of the environmental issues is therefore an important part of organising the framework for the environmental work.

2. Environmental conditions and interests

In the initial study, an first analysis of environmental conditions and interests in the area that could be affected by the project is carried out. The work is begun with information collection that is based on the environmental aspects described in Chapter 6, §3 of the Environmental Code. The collection of information is limited to what is relevant for the project, and is based primarily on existing material with a focus on public interests. This could, for example, be descriptions of natural and cultural environments from the municipality's general plan, map materials, and other types of inventories that were previously carried out.

FIGURE 27.
EXAMPLE OF REPORTING OF IDENTIFIED
AREAS WITH NATURAL VALUE. SCALE
FROM GREEN WITH SPORADICALLY
COMBINED VALES TO RED WITH HIGH
COMBINED VALUES (FROM PRELIMINARY
STUDIES OF THE GÖTALANDBANAN
FROM LINKÖPING TO BORÅS).





The report in the initial study may not stop at existing basic data such as the county council's GIS layer. A deeper project-related analysis of the material collected is required in order to get a picture of the values and shortcomings that may be significant in the choice of measures.

The analysis starts from a (national perspective national interests and protected areas must always be dealt with) and a regional and local perspective. In order to evaluate the significance of the environmental conditions for various interests, relevant bases for assessment are used, such as base values, environmental quality standards, environmental objectives, and evaluations done by the public, authorities, and experts concerned. The analysis should lead to a clear holistic picture of environmental conditions and interests, with clear descriptions of the values of the area and the qualities they are formed from. If special needs or conditions must be met for the values to be developed positively, this should also be described.

Visits are needed to interpret the material collected and put it into context, but in general no field inventories are conducted in this phase. On the other hand, the need for inventories in later phases with regard to the gaps in knowledge that were noted, and the need for a knowledge base in the environmental tests that may be topical, is identified.

Information collection and analysis is carried out in consultation with the public, organisations, and authorities. The consultation provides the opportunity to make use of knowledge, get help in focusing on the right environmental issues, and build a consensus around the evaluation of possible environmental consequences. Prior to the consultation, good basic data in the form of maps and illustrations that account for the environmental qualities and shortcomings of the influence area is needed.

It is written into the Environmental Code that the County Administrative Board must work during the consultation to give the EIA the objective and scope needed for the permit review. Consensus with the County Administrative Board on which environmental aspects are essential and which are not likely to affect the project simplifies the continued EIA process where scoping is an important part. When the influence area is marked off, indirect and cumulative environmental impacts – for example those connected to traffic flow – need to be taken into consideration so that the area is not too narrow. Questions concerning scoping are continually documents during the preliminary studies work so that they are a support for the work on the EIA in the subsequent phases.

During consultation, the County Administrative Board decides whether the project should be considered as entailing significant environmental impact. It is important that the County Administrative Board document the justification for the decision. The consultation proceedings must be adapted to the complexity of the project. In simpler projects, a written consultation with the county council is often enough.

Knowledge of environmental conditions and interests can also be used to formulate project objectives for the environmental qualities that are to be achieved in the project.

EXAMPLE OF CLEAR DESCRIPTION OF VALUE

The Stjärnan Gorge is a valuable biotope. The values are connected to the stream environment with older coniferous and deciduous trees, an abundance of fallen trees, and an herbaceous layer rich in vegetation. Protected hydrology is a prerequisite for preserving the natural values, as is that no direct encroachments are made in the stream gorge.

3. Alternative measures



A broad analysis of alternative measures is carried out in the initial study according to the 'four step' principle. The analysis provides the basis for decisions on which measures are to be investigated further with regard to how well they fulfil the purpose and objectives of the project, as well as their impacts and consequences.

Development of measures is based on the knowledge of the landscape and other environmental aspects that is produced. This knowledge must therefore be shared within the entire project group. Maps and illustrations that summarise important environmental conditions and interests make clear communication easier. The work should, in general, be organised so that different technical areas in the project group can conduct dialogues with each other over the course of the project. This provides the conditions for continued feedback and increases the opportunity to integrate environmental consideration into planning.

In the consultation, alternative measures are discussed with the County Administrative Board and others concerned. This contributes to good environmental adaptation and garners local support early on in the project.

After analysis of the measures, positions should be taken on which measures or combinations of measures are to be studied further. This also includes assessing which measures cannot be implemented, and providing justifications for this. It could be an issue of measures that cause negative impacts on people's health or the environment that are too great, entail unreasonably high costs, are technically impossible to carry out, or do not fulfil the objectives and purpose of the project. Measures decided on are then investigated more in-depth in the next phase.

4. Impacts and consequences

The analysis of the possible impacts and consequences of measures and combinations of measures is based on collected knowledge of environmental conditions and interests in the influence area. The analysis is clear but must still plainly show which positive and negative impacts and consequences could arise, and which of them need to be investigated further in the next phase depending on the choice of measures.

A key issue is how consideration of the values and qualities identified can be taken in planning. The need for environmental adaptations and environmental measures should be reported so that the knowledge is included in the next phase and space for them is ensured in a future budget. They are, however, not analysed further in this phase.

In the initial study phase, it is important to analyse what structuralising impact the project may have on housing development. Such an impact could give rise to indirect and cumulative impacts through traffic-related climate change and increased landscape fragmentation.

5. Environment in the preliminary studies document

Basic data dealing with the environment is reported as a part of the initial study document. The initial study must give a holistic picture of the environmental conditions and interests of the influence area, and possible impacts and consequences of different measures and combinations of measures. Essential environmental impacts and consequences are shown in the project's overall assessment.

The description of environmental conditions and interests must cover values and shortcomings, what they consist of and what is needed for positive develop-



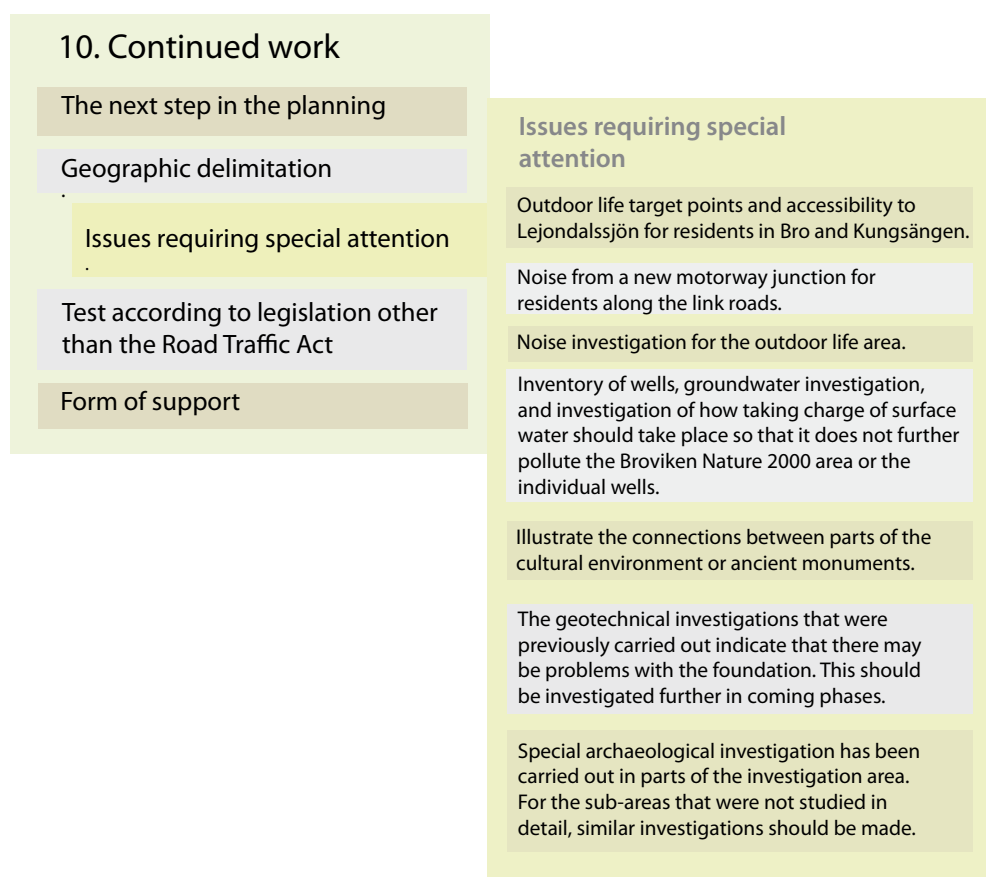
ment. It must be comprehensive but clear, and limited to what concerns the project and is of significance in continued design planning work. National interests, Nature 2000 areas and other protected areas that risk being impacted must always be described. Maps and illustrations are used to increase readability and reduce the volume of the preliminary studies.

Scoping of the EIA is an important element that is initiated in the initial study phase and must therefore be mirrored in the initial study document. The initial study must provide basic data for a reasonable scoping of the EIA as regards space, time, and content in the next phase. This includes showing which environmental aspects it is essential to study further, which are not affected, and what uncertainties exist. The continued work on environmental issues should also be described under a separate heading – for example what focus the EIA work should have and what feasibility studies and inventories, as well as competences, are needed. Which environmental tests, if any, that may come in later phases must also be indicated. Questions that need special attention should also be raised. See the example in Figure 28.

The environmental perspective must be included in justifications for an alternative measure being selected or rejected, since the decisions may be questioned in later phases.

Environmental issues that were dealt with during consultations are to be documented and commented on in the consultation review. The County Administrative Board's decision on significant environmental impact and the grounds for the decision are to be shown in the initial study.

FIGURE 28.
EXAMPLE OF HOW ISSUES REQUIRING SPECIAL ATTENTION IN THE NEXT PLANNING PHASE CAN BE SHOWN IN THE INITIAL STUDY. THE EXAMPLE IS TAKEN FROM THE "HIGHWAY 18 KOCKBACKA INTERCHANGE" INITIAL STUDY, WHICH CONTAINS A CHAPTER ON CONTINUED WORK THAT COVERS VARIOUS SEGMENTS.





3.7 FEASIBILITY STUDY

Purpose of the feasibility study phase

The purpose of the feasibility study is to analyse alternative road and railway corridors, as well as technical standards. The feasibility study phase is the first phase where an EIA document is required. The feasibility study with an EIA can also form a basis for the government's admissibility review according to Chapter 17 of the Environmental Code.

EIA in the feasibility study phase

Location of roads and railways are of great significance for the environmental impact that arises. The EIA therefore has an important function through contributing to development of alternatives, so that the location of the road or railway and the technical layout is adapted as much as possible to the environment. It must also illustrate the environmental consequences of the alternatives studied, and make an overall assessment possible.

Focus lies in showing the consequences of the alternatives for the public interest compared with the null alternative so that they may be compared among themselves. It is especially important to illustrate the consequences that are strongly connected to the choice of location. EIA work in the feasibility study phase is described below.

1. Starting points and framework

The project group starts with studying previous basic design planning data in order to be able to design plan the structure and focus of the feasibility study. It could be a question of the initial study, the County Administrative Board's decision on significant environmental impact, other needs analyses and the municipal planning basis that together provide a picture of both the project and local environmental conditions.

Environmental competence must be included in the project organisation and participate in the project meetings. There must also be expert competence for environmental aspects that are expected to be fundamental to the project. How the work is to be directed in order to be able to best integrate the environmental issues is discussed in the project group. It is important to have regular dialogue and proper cooperation between the various technical areas in order to get a joint picture of the project's development. Consultations should be design planned early so that every instance of consultation will fulfil its function in the work on the feasibility study and the EIA. Where and how the consultation is to be carried out, what purpose it has and what basic data need to be produced for an efficient consultation process.

Reporting principles and the preliminary structure of the EIA document, as well as methods and grounds for assessment, should be agreed upon early on. Inventories, research, and analyses that are to be carried out are entered into the timetable so that the results from them – for example, the prevalence of biotopes with high natural values – can influence the development of alternatives.

2. Environmental conditions and interests

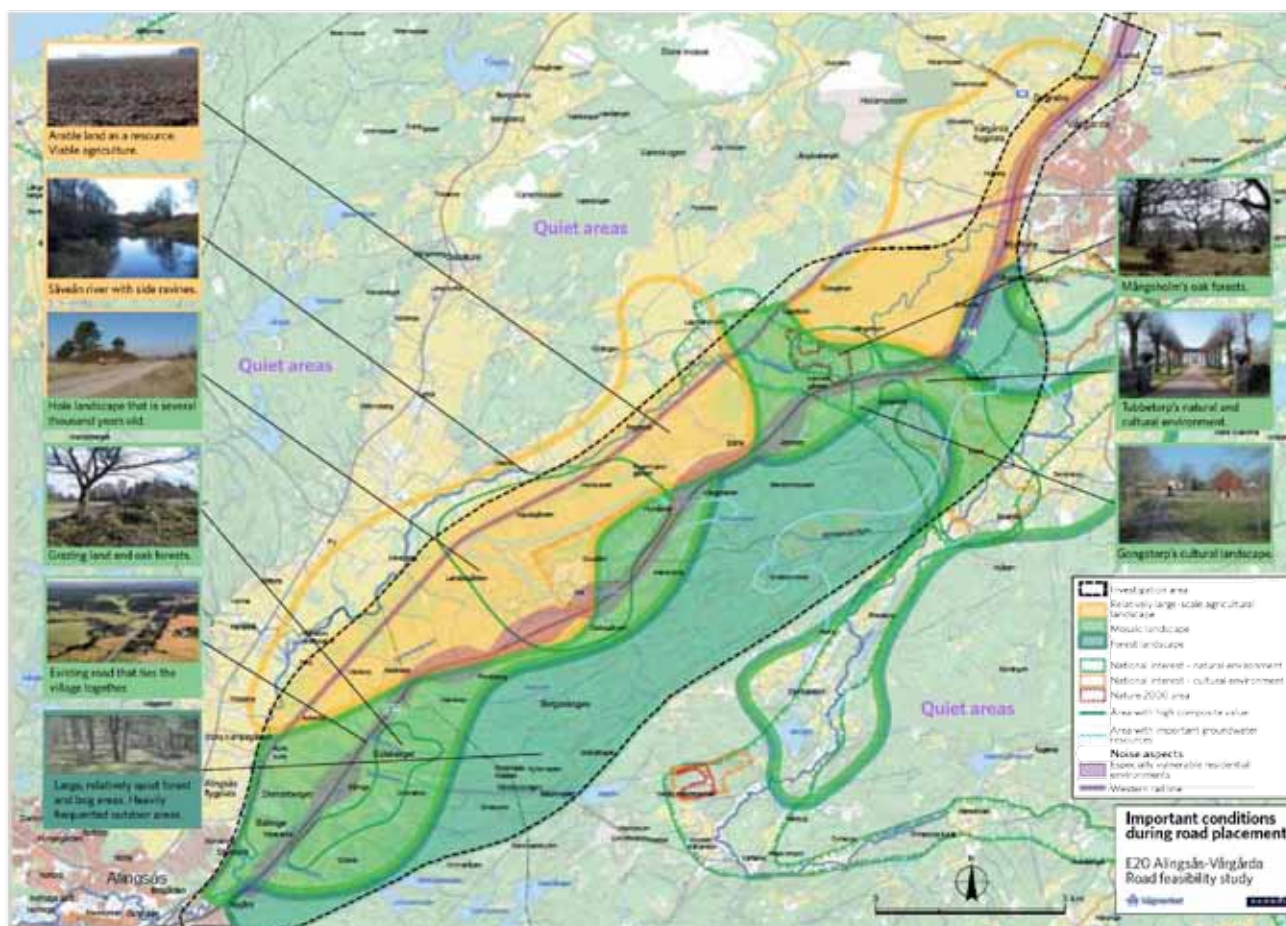
Existing knowledge of the landscape and environment is deepened through research, field inventories, and consultation. Qualities and shortcomings, as well as values and needs, are analysed for the current influence area and possible alternative locations.

An initial scoping of the influence area is carried out so as to be able to identify the environmental conditions and interests that may be impacted by the project's alternatives. Since the assessment of the impacts and consequences of the alternatives must be compared against a null alternative, the future development of environmental conditions and interests need to be analysed. The null alternative and choice of horizon year must therefore be defined and broadly supported within the project.

The analysis must provide a picture of the character of the landscape in the influence area, visual experience, natural conditions, and development, as well as land use and structures. An important part of the analysis is identifying values and qualities, but also shortcomings and needs. For example, it could be a question of silence in an outdoor life area, or conditions that a species depends on. In the analysis, areas that are especially sensitive to different impacts from the project can be pointed out. It is then important to describe the qualities that are essential for the value of the area and how they cannot tolerate the impacts the project could give rise to. For a population of



FIGURE 29.
EXAMPLE OF REPORTING OF VARIOUS
LANDSCAPE CHARACTERS (FROM THE
E20 ALINGSÅS-VÄRGÅRDA 2009 ROAD
FEASIBILITY STUDY)





frogs, for example, accessibility between the breeding and hibernation grounds may be one significant quality that a project could negatively affect.

A road or railway can, in certain cases, be built in a protected area or area of national interest if it is possible to combine it with the values that are to be preserved and developed. The conditions for preserving and developing the value indicated in the protected area must therefore be analysed and reported.

The results of the analysis of environmental conditions and interests, the environmental situation in the null alternative, and the project's environmental objectives are to be discussed in consultation with the County Administrative Board and others concerned. The purpose is to obtain a joint view of assessments and evaluation of the environmental conditions of the project.

3. Location alternatives

In the investigation phase there are good opportunities to avoid negative consequences through adapting the location. Extended conflicts of interest and expensive environmental measures in later phases can then be avoided. The location of corridors must meet the purpose and objectives of the project. Improvement of the road or railway in the existing extension is normally taken up as an alternative. Basic municipal planning data furnishes important conditions for the location work.

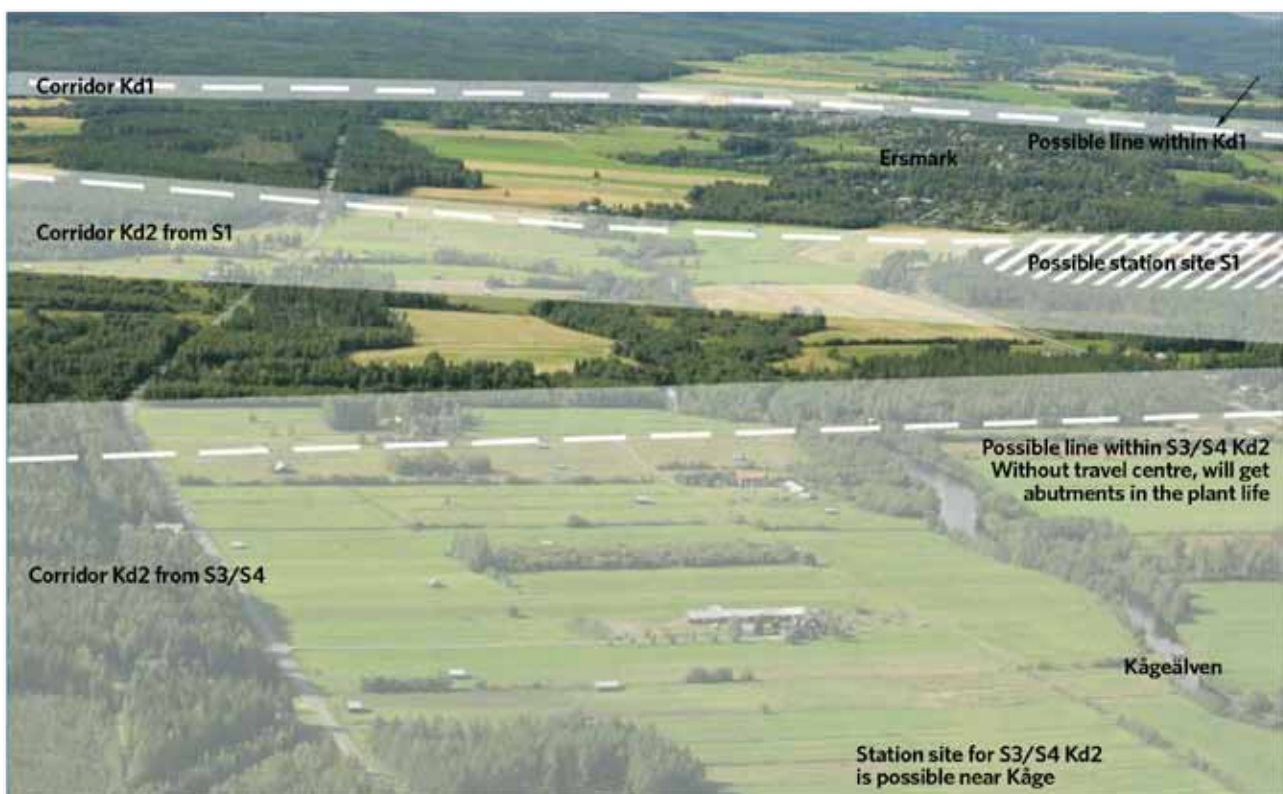


FIGURE 30.
EXAMPLE OF VISUALIZATION OF CORRIDORS THAT SHOW THE POSITIONS OF THE CORRIDORS IN KÅGEDALEN (FROM THE NORRBOTNIABANAN RAILWAY FEASIBILITY STUDY).

The work on developing alternatives should be run by a project group that deals with technical, environmental, formational, and economic aspects collectively. This means that experts in various areas take part – for example geotechnics, formation, architecture, environment, traffic analysis, and

hydrology. Knowledge of the landscape and environment is the common basis in developing alternatives. The results from the environmental analysis are shown on maps and are used as the basic planning data in the project group. This provides an opportunity to adjust the corridor width according to the environment's sensitivity and the need for space for environmental measures.

Apart from location, the feasibility study phase deals with general layout, for example choice of a bridge or embankment over a long valley, technical standards, interchanges, and guidelines for dealing with the landscape. A certain technical standard often entails requirements for the geometric layout, which can limit the opportunities for environmental adaptation. There can therefore be reasons to show alternatives with other technical standards than the recommended one, if it entails large differences in environmental consequences.

The location must meet the purpose of the project, but also technical requirements. The technical requirements for formation – for example curve radii, standards, and systems – are different between roads and railways, which affects the location. In a road project, for example, there is more flexibility regarding the opportunity to adapt the layout and the location. These conditions are of significance for how environmental adaptation is achieved, and must therefore be included in the work on the EIA.

Support for location and layout work in the county council and others concerned is garnered in consultations. The justification for locating corridors and for rejecting corridors is to be shown, as are identified needs for environmental measures.

4. Impacts and consequences

Assessments of impacts and consequences must be done in parallel with alternatives being developed in close contact with others in the project group so that environmental considerations are integrated. Any indirect and cumulative impacts that can arise from ancillary operations at various locations must also be identified, and highlighted in the assessment of consequences. This could, for example, deal with the condition of a station or a larger interchange that generates parking and operational areas and increased traffic, or a grade separated crossing that entails changes in access roads or minor roads.

In order to be able to make comparisons, alternative corridors and their consequences must be described in equivalent ways. The environmental consequences that arise are described for all the corridors included in the feasibility study so that it is easy to understand the differences between them and the null alternative. Differences that depend on alternative layout should also be illustrated. This makes it possible for decision makers and others concerned to assess what is the best possible location and layout with regard to public interests, legal requirements, and the national environmental quality objectives.

Impacts that can have negative consequences for different values and



ADVICE IN LOCATION WORK

1. Make use of knowledge of the landscape and other environmental conditions in development and location of alternatives.

2. Adapt the corridor width to the environment and to what is sensitive or valuable. A wide corridor is not synonymous with large-scale encroachment, since it can provide space for manoeuvre for environmental adaptations in a later phase. A narrow corridor can be used to prevent negative consequences.

3. Make use of opportunities to limit negative consequences and damage in developing and locating alternatives.

4. Make use of opportunities to contribute to environmental measures that produce enhancements. This could be an issue of supplying something that disappeared earlier from the landscape, or fixing a shortcoming connected to an existing road or railway – for example sunlit sandy areas, bodies of water, broadleaf trees, hayfields, or passage opportunities for animals or people.

5. Consider whether detailed design planning is needed in the feasibility study phase when sensitive or valuable areas are affected.



qualities connected to them must also be specially noted. Detailed location, layout, and construction can, in these cases, be of great significance. For example, geotechnical conditions may need to be investigated so that it is possible to assess the need for back-up measures and whether these entail a risk of negative consequences. The impact different locations can have on the qualities connected to the values, and whether physical damage could arise, are investigated in projects that affect protected areas or national interests.

If the construction phase could imply significant environmental impacts, this should be dealt with in the feasibility study phase. Examples of such environmental impact could be surplus soil mass, comprehensive stability measures, or major encroachment during tunnel construction. Important differences between corridors are to be shown in the EIA for feasibility study.

The analysis rounds off with identifying where there are still gaps in knowledge or uncertainties in the basic data, as well as which questions need to be investigated further in the next phase. It is useful to also make an assessment of which protected areas and species risk being impacted, what needs for adaptation this implies, and what permissions and exemptions may need to be applied for in the project. This knowledge should be brought forward into the next phase.

5. Environmental measures

For the corridors included in the feasibility study, the need for special environmental measures to reduce negative impact apart from the environmental adaptation that took place during location is identified. In the feasibility study, economically significant environmental measures and those that are significant for the choice of corridor are studied – for example, a longer bridge instead of an embankment, underpasses, fencing, larger passages for wild animals, and special architectural formation. Expensive environmental measures must be included in the project's economic calculations and basic technical data in order to be realized in later phases. The environmental measures are studied and then designed further in the design planning phase. The need for environmental measures of lesser scope is primarily analysed in the design planning phase.

6. The EIA document

The EIA document must comprise what is needed for decision makers and those concerned to understand the consequences of different corridors, to be able to take a position on location, and to understand which environmental measures and adaptations are needed to achieve proper environmental adaptation. The EIA for an feasibility study must describe the corridors that are included, and to what extent environmental considerations have influenced the layout of the corridors, as well as the justification for corridors being rejected.

The need for detailed location, layout, and special environmental measures for environmental adaptation of the project in continued design planning can be described under the heading “Continued work”. It must

EXAMPLES OF QUESTIONS FOR AN OVERALL ASSESSMENT:

- What do the overall changes mean for various environmental aspects?
- What is the total impact on the health of those living nearby?
- Will there be cumulative impacts on the landscape?
- Will a sustainable use of natural resources be possible?

be clearly indicated here which inventories, in-depth feasibility studies, and so on need to be carried out in the next phase. Which environmental tests, if any, must be submitted in later phases must also be indicated. The EIA must provide support for decision makers in consideration among different public interests and in taking a position that promotes good economisation and use of land and water areas. If damage in areas protected under Chapter 7 of the Environmental Code or areas of national interest can neither be prevented nor limited, possible compensatory measures and their results must be described in the EIA document. In an overall assessment, it should be possible to understand the environmental consequences both of the project and of the project together with other operations and design plans that contribute to the environmental impact. An overall picture of environmental impacts and environmental consequences of every alternative must be shown, but it is not appropriate to put different types of environmental aspects together in an overall picture. For example, it should be easy to understand what different corridors mean for people's health and for the overall value of the landscape.

Risks of conflict, and opportunities for positive synergy impacts among environmental aspects, should also be taken up in the report. It should be easy to understand what consequences are common to several alternatives and what differentiates them.

Compliance with legal requirements, guidelines, and environmental quality objectives that are relevant to the project must be indicated, and possibly concretised as project objectives.





3.8 DESIGN PLAN

Purpose of the design planning phase

In the design planning phase, how the road or railway is to be localized and laid out is planned in detail. Legislation indicates that the purpose of the road or railway must be achieved with a minimum of encroachment and inconvenience, without unreasonable cost, and that consideration be taken of the cityscape and landscape, and of natural and cultural values. A requirement for an EIA is imposed in the design planning phase.

The design planning phase results in a design plan, the main aim of which is to get access to land in order to build the project and provide a detailed report of the project, the situation, and the layout of the facility. The design plan is also a basis for decisions, and the EIA has an important function in showing its environmental consequences.

The design plan is legally binding, which means that only minor deviations are allowed while it is being implemented.

EIA in the design planning phase

The EIA must contribute to environmental questions being taken into consideration and influencing decisions on the detailed location, layout, and technical solutions during design planning. The EIA must deal with the need for environmental adaptation and environmental measures during the construction and operation phases, the environmental impact of the project, and the need for environmental follow-up as well as issues of maintenance during the operation phase. Focus lies on accommodating different interests, both public and individual. The consultation passes from more general issues of alternative general concepts and location to more detailed issues on the layout of the facility with the need for environmental measures and any compensatory measures, as well as assessment of the remaining environmental impact. EIA work in the design planning phase is described below. As much coordination as is possible must take place with municipal planning and any environmental tests. The elements are similar to those in the feasibility study phase, but the focus and level of detail are different.

1. Starting points and framework

Initially the focus and structure of the EIA are discussed, starting from the character and scope of the project, the needs in the design planning phase and the results, basic data and any project objectives that were produced in the earlier planning phases. A preliminary EIA document structure is developed, and methods and bases for assessment that are to be used in the project are discussed and decided. The knowledge requirement is also reviewed, and decisions on which in-depth analyses, and field inventories need to be carried out are made. The work on the EIA – for example consultation, analysis, and inventories – needs to be adapted to the design planning timetable at an early stage in order to achieve proper environmental adaptation.

Environmental issues are closely related to other subjects, such as geotechnics, road and rail technology, layout, and formation. This is especially clear when the facility, constructions, and especially environmental measures must



be formulated. In the design planning phase, it is an issue of good collaboration between different subjects in order to find the best solution. The need for competence and project structure is therefore ensured in dialogue between the consultant and the client.

2. Environmental conditions and interests

The larger, more detailed scale of the design planning phase places demands on more in-depth, project-specific knowledge. The knowledge of environmental conditions and the interests produced in earlier phases is consequently updated and deepened. Knowledge of the conditions of the landscape is necessary both for design and for the work on the EIA. Analysis and description of the landscape should be produced in common from several technical areas in order to obtain a joint picture.

A preliminary scoping of the focus and scope of the Environmental Impact Assessment is carried out in consultation with the County Administrative Board, among others. In the design planning phase, the studied and influence area are more limited in comparison with earlier phases. This provides conditions for inventories on a more detailed level. The need for field inventories and their purpose is clarified, as are bases for assessment, timetables, and how the results are to be taken in and shown. Field inventories are carried out in the appropriate season, as early as possible in the process, so that the results can be taken into consideration in the project. It is important to show early on which bases for assessment (legal requirements, base values, environmental objectives, expert assessments, etc.) are intended for use for the respective environmental aspects.

The description of environmental conditions in the null alternative supplements the description of the current situation by showing how the conditions are changed through traffic development and other development in the area. Traffic estimates for the horizon year selected are appropriate to use in describing the situation for traffic-related environmental aspects – for example noise, vibrations, electromagnetic fields and air quality.

Information on environmental conditions and interests are collected from various types of maps, for example, or cultural historical research, natural inventories, environmental and geotechnical research, and noise inventories. In cases where ancient monuments or protected areas or species risk being damaged, feasibility study in accordance with the Swedish Cultural Heritage Act and field inventories needs to be carried out early on in the design planning phase, on the one hand to contribute to proper environmental adaptation and on the other to form the basis for a possible environmental test. Assessing the need for environmental follow-up is included in the design planning phase. It is a good thing if the basic data collected during the information collection can also be used as ‘pre-data’ for the environmental follow-up.

The collection and analysis are based on the knowledge requirement in the project and its possible environmental impact. For example, good knowledge of a road’s surrounding area such as the housing situation, roadside vegetation and other biotopes, as well as cultural objects are needed during planning for back-up measures. Focus lies on identifying the values that risk being impacted, and describing what they are made of and what is required for them to remain and be developed.



Environmental conditions and interests are compiled so that important values and the qualities tied to them are indicated on a map, supplemented by descriptive text.

Consultation is carried out with agencies, municipalities, and other stakeholders in order to ensure that the EIA focuses on the right environmental issues and raise the need for environmental measures and any environmental tests. It is useful to coordinate consultations in design planning the project with consultations connected to environmental tests (for example, permits for water-related operations) and municipal planning (in-depth comprehensive plan or detailed development plan). It is important to clarify the various processes and delineations connected to the law and responsibilities for the public during such coordination.

3. Formation alternatives

Work on the detailed layout of the project lasts throughout the entire design planning stage. It can be described as a dynamic process with continual feedback in order to adjust the layout with regard to new knowledge. It is important in the process to understand what consequences different layout alternatives may have for the environment. The environmental coordinator has an important role here in procuring results from the analyses of the environmental conditions for the design planning work and seeing what analyses are needed in order to be able to assess the consequences of different layout alternatives.

An integration of environmental issues in the design planning must contribute to the level and side view, as well as technical solutions, are adapted to the environment. It can, for example, deal with improving the mass balance in order to attain good resource economisation and reduce the transport work, adjust the dimensions of a culvert to reduce the barrier effect for animals, adapting detailed location to avoid encroachment into sensitive environments and adapting the construction to avoid backflow impacts in water. Even the planning of individual roads, work roads, equipment shelters and poles, placement of surplus soil masses, and more, are to be optimized based on the environmental point of view throughout the design planning.

4. Impacts and consequences

The impacts and consequences of the project for different layouts and technical solutions, both positive and negative, direct and indirect, are continually assessed. The bases for assessment are used to determine the significance of the impacts and consequences. An important question to answer is whether the values identified and the qualities linked to them risk being affected in the short and long term. The assessment makes possible an adaptation of the project in order to avoid negative consequences on the values and qualities identified. Obstacles to migration for small and medium-sized animals can be avoided by, for example, adapting the layout of a culvert or bridge with the opportunity for land passage.

This integrated assessment of impacts is a part of the design planning. Apart from this, the impacts and consequences of the project are assessed and shown when its level view, side view, and technical layout have been determined in the design plan. It must be clear which environmental measures have been considered in the consequences shown in the EIA.

It is important to illustrate the needs for environmental adaptation during the construction phase in the EIA. The construction methods must be adapted to the environment and construction activities checked.

The need for a verification programme for follow-up in the construction phase is thus assessed in the EIA.

5. Environmental measures

Coordination among different technical areas furnish the conditions for continuously adapting the project to the environment, thereby reducing the need for special environmental measures. Environmental measures are to be studied for negative consequences that cannot be avoided or limited to a sufficient degree.

The planning of environmental measures must be carried out in collaboration among different technical areas so that technical and environmental functions are discussed in the same context. Environmental measures can be general or linked to a specific place, risk, or value. The type of environmental measure dealt with, as well as its purpose and the function it is to achieve, must be indicated in both the EIA and the design plan.

Arguments must be conducted on what uncertainties exist as regards the effectiveness of the environmental measures. Alternative environmental measures, their impacts, costs, and maintenance requirements need to be illustrated so as to be able to compare cost effectiveness.



Uncertainties about the project's actual environmental impact may mean that environmental follow-up is needed when the road or railway is built and handling traffic. The need for environmental follow-up must be analysed ba-

FIGURE 31.
FAUNA PASSAGE OVER HIGHWAY B33 NEU
ÜBERLINGEN IN GERMANY. WILD ANIMAL
FENCING AND EARTHWORKS BEHIND THE VE-
GETATION. PHOTO: MATS LINDQVIST, 2008.



sed on which aspects need to be followed up, as well as the purpose of the follow-up. More detailed planning of the environmental follow-up is normally done during the work on construction documents, but it can be initiated even in the design planning phase if 'pre-data' needs to be gathered.

The environmental measures from the EIA process decided on must be brought into the design plan's description and drafts in order to be legally binding. The design plan, in turn, forms the foundation for producing construction documents.

Compiling environmental measures and adaptations into some form of checklist or environmental programme is useful in order to ensure that they are carried out. The checklist or programme can include both environmental measures from the EIA and conditions from permits and exemptions. The conditions that must be brought into permits and exemptions in later phases can also be described here.

6. The EIA document

The EIA document provides the basis for decisions on the project's detailed location and layout by showing the environmental consequences that arise, the environmental considerations that have been worked in, and possible alternative solutions, as well as environmental measures that can be implemented.

The EIA document and supplementary materials such as environmental checklists are important basic data when construction documents and specifications for the contract are being worked out. The EIA must also provide a basis for assessing how different interests are accommodated and for considerations among them, both individual and public. Another purpose is to provide the public and others concerned with the opportunity to understand the impacts and consequences of the project, as well as the allowances made during the project.

In order for the EIA document to function as a basis for overall assessment, the conclusions on the overall consequences for the environment, people's health, and economisation of natural resources must be indicated. What the consequences mean with regard to bases for assessment that are drawn up, legal requirements, environmental quality objectives, and so on, must also be indicated. This means, for example, that a report on noise levels (increases and decreases) for various properties is not enough. Beyond this, the assessment must include a description of how different types of disturbances interact and affect people's health. It should be clearly indicated which environmental measures are included in the assessment shown.

Remaining negative consequences of the project and proposals for appropriate environmental measures are also shown in the EIA document. What needs to be investigated and what environmental tests will be carried out must be indicated in the construction document phase. For example, it could be an issue of analysis of environmental consequences during the construction phase, detailed design planning of measures, and applications for permits for water-related operations.

3.9 CONSTRUCTION DOCUMENTS



Construction documents are the last phase in design planning. The construction and the technical layout are then design planned in detail. Descriptions, drafts, and other documents are produced according to the principles, and with the detailed layout, established in the design plan. There is no requirement for an EIA in the construction document phase, but the results of the earlier work on the EIA must be implemented so that the environmental adaptation of the project is ensured.

The construction documents include such things as technical descriptions, bills of quantities, and drafts. It is a part of the specifications for the contract, where administrative regulations and works contracts are included. The project-specific environmental requirements and intentions described in the design plan and the EIA document must be worked into the various parts of the construction documents and specifications. They must be clearly described, implementable in practice, and computable for the contractor who is carrying out the project.

Environmental requirements and significance of the contract form

The contract form determines the division of responsibility between the client and the contractor, and is significant for the formation of the environmental requirements in the construction documents. Regardless of the contract form, the functions to be achieved by a measure must have been indicated in the EIA for the design plan. This provides flexibility prior to future design planning.

In a **construction contract**, the contractor implements the project based on the drafts, specifications, and provisions produced by the client. Technical solutions and environmental requirements are given in detail and design planned in the documents, and the contractor's assignment will be to carry out the practical construction work

Prior to a **design and build contract**, specifications are developed for the contract where the project and requirements for the facility are described. This is done as much as possible through functional requirements. It is the task of the contractor to produce the construction documents and do the detailed design planning so that it can be verified that the function described is achieved. This means that the contractor is given the opportunity to adapt the design and technical solutions. One of the basic ideas of the contract form is to stimulate creative and cost-optimised solutions. One form of design and build contract where the contractor is also responsible for maintenance and operation for a certain time is usually called a 'build and operate contract'.

In environmental contexts, a functional requirement may be connected to a detailed measure, for example noise abatement or animal passage, or to an environmental value (for example a biotope or cultural object). The requirement may also provide an opportunity to formulate the measure within a certain specified standard. Functional requirements can be formulated for both the construction and operation phases.



Examples of functional requirements for the environment in a design and build contract:

- Lumberwork construction, for example noise screens, constructed for a technical service life of X years.
- Passages under and over the road must be designed so that they function for elk as well as for walking and horseback riding.
- Ditch slopes on the X extension must be designed so that the conditions for a natural re-establishment of existing types of vegetation are good; see particular description of natural environments and species description.
- Clouding of streams must be prevented with the help of suitable methods; see description of measuring methods for cloudiness.

Basis for construction documents

In the design planning phase, it is important to produce a basis that is as useful as possible for construction documents and contracts.

Common bases for the construction documents where environmental issues are dealt with are:

- the design plan with drafts, descriptions, background documents, memoranda
- EIA documents, including background documents
- compilation of environmental measures and requirements for environmental considerations (environmental checklist/ environmental program)
- basis for programmes for environmental controls and environmental follow-up
- formation programmes
- risk analyses
- consultation review and minutes from meetings with agencies
- conditions decided upon from environmental tests
- general environmental requirements for contracts.

The work on environmental issues in the construction documents phase

The environmental work is initiated by compiling and creating an overview of the environmental measures, adaptations, and requirements that must be worked into the construction documents. How and where they are to be described in the construction documents or specifications is particularly considered. It is desirable that requirements and measures are clear, so that uncertainties and inconsistencies do not arise. Environmental competence therefore need to take part when different parts of the construction documents, including specifications, are worked out.

The environmental measures taken up in the design plan description must



always be included in the construction documents. These need to be design planned in detail in the construction documents phase. There may also be a need to design further environmental measures during the work on the construction documents as the implementation is concretised. This could, for example, be an issue of noise protection measures during the construction phase. The EIA document can here be used as a type of reference book to clarify and give background to different environmental measures. Existing environmental bases, for example for natural values and hydrological conditions, may need to be supplemented so that the project-specific environmental requirements can be specified. There are also general environmental requirements for the contracts that must be worked into the construction documents, including the specifications.

Environmental measures can impose requirements for a certain type of maintenance, which must be indicated in the basis. Without the right maintenance, the function may not come off in the long run. Maintenance instructions therefore need to be documented and sent on to the operating organisation.

The conditions decided upon in different types of environmental tests are to be worked into the construction documents. The design planning of environmental tests must be initiated as early as possible so that the basis can, to a great extent, be produced in the EIA process for the project.

It is also good if the test is carried out before the project is established, as it makes adaptation to any conditions in the test decision easier, and provides security as regards implementation of the project. Certain types of notifications and applications for permits are, however, often dealt with during the construction documents phase, since it is only then that it is known how the work is to be carried out in detail. Even if the test itself takes place during the construction documents phase, the issues that concern the test need to be clearly shown in the EIA for the design plan.

Division of responsibilities between contractor and client must be clearly indicated in the construction documents/specifications. It could, for example, concern permit and exemption applications, as well as information and consultations.

It is good to use an environmental checklist or an environmental programme to get an overall picture of all the project-specific environmental measures, environmental adaptations, and conditions that were set into the project during earlier design planning phases. It is also useful to show areas worth protecting in the environmental programme as a basis for any changes in the construction phase. The environmental programme can then form the basis for an object-specific procurement obligation directed at the contractor.

If it is suitable, control and environmental follow-up programmes are worked out, often in consultation with a regulatory agency. The grounds for follow up and verification during the construction and operation phase are described as clearly as possible in the process and detailed in the construction documents phase. The investments are also budgeted. Responsibility for follow-up is clarified during the work on the programme in the construction documents phase.

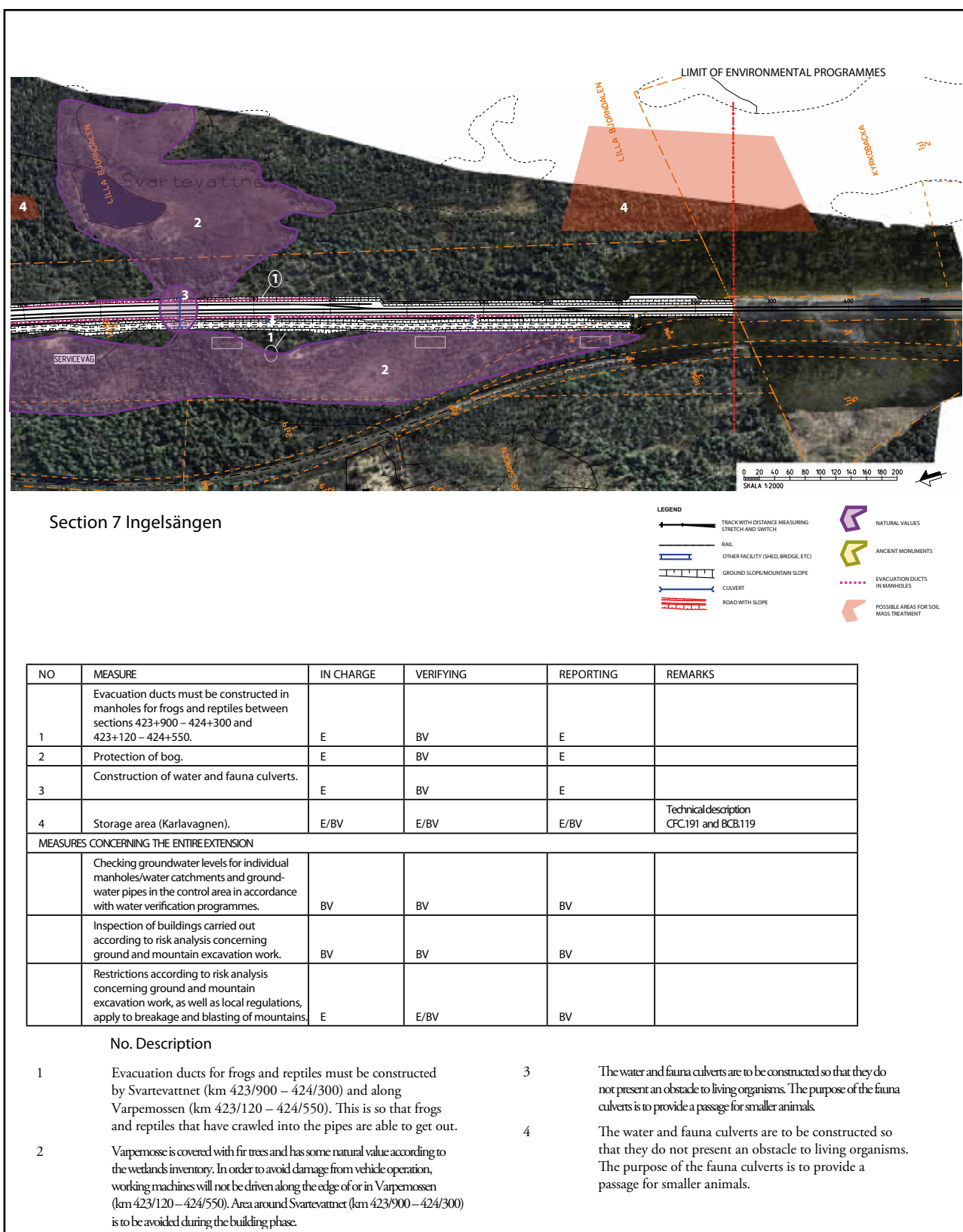


FIGURE 32.
EXAMPLE OF ENVIRONMENTAL PROGRAMME FOR CONTRACT
PHASE (FROM THE ENVIRONMENTAL PROGRAMME FOR THE
CONTRACT PHASE OF THE VELANDA – PRÄSSEBO SECTION
418+520 – 427+980 SPECIFICATIONS 090626)

The construction documents



The following bulleted list summarises important requirements for the construction documents linked to the environmental adaptation of the project:

- Drafts and documents must contain the environmental measures and environmental adaptations decided on in the design planning phase, as well as those that are established during the construction documents phase through new knowledge, permits, notifications, exemptions and consultations with agencies.
- Programmes for environmental follow-up and verification should be checked with regulatory agencies and must be included in the appropriate sections of the specifications.
- Existing permits, notifications, and exemptions concerning the project must be shown.
- Permits, notifications, and exemptions that may be needed during the construction phase and for which the contractor is responsible must be described.
- Environmental measures and requirements must, as much as possible, be included in calculations and must be able to be followed up.
- Requirements for environmental confidence and training with the contractor, as well as the person in charge of environment, must be described.

Continued work in the construction phase

During the EIA process, the practical construction work often lies far ahead in the future. This can be a reason that the construction phase often receives too little attention. Environmental impact in the construction phase can be comprehensive, even if the consequences of the completed facility are small. Suitable practical solutions for environmentally critical working moments can be proposed through reviewing the implementation from a technical and environmental perspective in earlier phases. An example of this is re-excavation of streams in environments susceptible to landslides and of high natural value, with temporary soil mass storage in the vicinity of the streams.

Handling the environmental issues in the design plan and construction document phases is especially significant for the final quality and environmental adaptation of the project. Environmental security during the construction phase aims at achieving the environmental requirements that have been set. The environmental checklist or the environmental program developed during the design planning and construction documents phase must contain the knowledge of the project's environmental conditions and requirements from the EIA that must be considered during the construction phase. These documents therefore need to be kept alive during construction and followed up continuously.

Further reading

Below are tips for further reading on EIA and road and railway design planning. See also links to literature and other information on the EIA Centre home page at SLU (www.slu.se/EIACentrum), the European Commission Environment on EIA (<http://ec.europa.eu/environment/eia/home.htm>) and the homepage of IAIA, the International Association of Impact Assessment (www.iaia.org).

EIA examples that supplement handbooks and legal frameworks can be found at Exempelbanken (www.exempelbanken.se). This contributes to spreading experience and interesting examples of EIA, and other items. Exempelbanken is continually updated with new examples.

EIA in general

Allmänna råd om miljöbedömningar av design planer och program. Naturvårdsverket. 2009.

Handbok. Miljökonsekvensbeskrivning inom vägsektorn. Sammanfattande del. Publikation 2002:40. Vägverket. 2002.

Handbok. Miljökonsekvensbeskrivning inom vägsektorn del 1. Regler och bestämmelser. Publikation 2008:24. Vägverket. 2008.

Handbok. Miljökonsekvensbeskrivning inom vägsektorn del 3. Analys och bedömning. Publikation 2002:4. Vägverket. 2002.

Introduction to Environmental Impact Assessment – Principles and procedures, process, practice and prospects. Glasson, J., Therivel, R. och Chadwick, A. London: Taylor & Francis Ltd. Tredje upplagan. 2005.

Miljökonsekvensbeskrivning – aktörernas roller och betydelse. Hedlund, A och Johansson, V. Rapport 4/2008. EIA-centrum SLU. 2008.

Miljöuppföljning av väg- och järnvägsprojekt. Vägverkets publikation 2007:40. Vägverket och Banverket. 2007.

EIA – Introduktion till miljökonsekvensbeskrivning. Hedlund, A. och Kjellander C. Studentlitteratur. 2007.

EIA – Perspektiv på miljökonsekvensbeskrivning. Wallentinus H-G. (red) Studentlitteratur. 2007.

Cumulative impacts

Cumulative Impacts in Swedish Impact Assessment Practice. Antoinette Wärnbäck Licentiatavhandling. SLU. 2007.

Kumulativa effekter och konsekvenser – Behandling i miljöbedömning och miljökonsekvensbeskrivning för vägar. Lennart Folkesson. Rapport 674. VTI. 2010.

Metoder för att beskriva kumulativa effekter med avseende på biologisk mångfald och vägar. Rodéhn, J. SLU. 2004.

Design planning methods

Att göra mål! Handledning för arbete med projektmål för natur, kulturmiljö samt friluftsliv. Publikation 2009:51. Vägverket. 2009.

Fyrstegsprincipen i förstudier. Publikation 2006:112. Vägverket. 2006.

Åtgärdsanalys enligt Fyrstegsprincipen. Publikation 2002:72. Vägverket. 2002.

Infrastruktur i landskapet -råd för landskapsanalys. Publikation 2011:103. Swedish Transport Administration. 2011.

Consultation

Moderna samråd. Publikation 2011:069. Swedish Transport Administration. 2011

Samråd & dialog: en idébok för den som ska arrangera någon form av dialog. De Laval, S., Vägverket. 1999.

Samverkansmetoder – samråd och dialog vid trafikdesign planering. Publikation 2011:078. Swedish Transport Administration. 2011.

Preliminary studies

Förstudie, Järnvägsutredning, Tillåtlighetsprövning enligt lag (1995:1649) om byggande av järnväg. Banverket anvisning 1608. Diarienummer F09-17429/SA20. Banverket. 2010.

Handbok Förstudie. Publikation 2002:46. Vägverket. 2002.

Feasibility study

Handbok Vägutredning. Publikation 2005:64. Vägverket. 2005.

Förstudie, Järnvägsutredning, Tillåtlighetsprövning enligt lag (1995:1649) om byggande av järnväg. Banverket anvisning 1608. Diarienummer F09-17429/SA20. Banverket. 2010.

Design planning

Handbok arbetsdesign plan. Publikation 2010:1. Vägverket. 2010.

Järnvägsdesign plan enligt lag (1995:1649) om byggande av järnväg. Banverket anvisning 806.3 BVBLG 36/SA20. Banverket. 2010.



TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Swedish Transport Administration, 781 89 Borlänge. Office address: Röda vägen 1
Telephone: 0771-921 921, TTY: 010-123 50 00

www.trafikverket.se