

Landscape As An Arena

Integrated Landscape Character Assessment – Method Description



The Swedish Transport Administration
Address: SE-781 89 Borlänge, Sweden
E-mail: trafikverket@trafikverket.se
Telephone number: +46 771 921 921

Title: Landscape As An Arena – Integrated Landscape Character Assessment – Method Description

Authors:

Tobias Noborn, Radar arkitektur & planering AB (editor and graphic design)

Bengt Schibbye, Schibbye landskap AB

Emily Wade, Landskapslaget AB

Mia Björckebaum, KMV forum AB

Emy Lanemo, KMV forum AB

John Askling, Calluna AB

Oskar Kindvall, Calluna AB

The team of consultants is working under the name of "Befaringsbyrån"

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FOREWORD

The Swedish Transport Administration has the overall responsibility for creating a transport system that is sustainable over the long term, and efficient. The transport system has a considerable impact on the landscape as a result of the building and management of roads and railways. For the Swedish Transport Administration, therefore, a holistic approach to the resources, values and change processes of the landscape has become an increasingly important issue. Understanding the landscape as an arena is an important basis and starting point for both long term strategic planning and in continuing spatial planning. Big and costly pending infrastructure investments, in high-speed railways among other things, further underline the significance of drawing up knowledge and support documentation that encompasses natural and cultural landscapes as well as issues of configuration, in an integrated manner.

Only a short time after the creation of the Swedish Transport Administration in 2010, this increased focus on landscapes led to several initiatives aimed

at developing knowledge and methods in the area. The material presented here is the fruit of a research project extending over several years, ‘Including landscapes in long-term spatial planning’, as well as of several related development projects and practical trials in applying and evaluating the ‘integrated landscape character assessment’ tool. A number of commissions have since used integrated landscape character assessment as a theoretical basis. Notably, these include the method for strategic environmental assessment, the government commission on Green Infrastructure, and the Swedish Transport Administration’s internal guidelines for landscape adaptation. In ongoing and continuing work, a cross-agency project (within the framework of the Environmental Objectives Council) has been initiated in which several government agencies are testing the tool’s applicability in their respective sectors.

Integrated landscape character assessment uses existing knowledge in new contexts and new ways. The method was developed by the Swedish Trans-

port Administration based on earlier characterisation methods, but it differs from these in some respects. What the method adds are the regional scale, a cross-sector working method, access to decision guidance at an early stage, and the view that the landscape is an arena for planning and thus the very prerequisite for future measures and development. Integrated landscape character assessment also describes the entire landscape, not just limited designated areas. Another new feature is that the method considers the sensitivity and potential of the landscape as a guidance factor in planning how measures can be carried out.

The Swedish Transport Administration needs knowledgeable employees and consultants who can understand and implement knowledge about the landscape at the planning stages and in projects. This method description is one of the tools for imparting such knowledge, and describes the method known as integrated landscape character assessment, abbreviated ILCA.

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1 Introduction

This method description describes, in concrete terms, the assessment tool *integrated landscape character assessment* and is directed at anyone who can benefit from the knowledge that such an assessment produces. It is directed at the *client* for the assessment, who needs the knowledge in order to make various decisions. It is directed at the *provider*, who is to carry out the assessment, and it is directed at the *examiners*, who in various ways oversee the exercise of public authority and compliance with legislation. These roles are explained in greater detail below.

It is a fundamental prerequisite that the assessment be prefixed by the word *integrated*. Interpreting landscapes is not a job for one person. A landscape is a complex reality that is used by everyone for a number of different purposes. Working with landscapes is a team effort that needs to be carried out in a spirit of collaboration and with sustainability as the objective.

These instructions are practical in nature, describing the procedure, staffing and elements of the assessment. The opening chapter describes the reasons

for working with the landscape in this way and gives examples of the benefits and areas of application of the assessment method.

Below are six comprehensive steps. They are not repeated in the instructions, but are intended to give an overall picture of the purpose and possibilities of integrated landscape character assessment.

1. What is the assessment going to be used for?

What is the purpose of the assessment? How early in the planning process should it be made? Does it have a broad, general purpose, as in a national or regional plan? Or is it intended as a basis for a more specific planning situation, as in measure selection studies? What has been assessed beforehand and what comes after – how does the knowledge live on? Who is to use the assessment and for what decisions? What goals need to be achieved for the planning situation as a whole? Are there development goals for the landscapes in which changes are being planned? These

questions are fundamental and need to be answered before proceeding with the following steps.

2. Delimitation

What are the ends for which the planning is intended? Infrastructure or utilisation? Or for regional or local development? For the hospitality sector perhaps, or sustainable resource use? For a joint spatial planning initiative by several parties? The answers to these questions determine the direction of the assessment.

What area is being assessed? How is this related to areas that are excluded from the assessment?

Who needs to participate – client, provider, examiner? How do you staff the planning situation and its various phases?

How do you capture knowledge from people in the area? The European Landscape Convention refers to ‘landscape ... as perceived by people.’ What degree of

citizen collaboration is suitable at the scale for which the assessment is being made?

Answers to the questions in steps 1 and 2 are necessary in order for the assessment to be appropriately set up and staffed.

3. Carry out an integrated landscape character assessment

Carry out the integrated landscape character assessment. These instructions describe the working method and gives examples of subsidiary analyses and manners of presentation.

4. Use sensitivity and potential as guidance

Changes to a landscape are associated with *sensitivity* as well as with *potential*. The landscape has a vulnerability, but plans and projects also offer the opportunity for development through healing, strengthening and creating qualities. Sensitivity and potential provide alternatives for action that function as construc-

tive pieces of advice and guidance in the planning situation. Sensitivity needs to be highlighted and handled with competence. Thinking in terms of potential is a matter of seeing possibilities not just in the current planning situation, but also for the surroundings in which the changes are to occur. For example, an improved infrastructure can be achieved *at the same time* as you get a strengthened landscape. This brings a positive and enabling force into planning.

5. How does the planning process or project need continuous knowledge support?

How is the newly acquired knowledge about the landscape going to live on in planning farther down the road? Who will carry the knowledge forward? How do you ensure that decisions are made on the basis of this knowledge alongside other decision guidance? How does the knowledge subsist between the stages in planning and projects? The knowledge and the ramifications of various alternatives for action need to be omnipresent to ensure decisions that are directed towards sustainability.

6. Organisational learning

How can an increased understanding of landscape conditions, sensitivity and potential improve future planning and project processes? Integrated landscape character assessment is a relatively new tool and approach. The assessment's holistic take on the landscape's character, function and relationships is significant for sustainable development, with strong links to Sweden's environmental objectives. Can organisations that carry out spatial planning develop their processes with the help of an increased focus on landscapes, in order to make sustainable development possible?

These instructions provides no answers for the two last steps, but they are salient issues for activating the knowledge about the landscape. This is, after all, about implementing the European Landscape Convention in Sweden.



Photo: Tobias Noborn.



Chapter 2

The landscape is the arena

“ *The Swedish Transport Administration is the biggest transformer of landscapes since the ice age...*
Environmental specialist,
Swedish Transport Administration

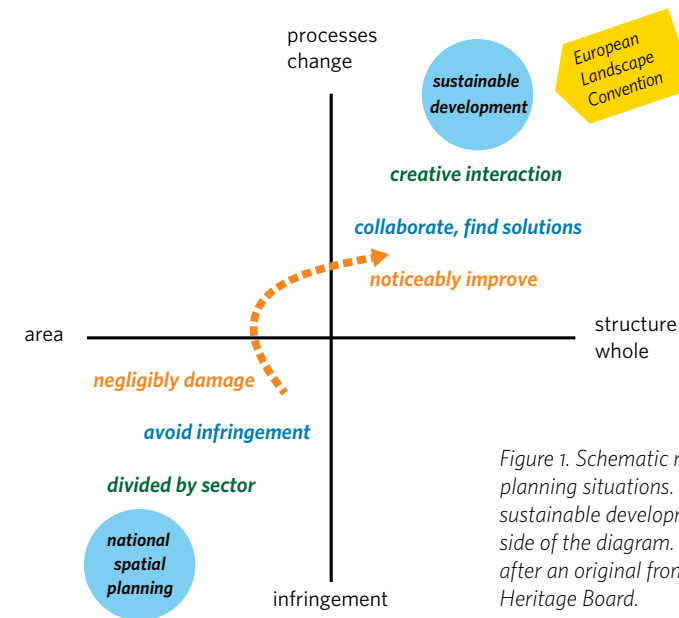


Figure 1. Schematic representation of complex planning situations. The best prospects for sustainable development are on the upper right side of the diagram. Illustration: Befaringsbyrån, after an original from the Swedish National Heritage Board.

THE LANDSCAPE IS THE ARENA

A large part of the Swedish Transport Administration's activities, and the measures it plans and implements, are intended to take place in the landscape, and in people's everyday lives. They are intended to occur in an environment which has been shaped by earlier generations through people's use of forests, land and water, in the ecosystems which have contributed to human prosperity. The average person usually calls this simply 'landscape', and everyone has a relation to it.

Those of us who plan and manage projects that affect the landscape need to understand the situation, understand the landscape where measures are planned, and understand in what way the measures will alter and develop the landscape. We say that 'the landscape is the arena' – the arena in which life will proceed in an even better way in the future, with improved mobility for people, better home environments, a good climate and a robust and resilient landscape.

Thinking in terms of the landscape is therefore an outlook rather than a particular element. It is not about an environmental issue or some further study with requirements to be added to the normal workload. Instead it is a broadened knowledge base and a shared understanding with implications for a large part of the Swedish Transport Administration's processes for planning, investment, operation and maintenance. It shifts the focus towards value-generating activities around infrastructure.

COLLABORATION FOR SUSTAINABILITY

Society's possibilities of achieving sustainable development depend on the ability to collaborate in order to reach satisfactory overall solutions. And this collaboration needs to take place in partly new discursive territory. The situation is illustrated in Figure 1, where the focus needs to be shifted from *negligibly damage* to *noticeably improve*.

The laws governing spatial planning are intended to achieve sustainable development through varied land use, where as many different interests as possible can coexist. The legislation mandates that different stakeholders maintain a dialogue throughout the planning process.

Application of these laws, however, is often characterised by a separation in terms of interest areas. In most planning situations sectoral planning documents are used that indicate valuable areas and objects in e.g. the natural or cultural environment. The focus in planning processes is often on avoiding infringement and damage in later stages, rather than letting the landscape influence the plan's or project's vision and prerequisites at an early stage. When planning is reduced to avoiding damage, integrating the landscape into the project becomes difficult. A power struggle arises between planning interests, in which the strongest wins. The upshot is that the landscape becomes divided into delimited areas which are protected and other 'blind spots', where measures can

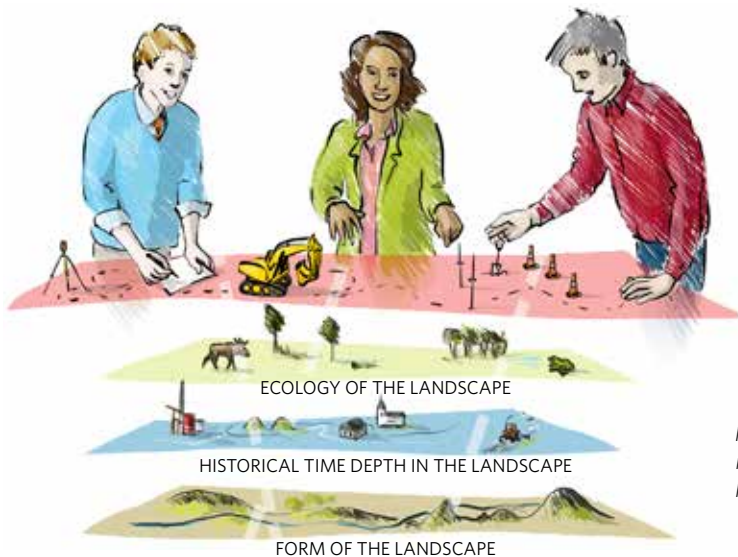


Figure 2. Understanding of and planning for the landscape requires interaction and collaboration between many actors. Illustration: Ingrid Frölich.

usually be undertaken without the landscape becoming a guiding issue.

A dialogue that sets out, instead, from the conditions and potential of the landscape provides wholly different opportunities for developing shared visions in a sustainable direction – to *noticeably improve* through the investments in question.

In this discursive territory, collaboration is crucial for resolving the usually complex planning situations. Collaboration needs to take place at all levels:

- **between client, provider and examiner**
- **between competence areas**
- **between agencies and stakeholders**
- **between stages, i.e. between planners, project managers and contractors.**

And also crosswise between all of these actors.

WHAT'S NEW ABOUT ILCA?

Integrated landscape character assessment (ILCA) is a method for producing decision guidance that puts existing knowledge in a partially new context, for use in new ways. The method was developed by the Swedish Transport Administration but is based on earlier character assessment methods, albeit differing somewhat from these in some respects.

Regional scale

ILCA is primarily for regional decision guidance. This means that knowledge is aggregated to a regional system level, where the landscape's features and functions can be explained in a bigger context. The decision guidance can then be made more in-depth.

Integration of fields of knowledge

The method is fundamentally cross-sectoral and involves a wide range of competences as well as roles in projects and processes. This requires that the competences work together – interpreting the landscape together, with several pairs of eyes at the same

time. This shared building of knowledge encourages greater creativity in the planning of measures.

Early knowledge

By being available as decision guidance early on, ILCA can serve as support for wise decisions at crucial early stages.

Shared arena for planning

ILCA describes the landscape, not as an environmental issue or interest, but as the very prerequisite for future measures and development.

No blind spots

ILCA describes the whole landscape, not just limited designated areas.

Sensitivity

The sensitivity of the landscape is described in terms of functionality and current character in a descriptive manner. The assessment does not classify sensitivity and does not specify any designated areas. Instead it

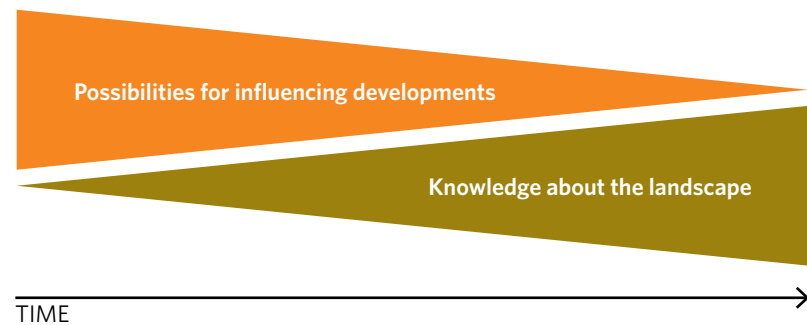


Figure 3. The possibilities for influencing a project are greatest in the early planning stages – but that is when knowledge about the landscape is at its scarcest. Once knowledge has increased, the project has progressed so far that it may be difficult to influence decisive elements. Choices of location, measures etc have already been made. Illustration: Befaringsbyrån.

can provide guidance for *how* measures may be carried out.

Potential

The potential of the landscape is forward-looking and can give guidance as to how measures may be carried out such that the landscape is strengthened. Sensitivity and potential can be used as creative guidance in planning.

WHEN DO YOU MAKE AN ILCA?

An integrated landscape character assessment is primarily a regional decision guidance document. As such it serves in planning situations for **regional and national plans** for transport infrastructure and the environmental assessment that these entail. In the same way, an ILCA serves in the external dialogues with other actors in early spatial planning.

Knowledge about the landscape is often at its lowest level early on in the processes, but that is when pos-

sibilities of influencing planning are greatest. Early knowledge about the landscape increases the opportunities for making wise and cost-effective choices.

ILCA can be used in *systems analyses* and *measure selection studies*, where choices are to be made according to the four-step principle and planning is focused on needs and gaps. ILCA is very useful in the *collective effect assessment*, and also when ordering measures once plans have been finalised, e.g. the formulation of specific orders and the staffing of projects.

The decision guidance and methodology can also be used on a more detailed scale. This means that ILCA can be a suitable source of guidance during later stages as well, e.g. those dealing with location, design, landscape adaptation, architectural characterisation etc, according to the planning process and in investment projects. In terms of content and structure, ILCA is well suited to serving as a bridge to other elements in later stages, such as cultural heritage assessments and nature conservation value inventories. By building directly on and deepening the integrated

landscape character assessment, the loss of important knowledge between stages is avoided.

ILCA can also provide useful guidance in other planning contexts that are not primarily concerned with infrastructure. This might apply to regional plans for spatial planning, environmental assessments, ecosystem services assessments etc. In Sweden there are few methods and examples for planning at the regional level, and here ILCA can contribute to generating knowledge that extends across municipal boundaries.



Figure 4. ILCA can provide support in many early planning situations (words in black). It can also serve as a bridge to other stages in which more detailed studies are required (words in grey), when ILCA can serve to describe the overall context. Illustration: Befaringsbyrå.

WHAT ANSWERS CAN ILCA PROVIDE?

Infrastructure planning requires insight into the conditions of the landscape – at an early stage. Knowledge is needed about conditions that determine constructability, risk and environmental factors, and coordination with other spatial planning, but also for management of facilities and the environment etc. An ILCA can provide a knowledge and decision-making basis for resolving issues regarding, for example

- technical requirements – radii, sections, standard levels
- management of the terrain – bridges, cutting, tunnels, embankments, fillers, shafts
- adaptation to the landscape – localisation, layout, materials and designs
- cost-effective operation and maintenance that also contribute to additional assets
- possibilities for passage by animals and people

- ecosystem services that can reduce investment and maintenance costs
- opportunities and risks when e.g. settlement development is to be coordinated with infrastructure planning.

Among the advantages are possibilities of

- increasing predictability in infrastructure projects
- identifying crucial issues early – technical, legal, spatial, financial. This knowledge will provide guidance for such things as staffing the project or the specification of joint planning issues
- spotting bottlenecks both spatially, in the landscape, and in the process
- avoiding drawn-out processes – finding the challenges early and acting accordingly
- reducing the risk of gaps between phases

- getting a financial overview – successive calculation. Where are the cost-driving factors?
- achieving more of the goals – climate goals, transport policy goals – functional goals and consideration goals, goals for the landscape, goals for social sustainability etc.
- finding the potentials – what added value is it possible to get when we invest for the future?
- contributing to attractiveness and functionality in the landscape, and meeting the Swedish Transport Administration's guidelines such as 'Landscape guideline' and the indicator 'share of landscape-adapted infrastructure'.





Chapter 3
Method

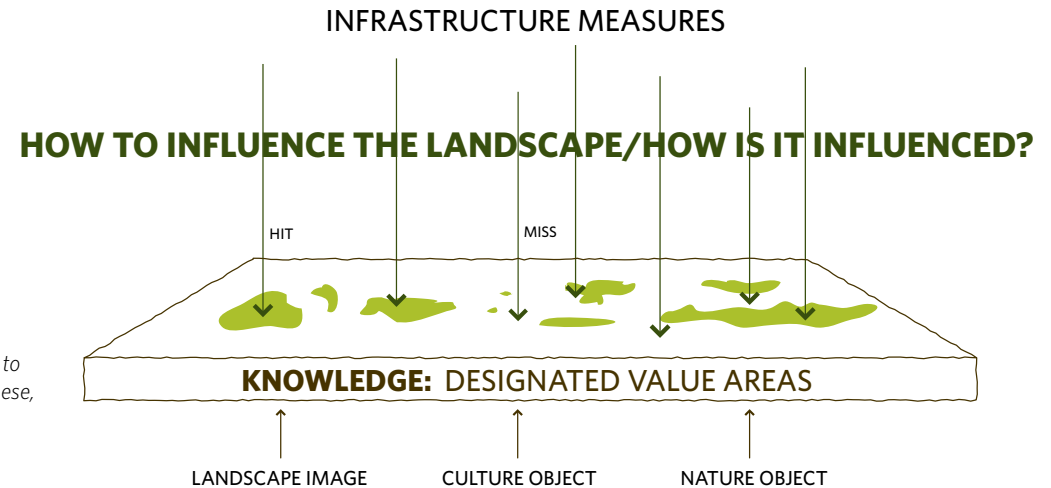


Figure 5. Knowledge about the landscape is limited to designated value areas. For the areas in between these, there is no knowledge. Illustration: Befaringsbyrån.

A COMPLEX KNOWLEDGE BASIS

This training material describes the method for *integrated landscape character assessments* (ILCA). The method was developed in response to new needs within planning and management of infrastructure.

The opening chapter describes the problems arising from the fact that most planning situations use sectoral planning guidance documents. This means that nature conservation, cultural heritage management and other landscape-related sectors present their areas of interest separately. There is the risk that planning and environmental assessments only consider the highlighted areas of interest and that infrastructure measures become located in the spaces *between* these objects. There is very little available information regarding these areas. The situation is illustrated in Figure 5.

To work instead with a complex knowledge basis shifts the focus from designated areas to structures and entities in the landscape, to functional connec-

tions and to what processes are ongoing. This can form the basis of more creative interaction and collaboration in order to find solutions for development needs regionally and locally, see Figure 6.

This knowledge gives us a holistic understanding of the landscape's *character, function and relationships*, and means that knowledge from the three aspects *form, historical time depth and ecology* of the landscape is integrated into the description. This gives a shared understanding of the landscape as arena.

The limitation of the situation in Figure 5 is that it is easy to observe an 'infringement' but harder to then extract constructive consequences from that. The more comprehensive description in Figure 6 provides *guidance* for possible courses of action on the basis of the knowledge gained and thus for *how* and *where* localisation and measures can occur.

ILCA - METHOD DEVELOPMENT

The research and innovation project 'Including landscapes in long-term spatial planning' was ongoing between 2010 and 2016, with the task of developing and testing methods for making early landscape decision guidance documents. The purpose was improved fulfilment of the Swedish Transport Administration's and Sweden's various objectives for the environment, landscapes and landscape-adapted infrastructure, as well the possibility of making good impact assessments of national and regional plans for transport infrastructure. It is also a way for the Swedish Transport Administration to implement the European

Including landscapes in long-term planning

The research and innovation project 'Including landscapes in long-term planning' has a website:

www.trafikverket.se/landskap

It provides access to all publications and reports produced during the project period, with many suggestions and examples.

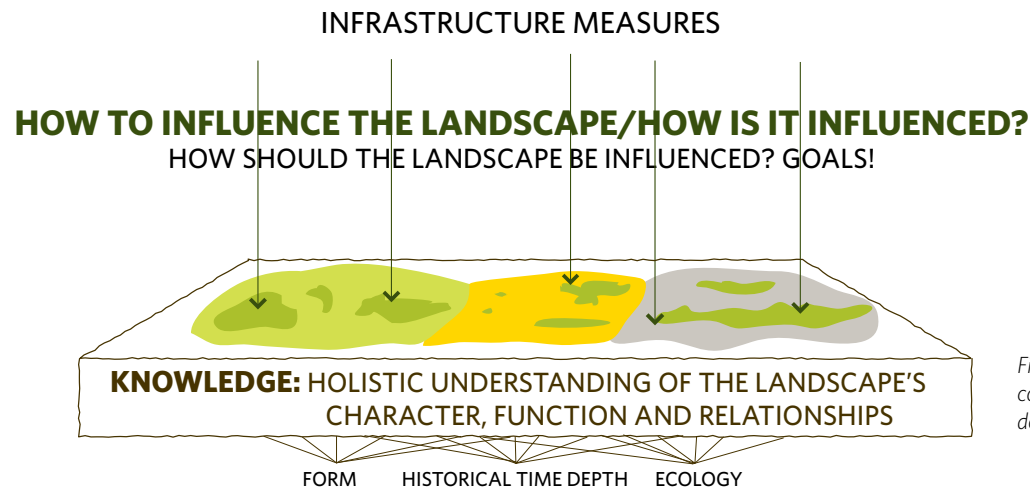


Figure 6. With a complex knowledge basis, the focus is shifted to structures, entities and functional connections, which encourages forward-looking, creative collaboration about influencing and developing the landscape. Illustration: Befaringsbyrå.

Landscape Convention's benefits and requirements in its operations. See the adjacent fact box about the convention. The method also embraces the Convention on Biological Diversity (CBD).

The project led to the method presented in this training material. During the course of the project, the method was tested in many different planning contexts and in investment projects, and was continuously adapted to specific needs. Several researchers have followed up the effects of using the method and put it in an international context.

The method has parallels to the British 'Landscape Character Assessment (LCA)'. One thing that distinguishes ILCA from LCA is that it encompasses more gap and function analyses. LCA also emphasises form and cultural aspects, while ILCA more roundly integrates ecosystems and the ecology of the landscape. For this reason ILCA requires an interdisciplinary and integrated approach. ILCA is moreover focused fundamentally on description and analysis, and less on evaluation.

The European Landscape Convention was ratified by Sweden in 2011 and came into force at that time. Among other things, this meant that all public authorities with planning responsibilities needed to adjust their activities in and for the landscape to the tenor of the convention. Its first article reads:

Article 1 - Definitions

For the purposes of the Convention:

- a Landscape** means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors;
- b Landscape policy** means an expression by the competent public authorities of general principles, strategies and guidelines that permit the taking of specific measures aimed at the protection, management and planning of landscapes;
- c Landscape quality objective** means, for a specific landscape, the formulation by the competent public authorities of the aspirations of the public with regard to the landscape features of their surroundings;
- d Landscape protection** means actions to conserve and maintain the significant or characteristic features of a landscape, justified by its heritage value derived from its natural configuration and/or from human activity;
- e Landscape management** means action, from a perspective of sustainable development, to ensure the regular upkeep of a landscape, so as to guide and harmonise changes which are brought about by social, economic and environmental processes;
- f Landscape planning** means strong forward-looking action to enhance, restore or create landscapes.

METHOD OVERVIEW

Analysing landscapes is about asking the relevant questions and seeking answers that can be put to use. Figure 7 on the right schematically summarises the method.

By asking fundamental questions about the landscape as we perceive it today, we focus on what can be experienced: how the landscape functions and how people use it (A. Characterisation). An understanding of why it looks and functions as it does is obtained by digging deeper, into thematic analyses (B), and by listening to people. These themes need not be the traditional, sector-separated ones, but can instead become relevant in-depth studies of the landscapes in question by means of a horizontal approach.

Once you have answers to these questions you have a firm basis for thinking about the future. What are our options for action now that we know this? Where will it lead? Questions about sensitivity and potential provide guidance for important considerations in the planning and design processes as well as in operation and maintenance (C. Development trends, sensitivity and potential).

The method for integrated landscape character assessment (ILCA) is focused on long term regional infrastructure planning and early measure selection studies. Its scale is regional, meaning that the assessment does not go into details. It can, however, be made more in-depth at other levels, which will be described later. Ecological, cultural and experiential connections rarely heed county or regional boundaries, and therefore national as well as occasionally international viewpoints are needed in order to explain the structure and function of a landscape.

A. **What** does the landscape look like, and how does it function?

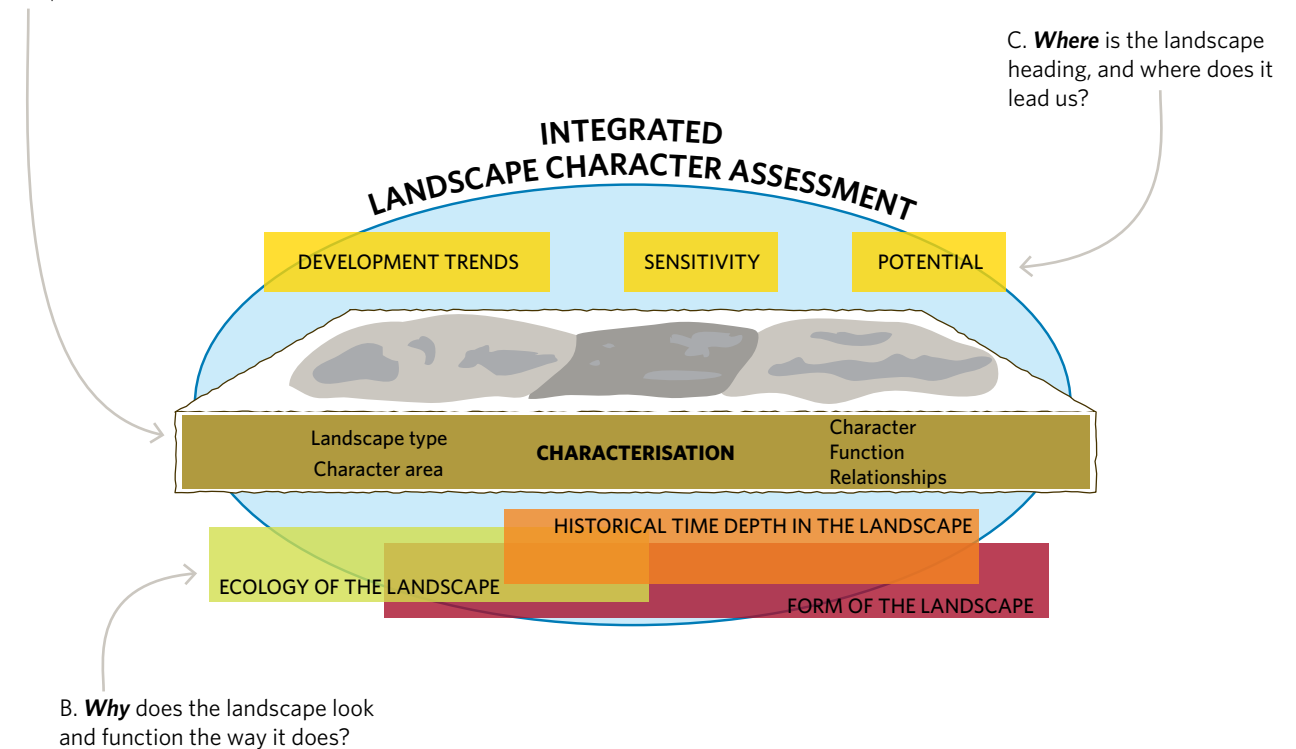


Figure 7. Summary of the method for integrated landscape character assessment. Illustration: Befaringsbyrån.

“ *An integrated landscape character assessment aims to provide an overall picture of the principal character, function and relationships of the landscape.* ”

The method is transparent and repeatable by allowing for a systematic application of the concepts in Figure 7 according to this method description. Using a system of check lists, it is possible to go back and see what the grounds were for various delimitations, descriptions and assessments.

ROLES

There are three fundamental roles in the process. The *client* is the party that needs the knowledge base and commissions the *provider*, who carries out the lion's share of the analysis. Additionally, *examiners* are needed – people with specialised knowledge who can examine, comment on and adjust facts and assessments. Examiners include specialists at the Swedish Transport Administration, from the county administrative board and from other authorities. Citizens and individuals who pursue activities in the landscape can take part as examiners and as providers of elements of the analysis, by means of dialogue or participation processes.

All roles need to have an understanding of the importance of integrating different knowledge fields in the process, and that these need to be not just present but also need to work together. The client needs to be clear about this already at the procurement stage, where the necessary competences have to be specified.

An integrated landscape character assessment is usually carried out by a team of consultants. The team needs to have access to all the specified competences, and they need to be able to work together. The analyses are not done in parallel but in an integrated, interdisciplinary manner. The examiners also need to organise themselves so that the dossier is penetrated in a multidisciplinary way.

IMPLEMENTATION

An integrated landscape character assessment is intended to provide an overall picture of the landscape's principal *character, function and relationships*, that

is, what it looks like and why, how it works and what relationships people have to it.

The method requires a multidisciplinary working process that includes people with different competences. These people will view the landscape with their own eyes, based on their specialist knowledge, and share this with each other during the course of the process. Through discussions they will then develop a shared understanding of the landscape being assessed.

In practical terms, this is achieved by actors with different competences taking part in a series of field trips and meetings together, as the work progresses. This produces a holistic assessment of the landscape – a shared narrative that all those involved are prepared to support.

WORK PROCESS

Working to characterise a landscape is not a linear process. Field trips are mixed with analyses, literature and map studies, and meetings with participants from various places, in several phases. This builds knowledge gradually, and assessments can be reviewed on a continuous basis. Figure 8 describes how the work is done – it is a process that goes through several iterations before everyone agrees and is clear about distinctions, descriptions and assessments.

1. Delimitations, staffing and requirements

Initially, limits need to be defined and the organisation that is going to carry out the assessment needs to formulate:

- purpose
- planning context and requirements (direction)
- geographical delimitation
- specification of the assessment scale, which depends on the purpose

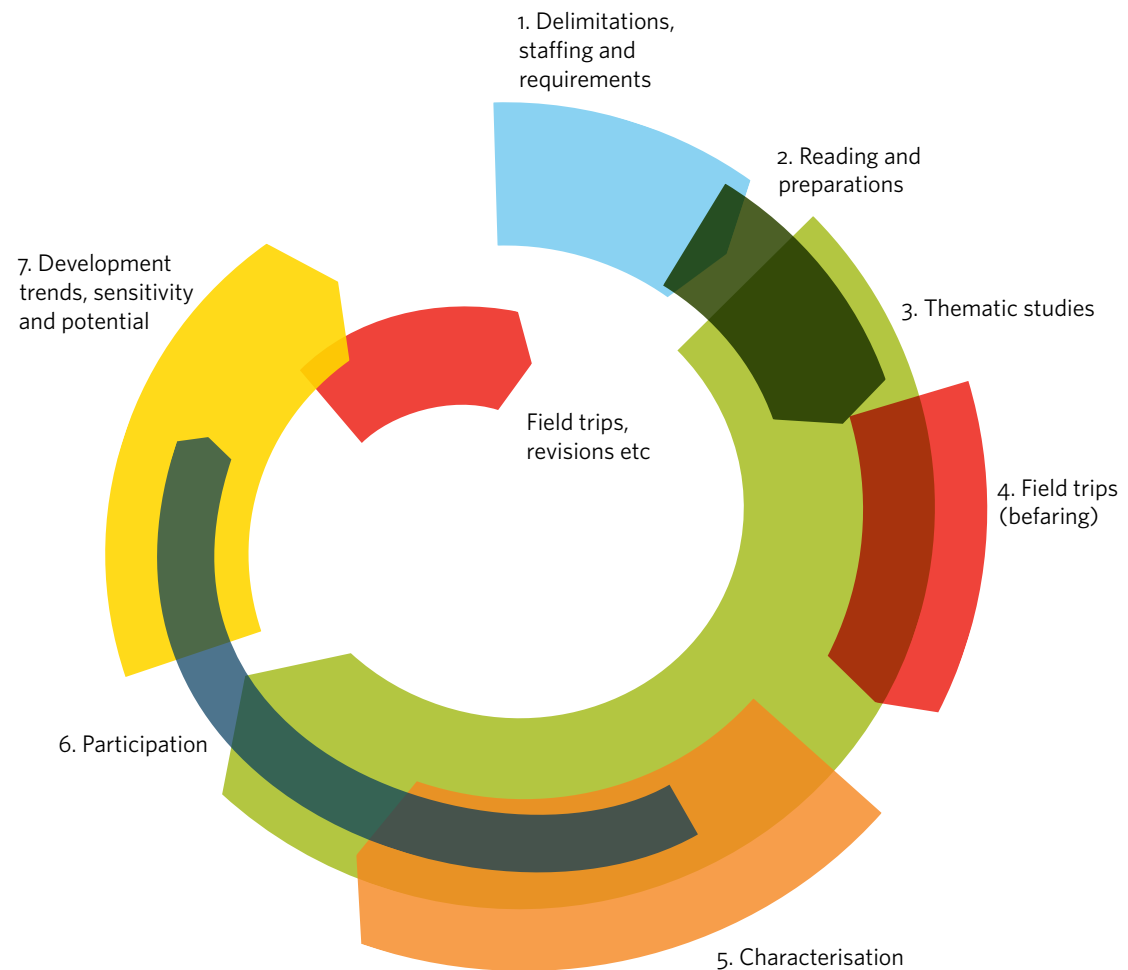


Figure 8. Characterising a landscape is not a linear process. This schematic image shows the different elements without fixed beginnings or ends. It's a process that can go several times around before everyone agrees and is clear about distinctions, descriptions and assessments. Illustration: Befaringsbyrå.

- landscape aspects to focus on
- organisation and roles, including any citizen participation
- areas of competence
- procedure – how and when do the different roles participate?

One element of delimitation that is worth highlighting is the analysis of the measures and ambitions that feature in the planning situation, i.e. what measures that are largely conceivable or possible. An understanding is needed of what the physical expressions of these measures are in the landscape – technical requirements, space requirements, standards and so on. It is on the basis of these requirements that the assessments of sensitivity and potential can be made and can serve as guidance in the management of the measures. This means that the assessment is pointed in a particular direction. It may be directed towards other types of development than infrastructure specifically, but a direction is needed in order to make the analysis sharp and easily applicable, and in order for it to work as guidance.

2. Reading and preparations

Before the first field trip, thematic studies begin by means of reading, map studies etc. Studies and analyses made previously are collated. Examples of such studies include landscape analyses for various purposes, cultural environment programmes, dossiers from county administrative boards or municipalities, the National Atlas of Sweden and *Atlas över Sverige*. When studying existing material describing the landscape it is important that it is ‘reformatted’ in accordance with the current planning situation, requirements and the need for multidisciplinary competence. A comprehensive reading of the material and the relevant literature is then made for an understanding of the bigger picture.

Map studies are done to identify overall patterns and obtain an initial image of the landscape. Map studies usually allow for a rough division of the landscape into landscape types, which can then be verified on the coming field trips.

3. Thematic studies

Thematic studies are needed in order to explain *why* the landscape looks and functions in the way it does. They are carried out in parallel with the overall work and provide continuous input to the joint process – from field trips to characterisation, assessment and guidance. By studying processes of change in the landscape, both thematically and in an integrated manner, it becomes possible to understand the landscape’s development and historical time depth – then, now and in a likely future. This forms the basis of an assessment of *development trends, sensitivity and potential*. As the picture of ongoing development trends and current requirements in the planning of measures becomes clearer, it will also become clearer which aspects of the landscape need to be highlighted in the thematic studies.

Here we propose three themes that illustrate different aspects of this: the landscape’s *historical time depth (development), form and ecology*. These themes need not follow traditional sector interests, and thematic studies can also be carried out jointly for



Photo: Bengt Schibbye



Photo: Bengt Schibbye



Photo: Bengt Schibbye

Image series 9. Elements of the ILCA work process. Photo: Bengt Schibbye

several of the themes (more on this in the *Thematic studies* chapter).

4. Field trips (*befaring*)

The word *befaring* is a loan from Norwegian, used in the Swedish version to emphasise that these field trips are not ordinary collection/inventory outings, but an observation in the field carried out with a multidisciplinary competence group. The aim is for all participants, with their different specialised knowledge, to achieve a shared basis by sharing experiences and knowledge of the landscape: to talk about and analyse the landscape *in the landscape*. It is therefore preferable if clients, providers and examiners all take part.

The object of the field trip is to clarify what the landscape looks like today and how it functions, and to constitute the basis for the division into landscape types and character areas, as well as for the analyses that need to be made in order to explain the landscape. A check list, provided as an appendix to this

method description, covers the tasks that need to be carried out during field trips.

Questions that may be significant for subsequent studies are discussed: Why does the landscape look and function the way it does? What processes are active? How is the landscape changed by natural processes? Is land utilisation stable or does it appear to be going through changes? A field trip usually results in a revision of the division into landscape types and a preliminary subdivision into character areas.

5. Characterisation

Characterisation of the landscape is about dividing it into areas – *defining character areas* which are geographically fixed – and organising them by *landscape types* that describe the conditions that define them (read more on this in the *Characterisation* chapter). With thematic studies begun and taken into account, the field trip seeks character defining elements and functions, as well as boundaries where one character transitions into another. Sometimes this boundary is

distinct, but it can also be indeterminate, in which case the boundary is drawn where you are most uncertain about which character is dominant. It is therefore sometime necessary to define transition zones in relation to surrounding areas, or allow character areas to partially overlap. Read more on characterisation in the *Characterisation* chapter.

6. Participation

Participation by experts as well as by the citizens and users who live in and use the landscape is important. That way you benefit from both established specialist knowledge and local know-how. This can occur during several stages of the process and in different ways.

Citizen participation is tied to the scale of the assessment. The closer you get to people's everyday lives in the analyses, the more likely you are to be aided by knowledge and interpretation of the landscape through the people who live and work there. This method description does not include citizen collaboration. Knowledge and methods may be sought in



Scale of analysis >	Local	Regional
Scale	Around 1:25 000 – 1:50 000	Around 1:250 000
Character	as perceived by people	natural, cultural and geographical structures
Function	use in everyday life	as a system
Relationships	identity, belonging, sense of place (topophilia)	cultural belonging
Participation	associations, rural community groups, individuals	representatives, public administration, non-profit organisations

Figure 10. Participation in relation to the scale of the analysis and other factors.

other literature and by looking at planning situations in which participation played an important part. An overview of the relationship between the scale of the assessment and participation, among other factors, is shown in table format in Figure 10.

7. Development trends, sensitivity and potential

An assessment of *development trends*, *sensitivity* and *potential* is added to the descriptions of the landscape type and/or character area. Sensitivity and potential are directed towards assessing current infrastructure measures and requirements, and is the forward-looking part of the assessment. It can serve as guidance for how infrastructure measures should be planned, and in that way provide guidance to where measures are appropriate and less appropriate. Sensitivity and potential can also be used in effect and impact assessments of infrastructure measures in different planning contexts. More on this in the *Development trends*, *sensitivity* and *potential* chapter.

REDIRECTING AN EXISTING GUIDANCE DOCUMENT

Many regions already possess regional landscape assessments that were carried out in the past, for various purposes and using various methods, e.g. for wind power. Characterising a landscape requires time and resources. Where possible, existing landscape assessments can be built on and redirected so that they can be practically applied in infrastructure planning, avoiding the need for a full integrated landscape character assessment to be carried out again. In these cases it is efficient to focus the work on the landscape's sensitivity and potential on the basis of infrastructure measures. Roads and railways are networks of linear structures that relate to the form and topography of the landscape in a different way than e.g. wind power does. Infrastructure therefore affects the landscape's character and functions in different ways. Characterisation and thematic studies may also need to be complemented or redirected in order to support the description of the landscape's sensitivity and potential.





Chapter 4

Characterisation

CHARACTERISATION - INTRODUCTION

Describing the character of a landscape means describing the *whole* landscape – there are no blind spots. The European Landscape Convention defines a landscape as an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. It also underlines that all types of landscapes are important to people – everyday areas as well as areas that are considered particularly beautiful. Research about landscapes that is connected with the convention centres on three concepts: **character, function, relationships**. The idea is that landscapes can be understood as:

- image/experience/perception (character) (Swanwick, 2003),
- ecosystem/socio-ecological system (function) (Plieninger & Bieling, 2012)
- territory/identity area (relationships, sense of place) (Tuan, 1977; Stuart & Williams, 1998).

CHARACTER	FUNCTION	RELATIONSHIPS
Key characteristics and building blocks, and their interrelationship	Functional aspects of the landscape	People's connection with and use of the landscape
<ul style="list-style-type: none"> • Land form, topography, relief, geological direction • Rock types, soil types, water in the landscape • Spatiality and spatial contexts (open/closed, texture etc) • Vegetation and vegetation structure • Nature types and biotopes • Land use as character • Infrastructure • Settlements (character, age, function, structure) • Scale • Complexity 	<ul style="list-style-type: none"> • Movement patterns and functional connections (communications, corridors etc) • Spatial functions (landmarks, delimitations, orientability etc) • Ecological functions and connections • Historical functions and contexts/cultural history in the landscape 	<ul style="list-style-type: none"> • Identity and connection • Cultural ecosystem services • Significant places/venues • Use of the landscape • Cultural references (places known from literature, art etc)

Figure 11. Aspects of the landscape from the check list, see appendix.

Fundamentally, the landscape is divided into *landscape types* and *character areas* that describe similar conditions in a complex landscape description. This is referred to as *characterisation*. It has proven easier for people to relate to such a description – it tells a story, something that you can relate to. That way, a map is drawn which is really the landscape's own, albeit interpreted by certain people, for specific areas of application. This becomes an image to pore over together in order to discuss changes and urgent future development issues.

Aspects of the landscape

As an aid to analysing the constituent parts of a character area or a landscape type there is a check list (see appendix). Instead of dividing the aspects of the landscape by sector, they are classed as pertaining either to the landscape's *character* or to its *function* (see adjacent box). People's *relationships* to the landscape is also included in the check list since this information may be useful to those experts who are interpreting the landscape. The check list can of course also be used in the event of citizen participation, if this is seen as being helpful, but there are other tools and methods to use in that instance.

“ *Landscape character is a concentrated expression of the interplay between an area’s natural conditions, land use, historical and cultural content, as well as spatial and other perceivable circumstances that typifies an area and distinguishes it from surrounding landscapes.*
(Clemetsen, 2010, translated)

CHARACTER

Landscape character is a central concept in this method, and is defined as quoted above.

An ‘area’, as referred to in the definition, that is ‘set apart from the surrounding landscape’, is considered using the two terms *landscape type* and *character area*. The conditions referred to are a number of characteristic building blocks – that build character. These are called *key characteristics* and need to be sought out jointly on field trips, through guidance documents and studies of the landscape (see the *Thematic studies* chapter). These key characteristics are the bearers of the landscape’s expression and character and are therefore sensitive to change, if the prevailing character is to remain. As a result of defining these conditions, guidance can be provided to the landscape’s *sensitivity* and *potential*. Key characteristics are not the same thing as highly valued areas or single interesting phenomena.



Image series 12. Key characteristics and building blocks in a 'lesser mosaic landscape'. Selection: small-scale, hilly, variable spatiality, rich in biotopes and species, short dispersion distances, varied land use, varied settlements, historical tone. Photos: Bengt Schibbye.

The identification of the character of a given character area can involve people who are active in and have a relationship to the place. Read more about participation in the *Method* chapter, under *Implementation*.

Character areas

In order for it to be possible to use the qualitative content of the landscape character in planning and administration, it has to be tied to geographically delimited areas – character areas. Each character area is unique and only exists in one place, and differs from adjacent areas.

Landscape types

Different character areas almost always have certain shared features. Such shared features make it possible to categorise character areas into landscape types, e.g. plains or rift valleys. Landscape types can feature in several places – an example is that the ‘Kristianstad plains’ and the ‘Skara-Vara plains’ are both character areas of the ‘plains’ landscape type. In this method,

the division into regional landscape types is an important basis for the description. It makes it possible to compare different character areas with a similar structure, such as different plains landscapes.

Choosing a description level

For each individual assessment it needs to be determined whether putting the emphasis on landscape types or on individual character areas will be most appropriate for the description and assessment. At an overall, regional scale there may be advantages to describing landscape types and specifying the description for character areas. If the scale of analysis is more detailed, however, it may be more appropriate to let the character area dominate the description.

Drawing boundaries

There is no given answer to how you delimit landscape types and character areas – where one character transitions into another. Sometimes the boundary is distinct, but it can also be indeterminate, in which

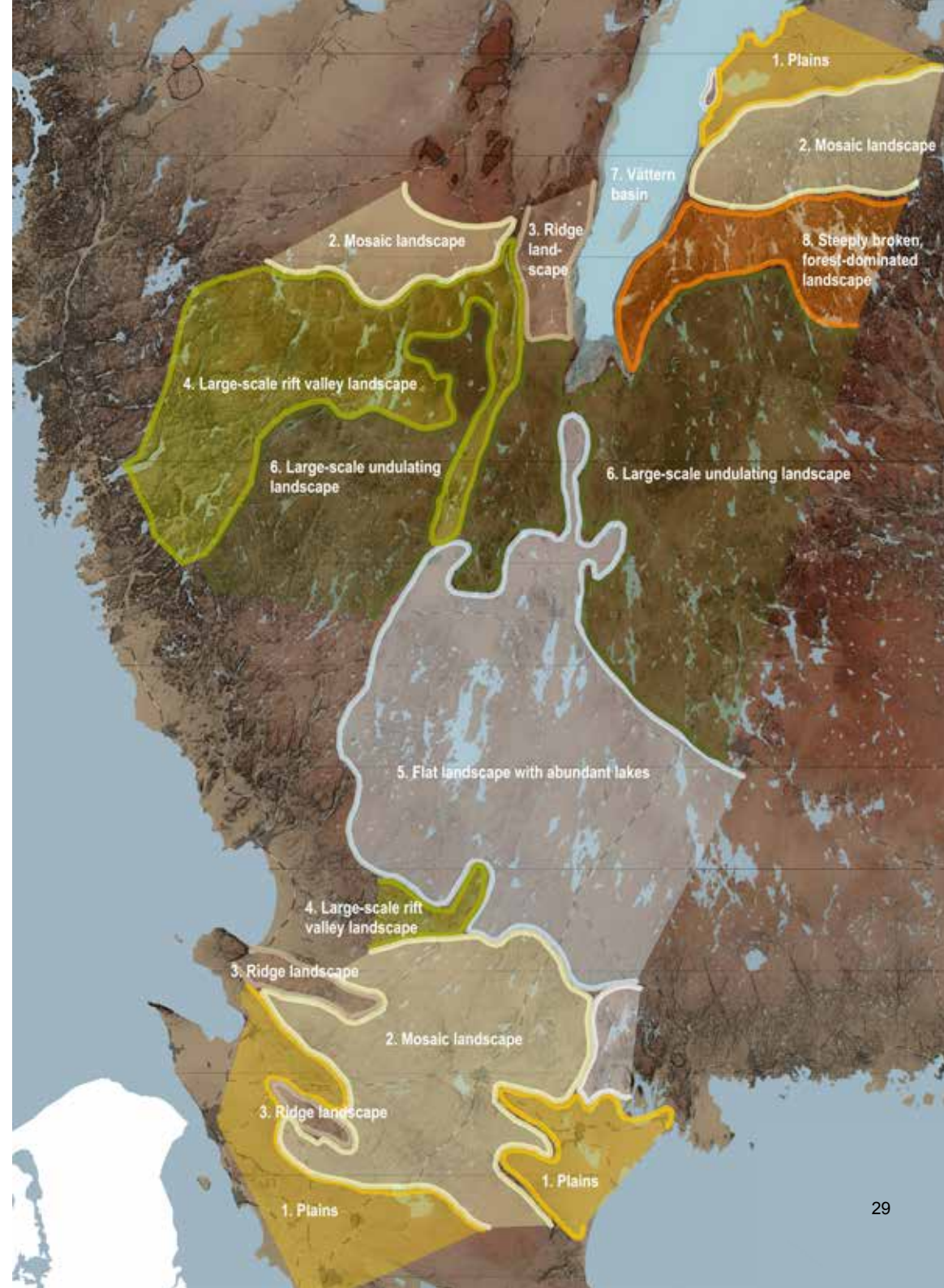
case the boundary is drawn where you are most uncertain about which character is dominant. It is therefore sometime necessary to define transition zones in relation to surrounding areas, or as partially overlapping character areas.

Naming

There is no predetermined set of landscape types in Sweden. Division and naming are adapted to current planning cases. However, for landscape types it may be appropriate to construct the name using natural geography terms that relate to the area’s topography, which of course is fundamental to infrastructure. Examples include *plains*, *long valleys* and *ridge landscapes*. For hilly landscapes it may be appropriate to specify whether it is a *large-scale undulating landscape*, a *steeply hilly landscape* or a *small-scale rift valley landscape*. If there is a dominant feature it may be appropriate to specify this too, e.g. a *flat landscape rich in lakes*. If there is no dominant feature, the landscape may be a *mosaic landscape*. Names such as ‘intermedi-

Regional overall LANDSCAPE TYPES	Regional overall CHARACTER AREAS
1. PLAINS	<ul style="list-style-type: none"> • Östgöta plain, Västansång • Ängelholm plain • Kristianstad plain • Southwest Skåne's plains
2. MOSAIC LANDSCAPE	<ul style="list-style-type: none"> • Västergötland's transition zone • Southern Östergötland's transition zone • Northern Skåne's transition zone
3. RIDGE LANDSCAPE	<ul style="list-style-type: none"> • Hökensås • Hallandsås • Söderås
4. LARGE-SCALE RIFT VALLEY LANDSCAPE	<ul style="list-style-type: none"> • Sjuhäradsbygden • Nissan river valley
5. FLAT LANDSCAPE WITH ABUNDANT LAKES	<ul style="list-style-type: none"> • Southern Småland's lake landscape
6. LARGE-SCALE UNDULATING LANDSCAPE	<ul style="list-style-type: none"> • South Swedish highland west of the Nissan • South Swedish highland between the Nissan and the Lagan • South Swedish highland east of the Lagan "Småland highland"
7. VÄTTERN BASIN	<ul style="list-style-type: none"> • Vättern basin
8. STEEPLY BROKEN, FOREST-DOMINATED LANDSCAPE	<ul style="list-style-type: none"> • Östra Vätternbranten and the Sommen

Figure 13. Landscape types and character areas, here at the regional scale. The type of landscape (landscape type) can be found in several places (character areas). Character areas have geographical names – the exception here is the Vättern basin, which is unique in the country. Illustration: Befaringsbyrån.



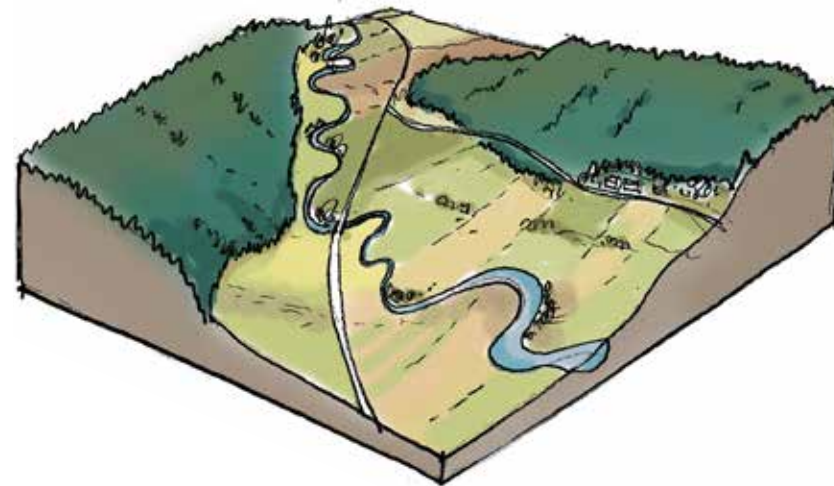


ate landscape' should be avoided, as they tell us nothing about the specific character of the landscape.

Character areas, in contrast with landscape types, should have geographical names as they refer to an area with a specific location. People should be able to recognise and relate to the names, e.g. the Fal district, the Kristianstad plain and the Ångerman river valley.

Illustrating character

On this spread are some examples of illustrations of the building blocks that build character. They are all stylised representations that focus on the distinguishing key characteristics. It is a good idea to supplement them with photographs that illustrate particular manifestations.



Figures 14 and 15. Two examples of illustrating character by stylising the landscape and highlighting dominant features and manifestations – key characteristics. Illustrations: Emily Wade.

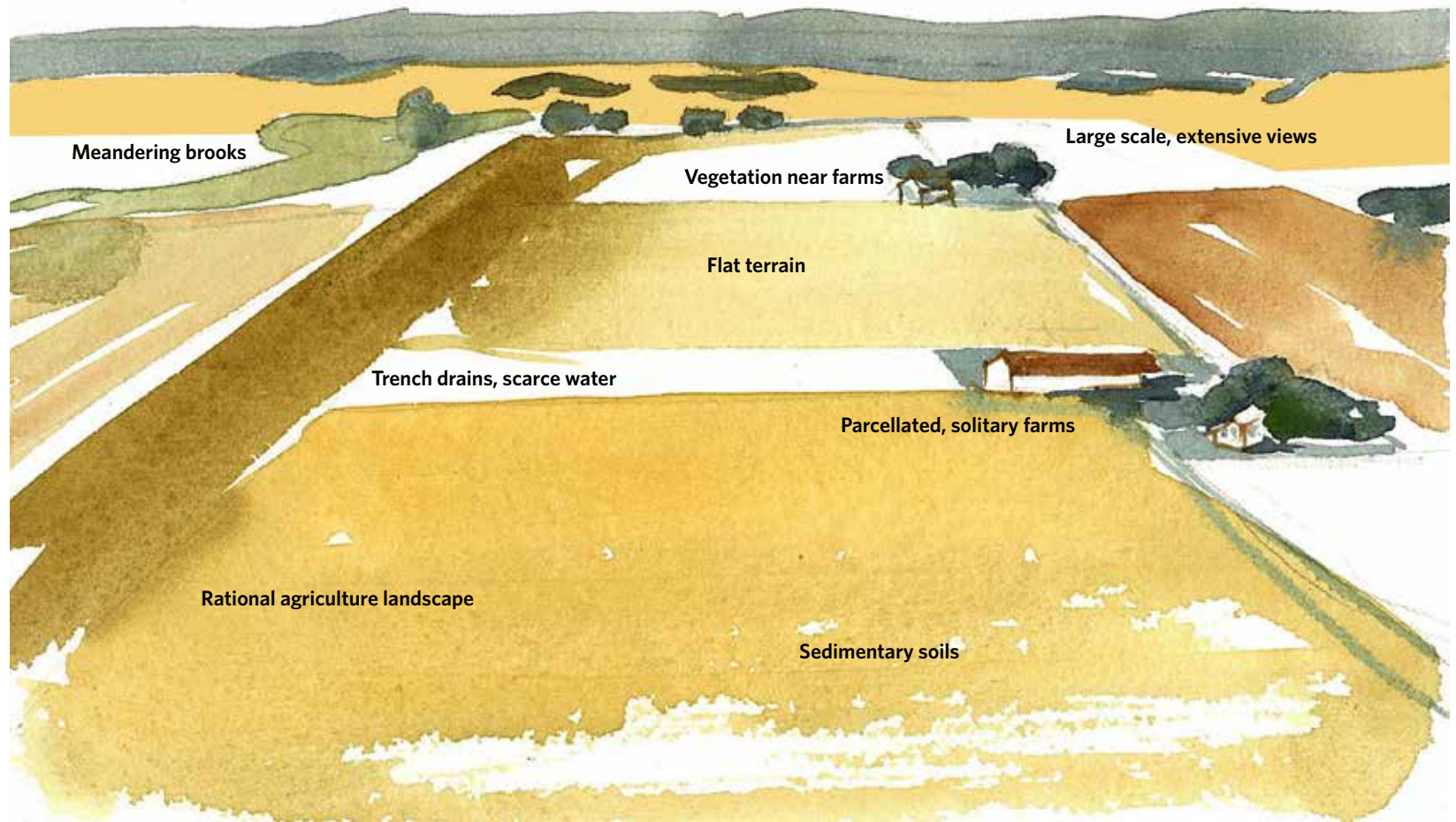


Figure 16. A stylised watercolour with character-making building blocks or key characteristics. Example from plains in Västra Götaland.
Illustration: Emily Wade.

FUNCTION

How a character area or landscape type functions as an ecosystem and a socio-ecological system can be described using text and maps (see the adjacent example). Often more in-depth thematic studies are needed in order to obtain this knowledge. Sometimes aggregated knowledge at the overall landscape level is needed – a type of documentation that sometimes has to be created (read more in the *Thematic studies* chapter). Sometimes it is also necessary to carry out combined analyses with several thematic input values.

The function of a landscape can also be understood by means of e.g. gap analyses and ecosystem services assessments (ESA). ESA and function assessments for ILCA are complementary, see Figure 21 on page 35. Cultural ecosystem services are connected with the *relationships* aspect of the landscape.

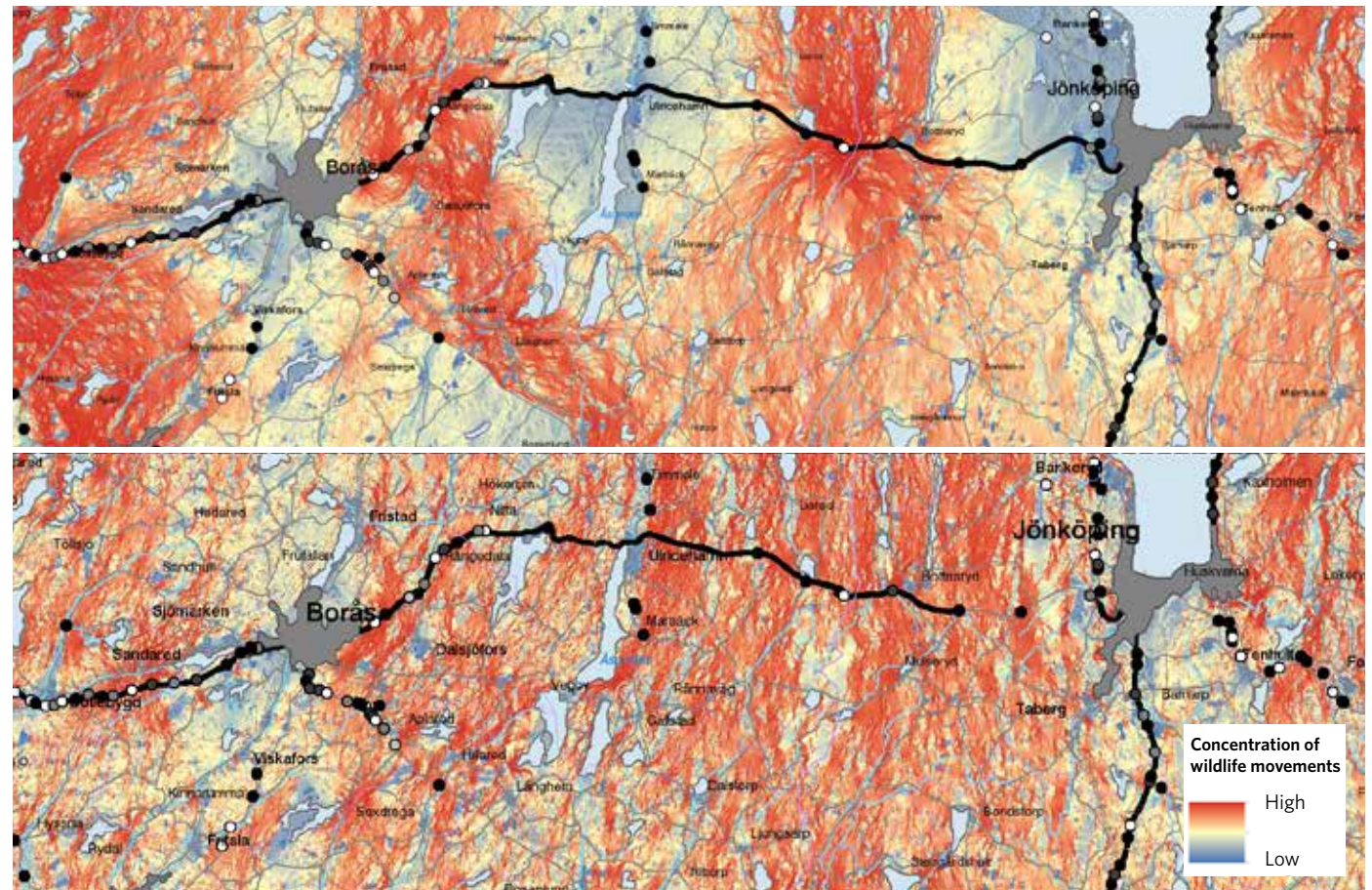


Image series 17. The maps show conditions for the movement of wildlife on the basis of attractive biotopes for wildlife, with and without barrier effects from infrastructure – a “natural” state and one with corridors directed to possible passages. These differences can form the basis of a gap analysis of wildlife passages. Maps: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

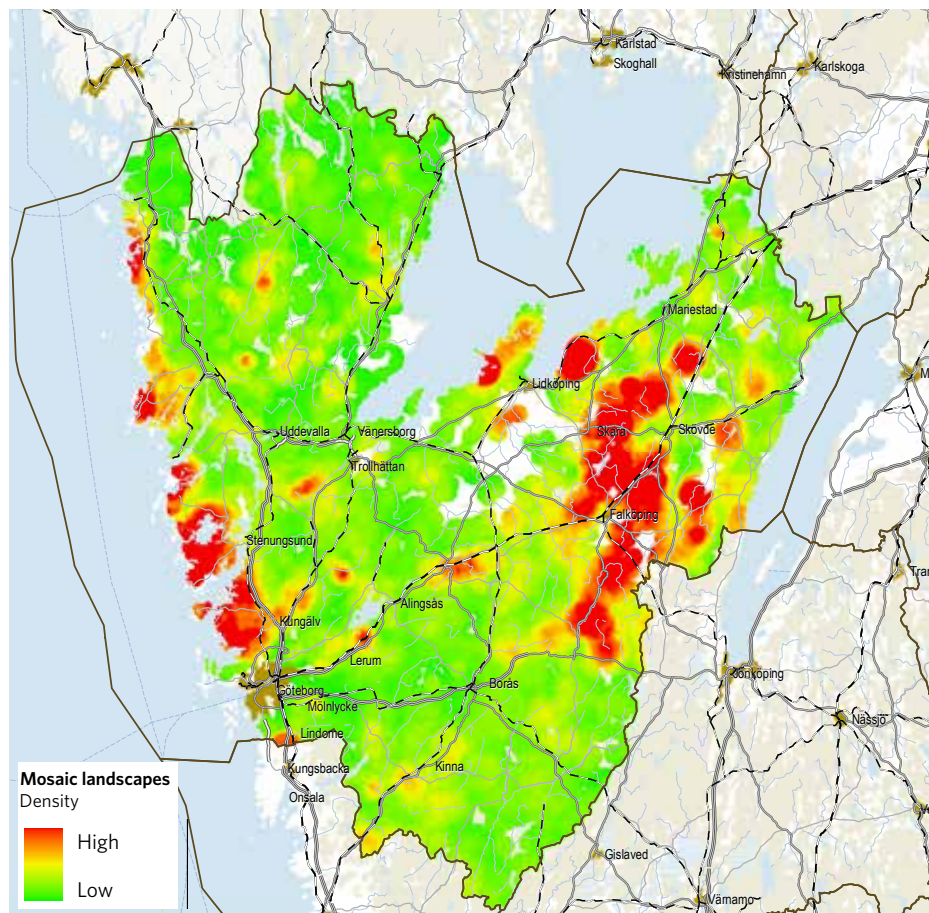


Figure 18. Conditions for biological diversity and functional landscapes. Map: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

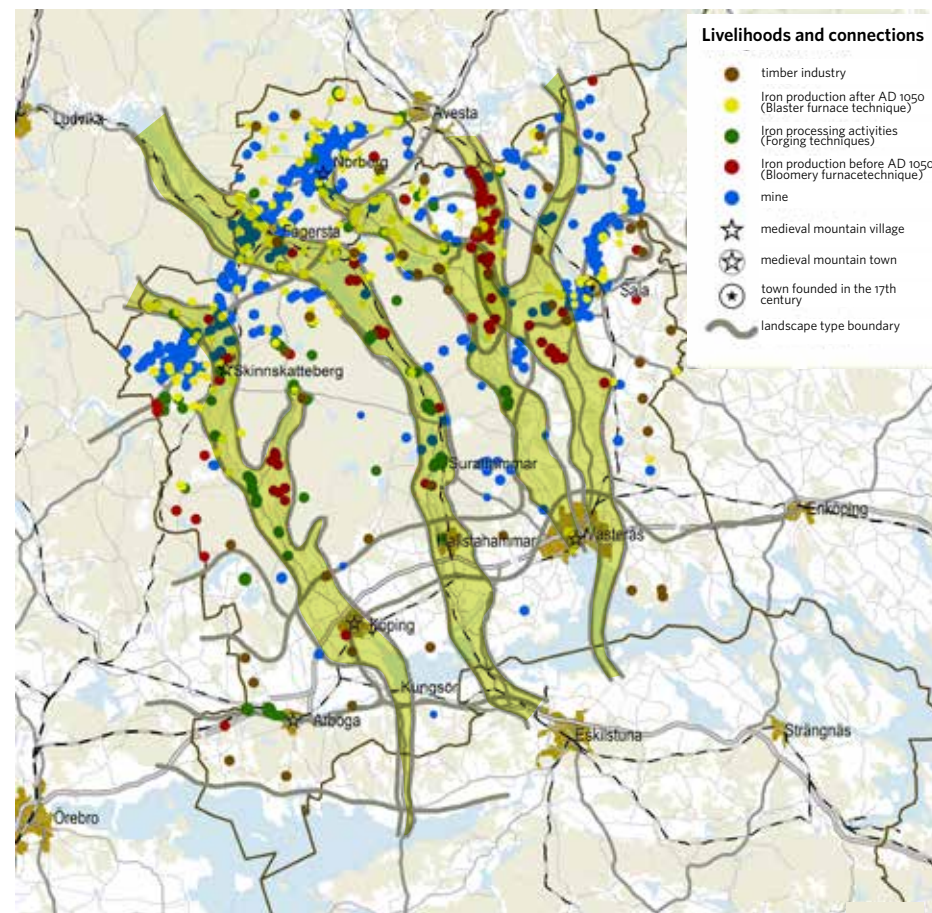


Figure 19. Regional livelihood structures in Västmanland county, linked to mining. The map shows the important function of the river valleys (in green) as "arteries" throughout the time of human mining activity. Map: KMV forum. Background map: ©Lantmäteriet, Geodatasamverkan.

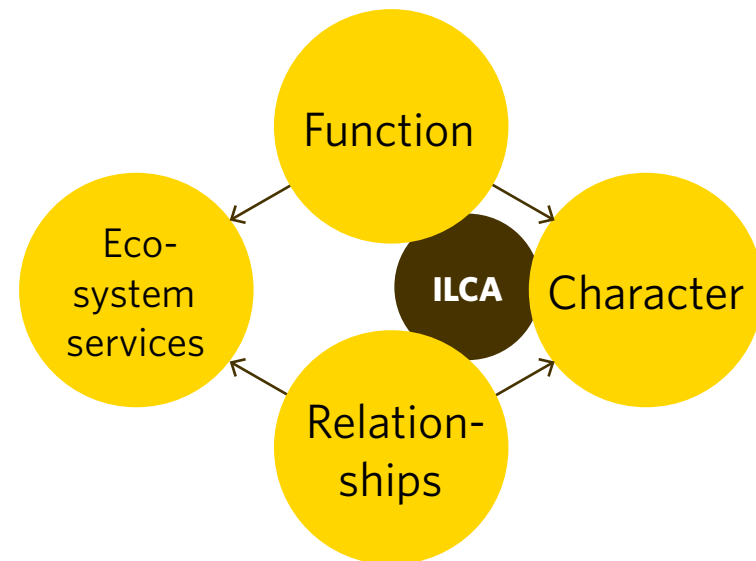
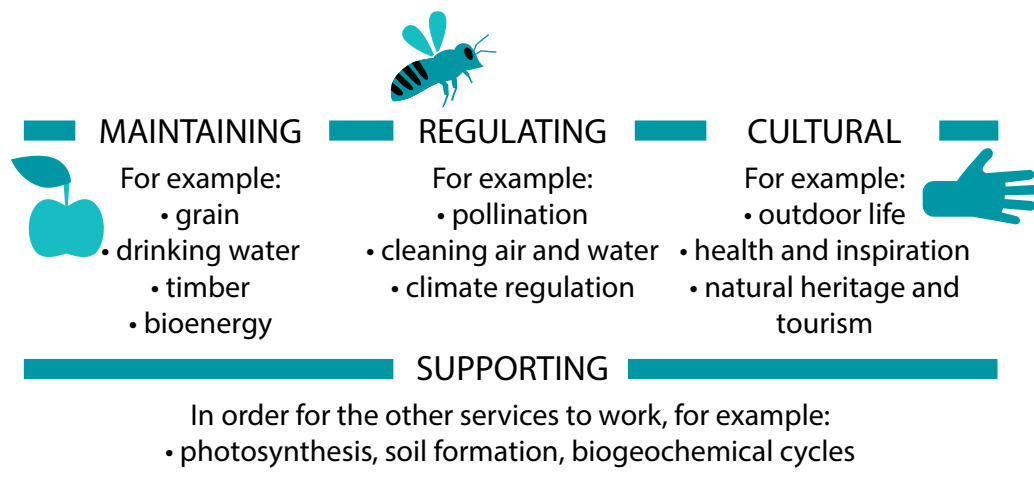
RELATIONSHIPS

The landscape convention sets out from people's relationships to the landscape. People have a pragmatic relationship to the landscape as well as particular identity bonds. Often the landscape is taken for granted. People's relationships to the landscape can be understood by means of dialogue and participation processes. For the relationship aspect participation is crucial, but people can also make significant contributions to character and function descriptions, as mentioned earlier.

The analyses and participation processes can provide narratives about social systems. Ecosystem services are usually divided into supporting, maintaining, regulating and cultural ecosystem services (see Figure 22). Cultural ecosystem services are tied to people's well-being in relation to nature. An ecosystem services perspective can thus contribute to important function and relationship knowledge for an integrated landscape character assessment.



Figure 20. People have different relationships with the landscape, depending on how they use it, among other things. We often take the landscape for granted. Photo: Bengt Schibbye.



▲ Figure 21. The landscape's functions and relationships are the basis for the mapping of ecosystem services. The character of the landscape is dependent on functions and relationships. Illustration: Befäringsbyrån.

◀ Figure 22. Ecosystem services (ES) are often divided into four categories. Analyses of ES can support and be the basis of analyses of functions and relationships in an ILCA, where cultural ecosystem services are about people's relationship to the landscape. Illustration: www.naturvardsverket.se/ekosystemtjanster

SCALE

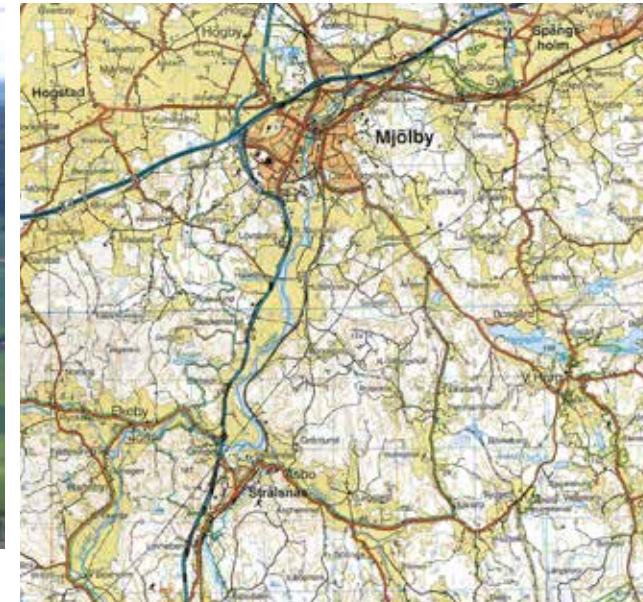
Landscape types and character areas can be used at different scales, as described in Figure 26. At the regional level, for instance, there are several character areas of the plains type – such as the *Skara-Vara plain* and the *Dalbo plain*. On the next level we can look at the Skara Plain, for example, and see that it in turn is made up of parts of one or more character types at the local scale. In this way regional analyses can be made deeper at future stages without losing the overall context. The scale of analysis is simply chosen on the basis of the task at hand.

The method was developed for a regional scale. It has, however, been tested in higher resolution planning cases at the local scale, and works there too. It depends on what ‘flying altitude’ your analyses have.

In order to understand landscape conditions, it is often useful to shift scale during the course of the work, both upwards and downwards. This allows you to see inherent details, or gain an overview and identify patterns. It can be done e.g. by studying maps with different scales, where information and presentation have been adapted to the scale. For this reason, analysis work includes shifting between different scales, even if the reporting is then done at a specific scale.



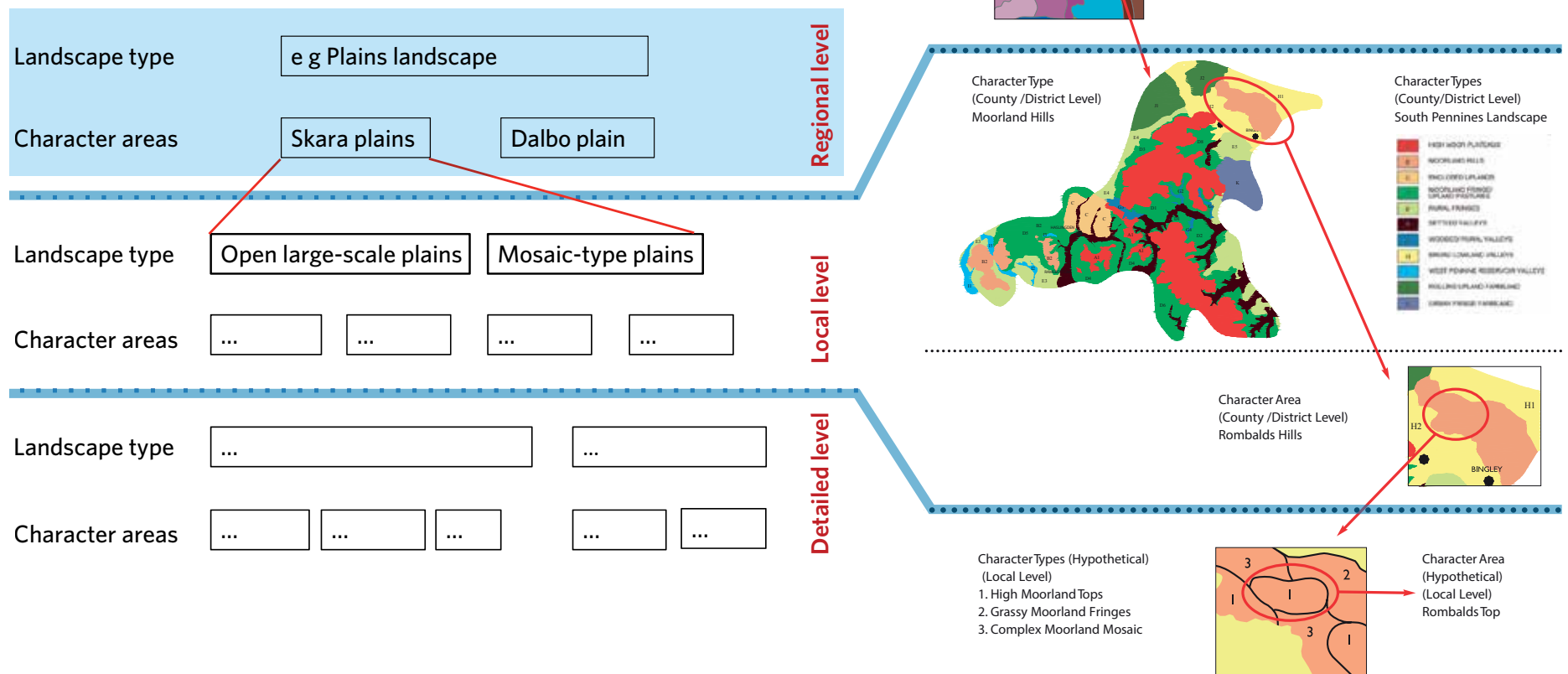
▲ Figure 23, top left. The scale – the “flying altitude” – determines what we see. An overall picture provides contexts, but not very much detailed knowledge. If we zoom in on details, it is easy to miss important connections between the parts. The task should govern mapping and choice of scale – but in all analyses it is necessary to zoom in and out in order to include various perspectives. Photo: Pekka Kärppä.



► Figure 24, top right. Lantmäteriet’s Road map at a scale of 1:100 000 is suitable to take along when you are in the field. It gives a more detailed view of the topography of the landscape and includes information about small forest roads, cycle paths and protected areas. It also includes many locality and place names, which is important for remembering different places and in order to be able to identify the photographs taken during field trips. Map: ©Lantmäteriet, Geodatasamverkan.



► Figure 25, bottom right. For the regional scale, maps at a scale of 1:250 000, such as Lantmäteriet’s Survey map. This map shows woodland, open landscapes, lakes and major wetlands, rivers, the road network, population centres and elevations of some lakes and peaks. The survey map provides an overview of land cover and the density of people’s built structures. Map: ©Lantmäteriet, Geodatasamverkan.



Source: Derived from LUC (1999) South Peninnes Landscape Character Assessment. For SCOSPA, Bradford.

Figure 26. The relationship between **landscape type** and **character area**, and different **levels of scale**. A landscape type such as plains can occur in many places, but a character area only exists in one place – it is unique. Character areas and landscape types occur at the different levels of scale, which is an important point of the method – it can be built on at later stages with more detailed studies. The British example on the right shows how this can be applied in planning contexts. The image is taken from the manual for Landscape Character Assessment (The Countryside Agency, 2002).





Chapter 5

Thematic studies

“ *Thematic studies are aimed at explaining **why** the landscape looks and functions the way it does.* ”

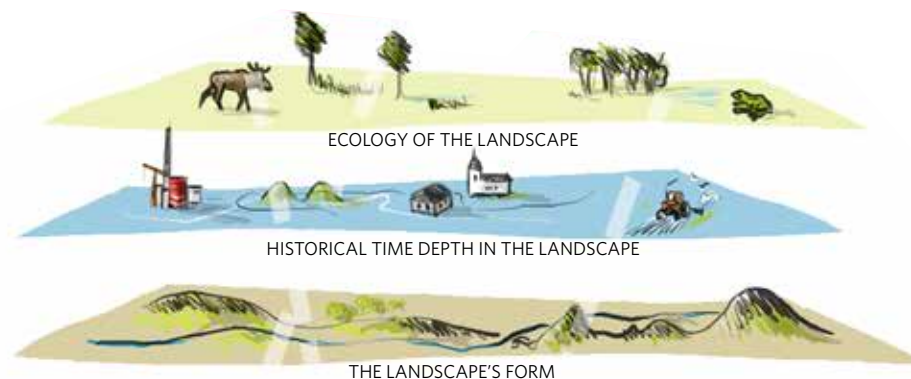


Figure 27. Illustration: Ingrid Frölich.

THEMATIC STUDIES - INTRODUCTION

Thematic studies are aimed at explaining *why* the landscape looks and functions the way it does. The studies place the landscape in a temporal context and explain its historical time depth – how the landscape was formed before and after the ice age, and how animals and humans settled in the landscape, made use of it and made their lives in it.

The studies also place the landscape in a spatial context. By aggregating knowledge, structures and patterns can be elucidated. This may need to be done at different scales – sometimes in comprehensive regional or national contexts. Sound knowledge is needed here to interpret the picture that emerges.

The thematic studies contribute knowledge to the characterisation, and vice versa. In other words, the thematic studies are carried out in parallel with the other cross-sectoral collaborations, and these enrich each other.

By studying processes of change in the landscape, both thematically and in an integrated manner, you can gain an understanding of the landscape's development and historical time depth – then, now and in a likely future. This forms the basis of an assessment of development trends, sensitivity and potential.

Thematic studies can be made according to traditional sectors for landscape information, since guidance documents have often been drawn up that way. Still, it can be rewarding to combine studies and create new themes, since it all concerns phenomena in the same landscape. The studies are made to explain the landscape's conditions for the planning or design situation in question, and are adapted accordingly.

It can be a good idea also to make thematic studies knowledge compilations for other reviews that are required as part of the Swedish Transport Administration's planning process, such as inventories, cultural environment analyses and environmental assessment processes.



Figure 28. The landscape's form stylised in a watercolour representation. Here a rift valley landscape with abundant lakes.
Illustration: Emily Wade.

THEMATIC STUDY: THE LANDSCAPE'S FORM

Form is one of the basic parameters that make up a landscape's character. The form of a landscape includes aspects such as its *scale*, *structure* and *visual character*. The scale and structure of a landscape are constituted by its topography, geological direction and relief, while its visual character – and to a certain extent its structure as well – is furthermore influenced by its varying degree of openness, and by the location and character of settlements and infrastructure. Thus a road running along the boundary between cultivated and forested land – often also where the soil types changes – can make the landscape's own structure clearer. The openness or otherwise of the landscape is strongly linked to natural conditions (including rock and soil types, climate and water conditions) as well as to current and historical land use.

Infrastructure measures can influence the scale of the landscape, e.g. if the measures are on a considerably larger scale than the landscape where they are

applied. For example, an existing road that is rebuilt using large-scale geometry in a small-scale landscape. Infrastructure measures can also strengthen, or weaken or break, an existing and distinctive structure – or give rise to a barrier effect that disrupts connections between the different parts of the landscape.

Underlying assumptions of a thematic study

The character description of a landscape is a snapshot of the landscape as a whole. The purpose of the thematic study is to describe the landscape's form and explain what natural and cultural processes shaped it. A fundamental element of the study is understanding the natural geographic conditions, e.g. where different rock and soil types are, and the spatial conditions such as topographical conditions, geological directions in the landscape and the distribution of different landscape elements such as lakes, forests, road networks and settlements. Information about the form of the landscape is a fundamental prerequisite for the con-

struction of installations. For that reason, the theme can also include a description of the form of the installations e.g. geometrical and geotechnical requirements, the scale and structure of installations (e.g. wind farms, settlements), bridges and embankments.

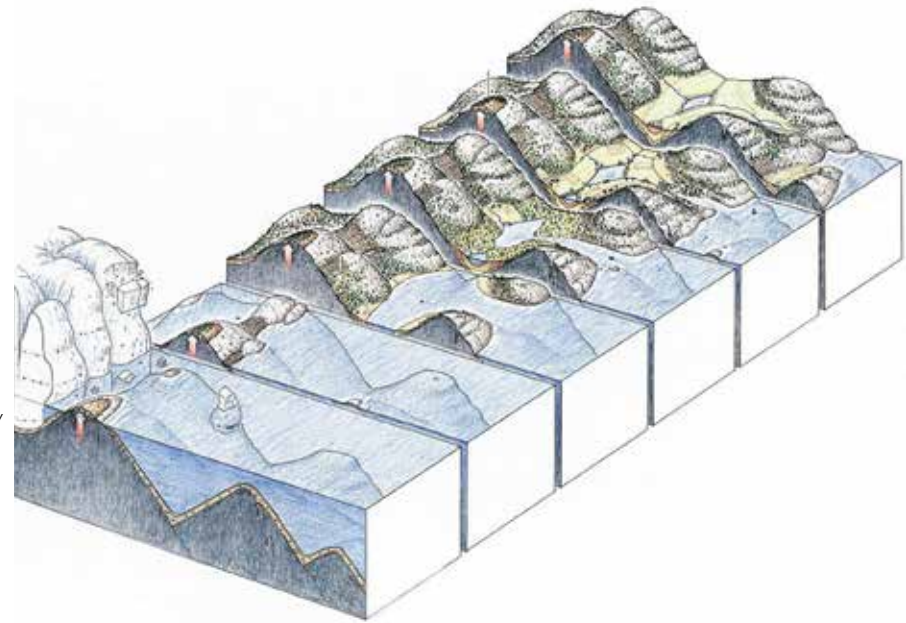
Aspects to analyse

For the form theme it is appropriate to analyse *natural geographic conditions* such as geology, geomorphology and hydrology, as well as *spatial conditions* such as structure, directions, scale and landscape elements.

Geology and geomorphology

Geology is the science of the origin, composition and evolution of the rock and soil types in the earth's crust. Geomorphology is the study of land formations and the processes that give rise to them. Geology is one of the landscape's slow processes, and can therefore be perceived as static, but in fact there is a con-

Figure 29. Areas below the highest coastline (HC) have been affected by ocean currents and waves that have distributed the soils. The arable soils are found in the valleys. Illustration: Lars Högberg/Västernorrland county administrative board.



stant creation, growth and ageing going on through continental drift and volcanism and, at the local scale, through decomposition and erosion. The geological timescale extends right across the earth's history and naturally proceeds at a very slow pace. All biological processes and the changes we make to the landscape are very fast by comparison, and we can therefore relate to the geology of the landscape as something relatively constant. In the Nordic countries the landscapes are marked by the ice ages that abraded rock into moraine, and by melting away created sedimentary structures such as boulder ridges and deltas. The elevation of the land that followed the ice melting away led to a rearrangement of the sediment and created the distribution of soil types that determines ecology and land use today.

In the context of an ILCA it is interesting to highlight the principal characteristics of an area's geomorphological development. Examples might include the fundamental conditions of the bedrock, how the area was affected by the ice age and the uplift, and what physical traces remain in different landscape types.

Hydrology

Water is an important component of the landscape. Water and ice have moreover shaped large parts of the landscapes we see today. The deposition of soil types is dependent on how water interacted with fine sediment, e.g. sandy deltas, bogs in former sea beds or old beaches washed clean of sand. A landscape's hydrology is also precondition for what ecosystems and land use have been and are possible. From the 17th century on, humans have strongly altered the hydrology of the landscape. Through the draining of arable land, woodland and bogs, and the building of power stations, cities and industries, natural water flows have been restricted, quays have replaced shorelines and open ditches have been culverted. In general, therefore, our landscapes have become drier as areas for the natural fluctuations of water have been sharply reduced. With more sealed and built-up land, water flows faster than in many natural systems, and increasing rainfall has led to great material damage in connection with the flooding thus caused. The water cycle is ever ongoing, and is one of the landscape's

functional processes that influences where and how we can build.

At the regional scale, water can be used to describe a landscape's character, e.g. lake landscapes or water-rich flat landscapes. The presence of water must always be included in character descriptions of landscape types and character areas, e.g. as a drained landscape with few open water surface areas, or a water-rich area with a large proportion of bogs, brooks and lakes.

Structure and direction

The main features of the landscape, its *direction* and *structure*, can largely be explained by the surface shape of the bedrock and the soil types. Are we in

Examples of hydrological conditions that characterise an area

At the regional scale, water can be used to describe the character of the landscape, eg a lake landscape or a flat landscape with abundant water.

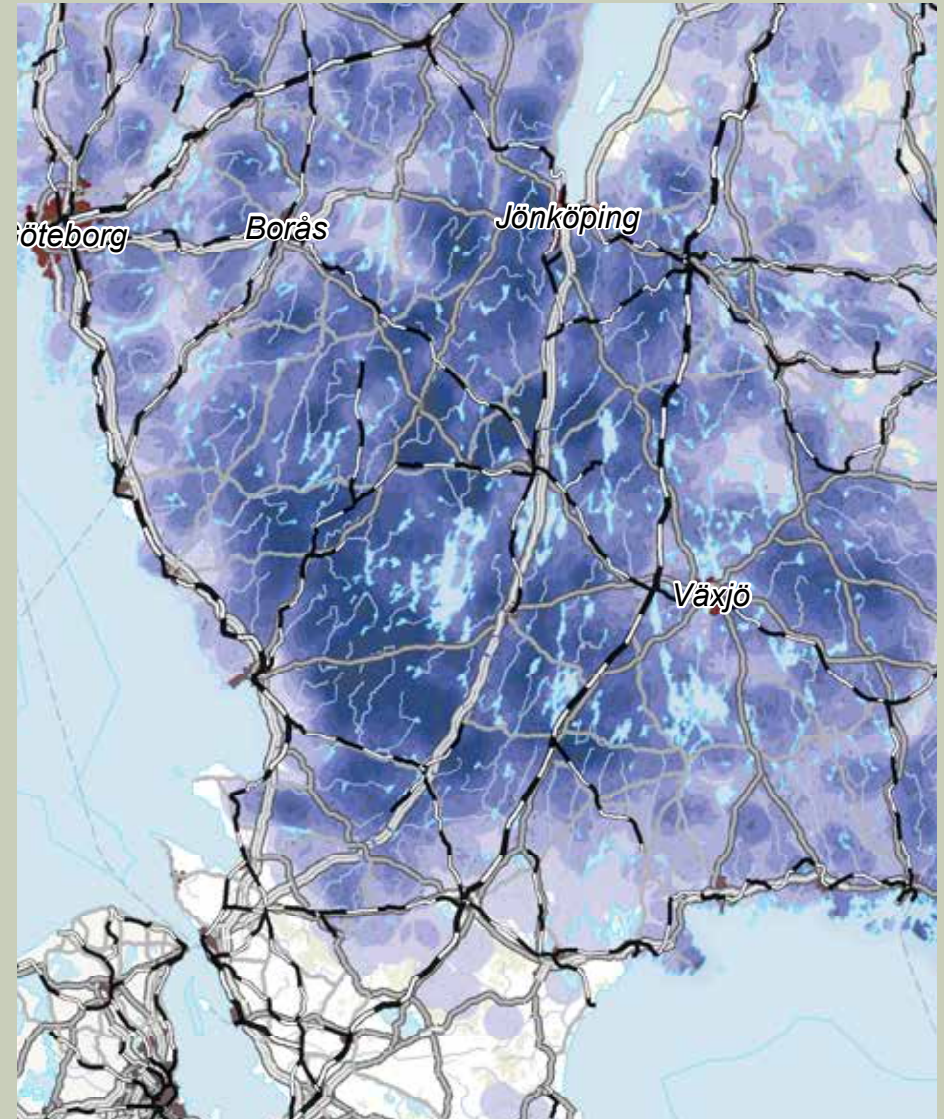


Image series 30 and 31. This representation of the density of wetlands, from the wetlands inventory, was used to describe hydrological conditions. Here we see how an entire region is characterised by water abundance. In the classification into landscape types, this water abundance was so character-making that it gave the landscape type its name: "Flat landscape with abundant lakes". Example from an overall ILCA for new trunk lines. Maps: Calluna and Befaringsbyrå. Background map: ©Lantmäteriet, Geodatasamverkan.



Flat landscape



Undulating landscape

Image series 32. Illustration of how the relief of the landscape, or its relative altitude differences, goes from flat to steeply broken. Illustrations: Emily Wade.

mountainous terrain, hilly plains, or in a rift valley? Are there faults and fissure systems that shape the direction of the landscape? Here the development of the landscape over millions and billions of years is explained. Together with the landscape's relief, the structure often gives the landscape type its name, such as large-scale undulating or rift valley landscapes. Directions in the landscape are usually made up of ridges, river valleys, rift valleys and shorelines. In these cases, the directions give the landscape its character. In areas with a more complex structure, such as mosaic landscapes, there are no distinct directions. Landscapes without directions can be harder to find one's way around in, and here instead it can be the infrastructure in itself that provides directions in the landscape.

Relief, which is to say *relative altitude variation*, tells us about the topography of the landscape. The landscape's relief or relative altitude variation is an essential parameter, particularly for infrastructure. Roads and railways are geometrically rigid elements that can be difficult to adapt to certain types of land-

scapes without making major changes (cuttings and embankments, tunnels and bridges). It is therefore important to register 'wavelength' and 'amplitude' in the terrain, where by wavelength we mean the incline and distance between peaks and valleys. Amplitude refers to the relative height difference between valley floors and mountain peaks. In several planning contexts a special map has been produced to show this, known as a 'Teddy Map' (see e.g. Figure 34). It is based on representations of elevation data, with the colour scale varying depending on the height above sea level. There is also shading to better bring out relief. Terms that can be used include flat, flat undulating, undulating, slightly broken, hilly, large-scale undulating, steeply broken, and mountainous terrain (see image series 32 above).

The scale of the landscape

The concept of scale is essential when analysing the relationship between infrastructure and landscape. New infrastructure increasingly tend to be more large-scale – such as motorways, new railways, airports and ports. The relationship between the scale

of these installations and the landscape is an essential parameter. The scale is made up of the landscape's overall topography together with open stretches of landscape and wooded areas. The characteristics of the landscape can be described with terms such as 'small-scale' and 'large-scale'.

Landscape elements

On the surface of the landscape are a number of landscape elements including lakes, wooded areas, road networks and built settlements. These landscape elements serve as building blocks, and the distribution of them gives an area its character. At the regional scale, all these elements are not described – instead the description concentrates on those elements that make up the landscape's character.

Scale and detailing compared with other landscape assessments

An integrated landscape character assessment can be carried out at different scales (see the *Characterisation* chapter, under *Scale*). This manual focuses on



Broken landscape



Steeply broken landscape

assessment at the regional scale, with the possibility of taking the analysis to a larger, more detailed scale.

A major difference with ILCA when compared with many landscape assessments made in connection with planning is that ILCA does not include purely spatial analyses in which landscape spaces, land forms, lines of sight and landmarks are described on a map. At the regional level it is instead more relevant to highlight landmarks and identity markers such as Vättern, Hallandsås, Kinnekulle and Skuleberget.

Effects of infrastructure measures on the landscape

Within the thematic study of the landscape's form there are terms that are usually employed to describe effects and consequences in environmental assessments. These terms are also useful for describing development trends, sensitivity and potential in the landscape. They are primarily about effects on the spatial features of the landscape, about the perception of an area. The following suggested terms are

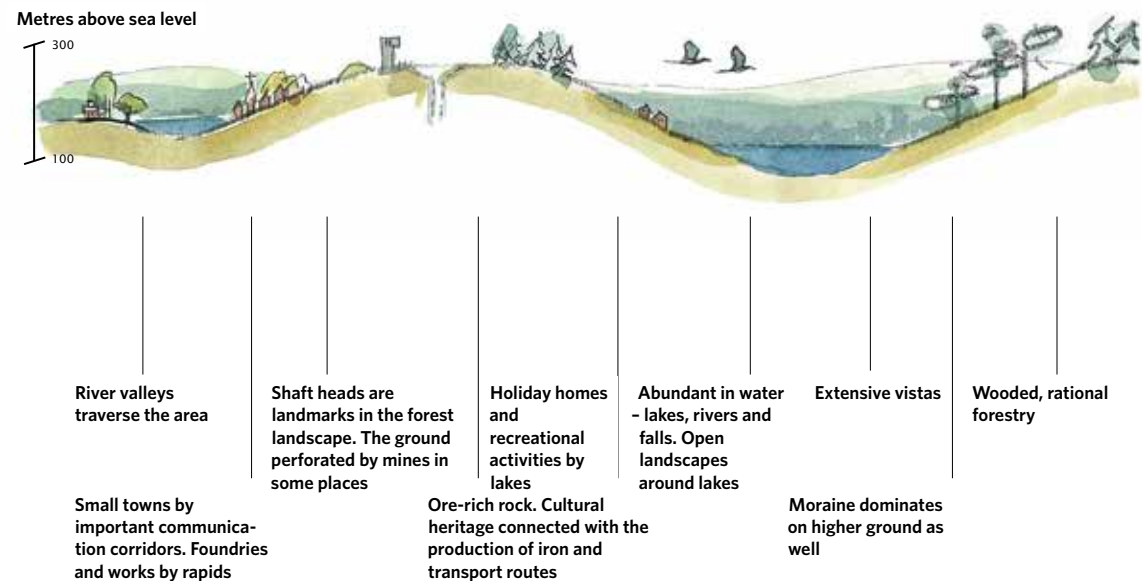


Figure 33. Example from an ILCA of Västmanland where the "Large-scale broken landscape" type is illustrated by means of a description of the landscape elements that make up the landscape type's characteristics. The elements described in the image are often the ones most sensitive to change. Illustration: Emily Wade.

also used in the Swedish Transport Administration's *collective effect assessment*.

Conflicts of scale

Conflicts of scale can be the result of e g a large-scale installation being placed in a small-scale landscape.

Altered visual character

An altered visual character can occur when land use changes, when an infrastructure installation is converted and changes the perception of a landscape, or when e g a railway line is changed from an integrated tram character to an electrified track on an embankment.

Conflicts of structure

Conflicts of structure can be an effect when a measure does not coordinate well with the structure of the landscape, i e spatiality, patterns and directions. The term can also describe how urban structures or road networks are cut off, with the effect that character and function are changed.

Sources for thematic study: the landscape's form

- The National Atlas of Sweden for rocks and soil
- Geographical literature about the county
- General maps (Lantmäteriet) – Comprehensive, Road, Terrain, and Property maps
- Maps on soil types
- Maps on bedrock
- Elevation data
- Svenska Marktäckedata (Swedish Environmental Protection Agency)
- Terrain maps (e g teddy maps, relief maps or Lantmäteriet's 'terrain shadowing')
- Orthophotographs (Lantmäteriet, Google Earth etc)
- Existing landscape assessments

Examples of maps that show structure, topography and water in the landscape

The main features of the landscape, its geological direction and structure can be explained to a great extent by the surface forms of the bedrock and soil types. This can be described in maps where the topography is given a three-dimensional expression.

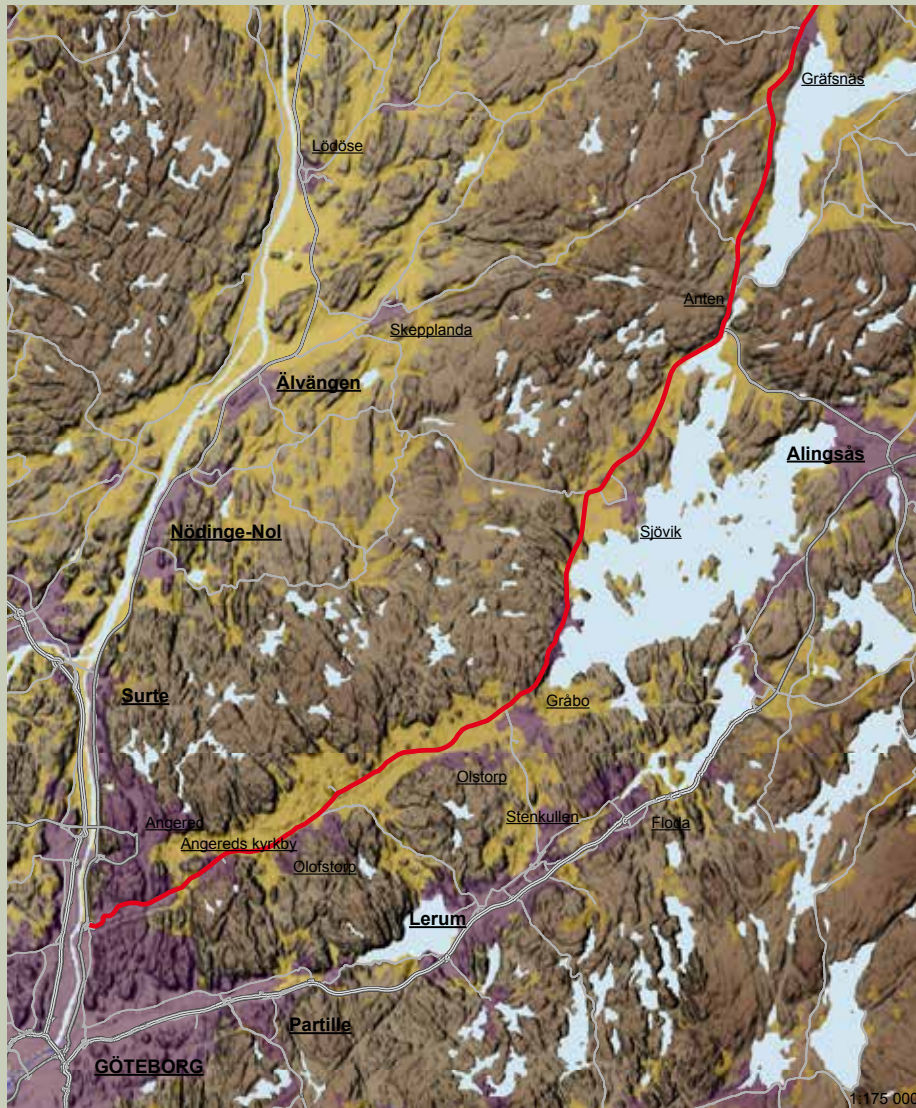


Figure 34. Example from an ILCA for Road 190 which showed the landscape's relief by means of this "Teddy map". Here it shows watercourses, open terrain, densely built-up areas and roads. This degree of detail, at a scale of about 1:50 000, proved appropriate. The map gives a good picture of overall topographic structures, geological directions and to some extent scale. Map: Befaringsbyrån. Background map: ©Lantmäteriet, Geodatasamverkan.

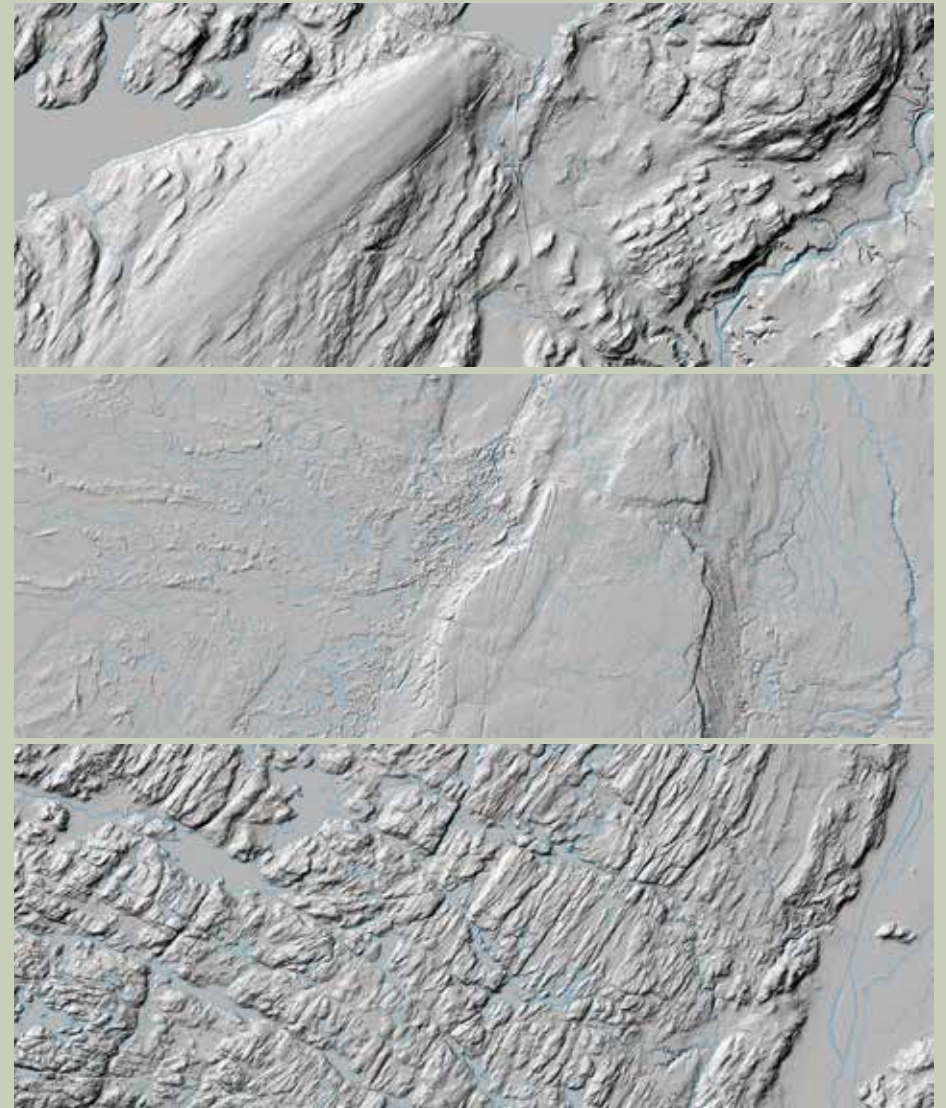


Image series 35. Three sections from Lantmäteriet's map "Terrängskuggning" (hillshade), available as a web service and with a very high resolution. Following laser scanning of all of Sweden, the terrain has been rendered in the same way as in the "teddy map" in Figure 34, and the landscape's relief emerges very clearly. At the top we can see a drumlin in a rift valley landscape, in the middle a plateau, and at the bottom a rift valley landscape with a very clear geological direction. Maps: ©Lantmäteriet, Geodatasamverkan.

THEMATIC STUDY OF THE HISTORIC TIME DEPTH IN THE LANDSCAPE: BASIC ASSUMPTIONS

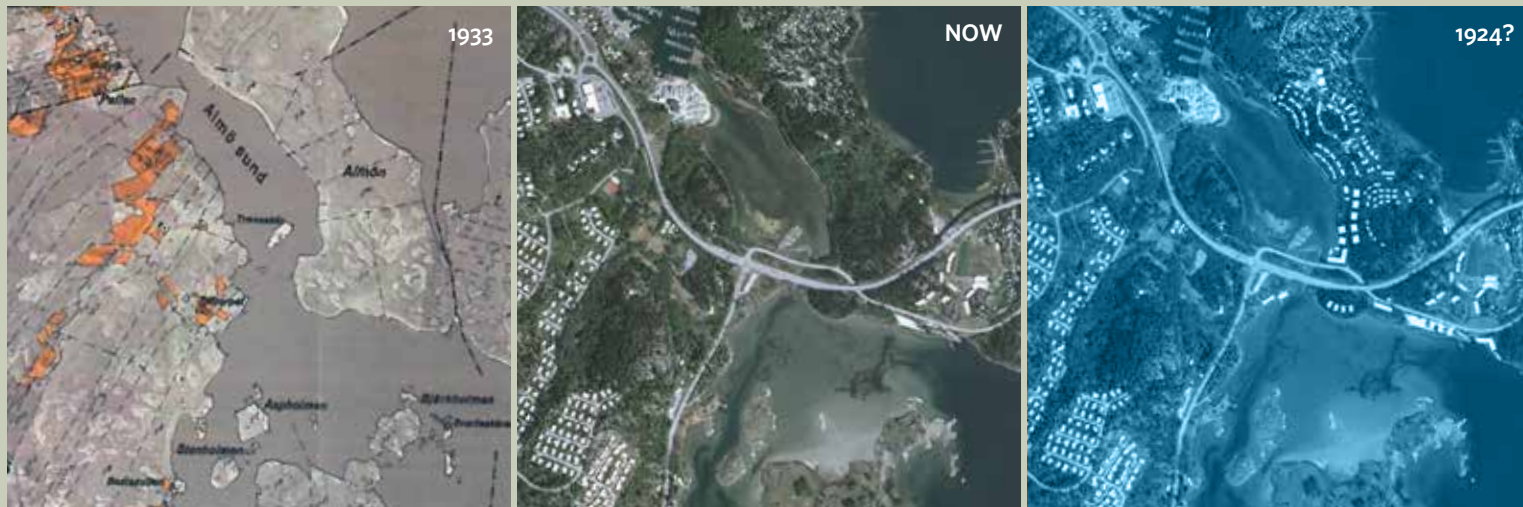


Image series 36. Questions for the thematic study: Why does it look the way it does? What will we be taking into the future? Illustration: KMV forum. Maps and orthophotos: ©Lantmäteriet, Geodatasamverkan.



Figure 37. The historic time depth in the landscape stylised in a watercolour. Location of settlements in a plains landscape.
Illustration: Emily Wade.

THEMATIC STUDY: HISTORICAL TIME DEPTH IN THE LANDSCAPE

The thematic study of the *Historical time depth in the landscape* focuses on people and their use of the landscape and its natural resources over time. The physical traces left by humans throughout the ages are our cultural environment, and are present as character-creating dimension in all landscapes. The traces of people's use of the landscape over time can be seen in big structures, such as the placement of localities in relation to each other, via patterns in the landscape such as roads and cultivating boundaries, and down to different types of objects in the landscape. There are also cultural values linked directly to infrastructure, roads and railways, which, if managed well, can contribute to improved traveller experiences and greater understanding of the significance of infrastructure for social development.

The thematic part provides a more in-depth understanding of the historical time depth in the landscape and of the landscape's character, function, sensitivity

and potential. This is important when solutions have to be found for the plan or project and be assessed from a cultural heritage perspective.

Underlying assumptions for the thematic study

Setting out from today's landscape

Today's landscape is the starting point for the study, and the thematic study's aim is to provide a historical explanation of the characteristics, contexts, physical expressions and functions that characterise today's landscape. Studying the landscape's historical development produces an understanding of today's landscape and for ongoing and future transformation processes, as well as their effects on the landscape. An important basis for the study can be summarised 'then-now-future' – why does it look the way it does, and what guiding principles are we going to have for the future?

Choosing the scale

The question of scale is important for the study of the landscape's historical time depth. Among other things, this involves choosing the right level of detail in the analyses. A small scale often requires patterns and characteristics to be simplified in order for the essential features to emerge, while a larger scale allows for a more complex and detailed picture. In the study it is often necessary to change the scale – e.g. increase the scale in order to study details, and reduce the scale in order to discern overall patterns (see image series 39 on page 51).

It is also about the importance of seeing the same landscape at several different geographical scales. What significance have different areas had locally, regionally, nationally or internationally? Are the cultural history characteristics that recur in other areas or parts of the country?

Adapting it to the aims

The aim of the integrated landscape character assessment and its intended use determine the focus of the thematic study. Depending on whether it is intended, for example, to be used as a basis for long-term planning (e.g. the regional plan), as a knowledge resource in the project and maintenance stages, or as a basis for other ends than infrastructure planning, the study is directed towards issues that are topical for each of those aims.

Putting the physical environment at the centre

The study of the historical development of the landscape aims to explain why today's landscape looks and functions the way it does. A basic assumption is therefore that the study sets out from and focuses on the physical manifestations that the various historical events or phenomena have given rise to and which exist today.

Aspects to analyse

This chapter describes which cultural aspects should be analysed in the thematic study. These vary, and should always be adapted to the planning situation and the character of the landscape. Here we also describe how to carry out the thematic study of the historical time depth in the landscape and how it relates to the work on the ILCA as a whole.

The thematic study of the historical time depth in the landscape puts the landscape in question in a chronological context and gives an understanding of people's use and transformation processes and their effect on the landscape over time. By carefully selecting and delimiting different aspects it is possible to sort,

refine and clarify the historical narratives. Looking at different aspects is a way to simplify and sift through the description of the landscape's development; this is an important pedagogic point.

The thematic study should highlight those parts of the historical development that are significant for the characterisation of the landscape at the chosen scale, and that may have a bearing on the requirements imposed by the planning or design situation in question.

The various aspects are always seen in relation to the natural geographic conditions and to the ecology and

form of the landscape. How have people used and dealt with their natural resources and the conditions of the landscape? What role has the place or region played, and what regional characteristics have been significant for how the landscape has developed? The focus of the analyses should always be on how the various aspects have made their physical imprint on the landscape. Often there is a strong connection with the landscape's ecology.

Some aspects to set out from in the thematic studies are described on this and the following page.

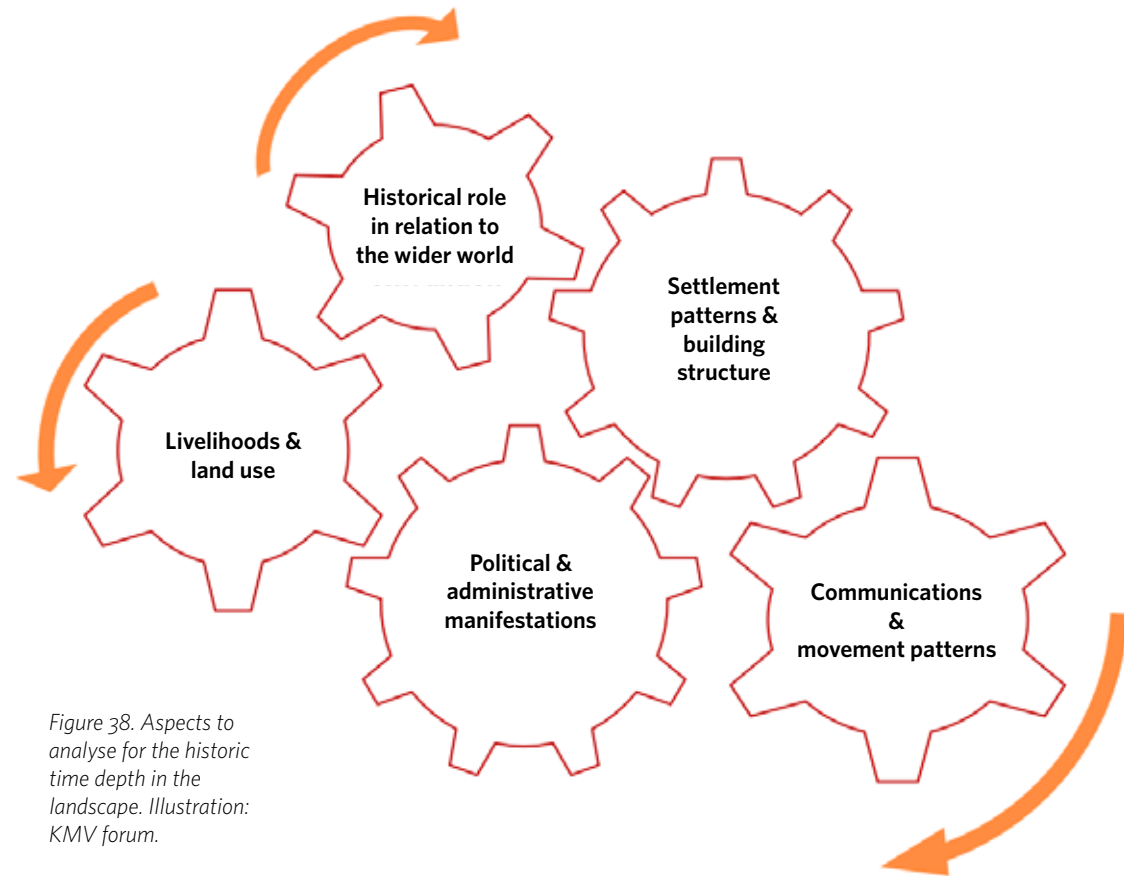


Figure 38. Aspects to analyse for the historic time depth in the landscape. Illustration: KMV forum.



Image series 39. Identifying the right geographical scale is an important basis for the analysis. Orthophotos: ©Lantmäteriet, Geodatasamverkan.

Historical role in relation to the wider world

This highlights the area's role and function from an international, national or regional perspective. Has the area had a particular political or administrative function in relation to other areas? Has it been important for trade or communications, or in some other way been a centre that has influenced the region, the country or the outside world?

The importance of places or areas for the surrounding world may have varied over one more periods of time. In some landscapes it is especially evident how the physical environment has been shaped by the area's role in its relationship with the surrounding world. For example, it is difficult to analyse Bergslagen without putting the landscape in relation to the entire country's interest in the production of iron, or to analyse the Stockholm archipelago without regarding it in relation to the capital's need for military defence, fishing and shipping – or to the interest in recreation and holiday homes that grew there over time.

Political and administrative manifestations

Administrative division, borders, power and political relationships over time constitute an important aspect in order to understand today's landscape. National, county and municipal borders, as well as parish and district limits and church establishments are examples of aspects that can explain phenomena in today's landscape. Important administrative functions such as county or district courts, seats of government, diocesan capitals or prehistoric power centres have often influenced the physical character of the place or area.

Settlement patterns and building structure

Where in the landscape did people first settle, and how has the pattern of settlement developed over time? What effect has shoreline displacement had? Where are there rural settlements, and how dense are they? Is the structure mainly of individual farms or of smaller or larger villages? At what locations have cities and suburbs emerged, and when? Look at the location of settlements in relation to the shape of the landscape, land use, communications and sources

of livelihood. General patterns can be discerned at a smaller scale, while a larger scale may be needed in order to describe the location, character and structure of settlements in specific landscape spaces.

By studying settlement patterns over time, central districts (with early, continuous and often denser settlement) as well as more peripheral ones can be discerned.

Livelihoods and land use

The dominant forms of livelihood and the natural geographic conditions for agriculture and other livelihoods are an important aspect in many cases. The conditions for agriculture have been a powerful character-making factor, not least for settlement patterns and structure. The emergence of other livelihoods connected with forests and mountains or lakes, seas and watercourses are another character-making factor. Which have been the main livelihoods in the landscape, and what secondary livelihoods have been important? How have the subsistence systems left traces in the landscape? The broadened economic

structure of the 19th and 20th centuries have left characteristic traces in many landscapes – what industries and trades have influenced population size, urbanisation, building structure and patterns of movement in the landscape?

Communications and movement patterns

Study the development of communication patterns over time, as well as their connection with the emergence of important nodes, businesses or administrative boundaries. Waterways and ports, corridors, road and rail networks or airports can be given varying prominence depending on the landscape in question. At a smaller scale, the patterns of the infrastructure and the nodes it links together can be shown, while the character, volume, position and location in the landscape will be seen more clearly at a larger scale.

The physical infrastructure is one key, and how people have made use of different lines of communication another. Which roads have been important for getting to the neighbouring village, or to church? Along what roads and streets have the entrances to cities been? What patterns of movement are important for the landscape's character and what are the conditions for maintaining or re-establishing these patterns? A study of the movement patterns in the landscape –

the landscape's functional connections at the local, regional and national levels – can constitute a historical basis for various types of social analyses of current commuting and movement patterns.

Effects of infrastructure measures in the landscape

The landscape's cultural characteristics can be affected by infrastructure measures in different ways and on a varying scale. Measures can have positive as well as negative effects. This depends in part on what values are at stake, and in part on what we ourselves want from a landscape – our objective, in other words.

Within the thematic study of the historical time depth in the landscape there are terms that are usually employed to describe effects and consequences in environmental assessments. These terms are also useful for describing development trends, sensitivity and potential in the landscape. The following suggested terms are also used in the Swedish Transport Administration's *collective effect assessment*.

A **structural transformation** means that a landscape changes character, e g from rural to urban. It can also mean that the major structures are greatly trans-

formed or relocated, e g when an area's central nodes are moved. To a high degree, structural transformations are an indirect effect of measures.

A culturally conditioned **character** can be strengthened, e g when new establishments continue building on key characteristics, or be weakened when deviations become so great that they threaten to drown out existing characteristics. If the collective character changes beyond a certain degree, this leads to a structural transformation.

Connections comprise both visual and functional conditions, and these may be strengthened or broken through the choice of measure. The effects for character and relations often depend on *how* a measure is carried out.

The degree of **neglect** in a cultivated landscape, or the possibility of upholding good maintenance of it, can increase or decrease as a result of a measure. If the maintenance aspects change to a sufficient degree, this can lead to effects on character and relations. Neglect and good maintenance can also apply to individual phenomena or features in the landscape. The cultural value of a certain feature, e g a building, may remain unaffected by a measure while the



Image series 40. Three different historical maps – from the 1730s, of parcels in the 1800s and an economic map from the 1950s. The two on the right have had the current road network superimposed on them. Maps: ©Lantmäteriet, Geodatasamverkan.

degree of neglect or the possibility of upholding good maintenance may increase or decrease as an indirect consequence of the measure. This may affect the experience of the phenomenon or feature, but in the longer term its cultural value will also be affected, as when escalating neglect eventually causes eradication.

Eradication is usually observed as a direct effect of a measure.

Sources for thematic study: historical time depth in the landscape

Map studies are carried out to identify overall patterns and establish an initial image of the landscape. Existing digital and other cultural environment documentation is collated and combined in different maps. Examples of map studies include:

Combine guidance documentation

Combine different digital documentation such as: shoreline maps, the register of ancient monuments (*Fornminnesregistret*, or *FMIS*), the Database of Built

Heritage (*Bebyggelseregistret*, or *BeBR*), parish boundaries, inventories by the county administrative board, TUVÅ (the Swedish Board of Agriculture's inventory of meadow and pastureland), land cover data, soil type maps and natural environment documentation.

Designated value areas

Identify areas of national interest and other designated cultural environments. These are used as a knowledge basis for *understanding* the landscape, not for evaluating it.

Historical maps

Historical maps that are applicable at the chosen scale. At a smaller scale, e.g. *Generalstabskartan*, *Häradsekonomska kartan*, *Fastighetsekonomska kartan* can be useful. Province maps (17th and 18th centuries) and road maps (18th century) show entire provinces and counties. All are available in Lantmäteriet's database of historical maps. More detailed maps or orthophotographs may be necessary in order to obtain examples on a more detailed scale. Map overlays at a more comprehensive level can be made

in order to identify e.g. the development of patterns of communications, changes to settlement patterns or in land use.

Documentation and sources

- Cultural environment programmes and other regional or municipal documentation
- The National Atlas of Sweden
- Atlas över Sverige
- General maps (Lantmäteriet) – Comprehensive, Road, Terrain, and Property maps
- Historical maps (Lantmäteriet)
- Orthophotographs (Lantmäteriet, Google Earth etc)
- Svenska Marktäckedata (Swedish Environmental Protection Agency)
- The ancient monuments register (FMIS, Swedish National Heritage Board)
- Database of Built Heritage (Swedish National Heritage Board)
- The meadow and pastureland inventory (TUVÅ)
- Existing landscape assessments.

Examples of analyses of the historical role of the landscape in relation to its surroundings

A landscape needs to be seen in relation to its surroundings. In many landscapes, land use, livelihoods or towns have been significant for the entire region, the country or even internationally.

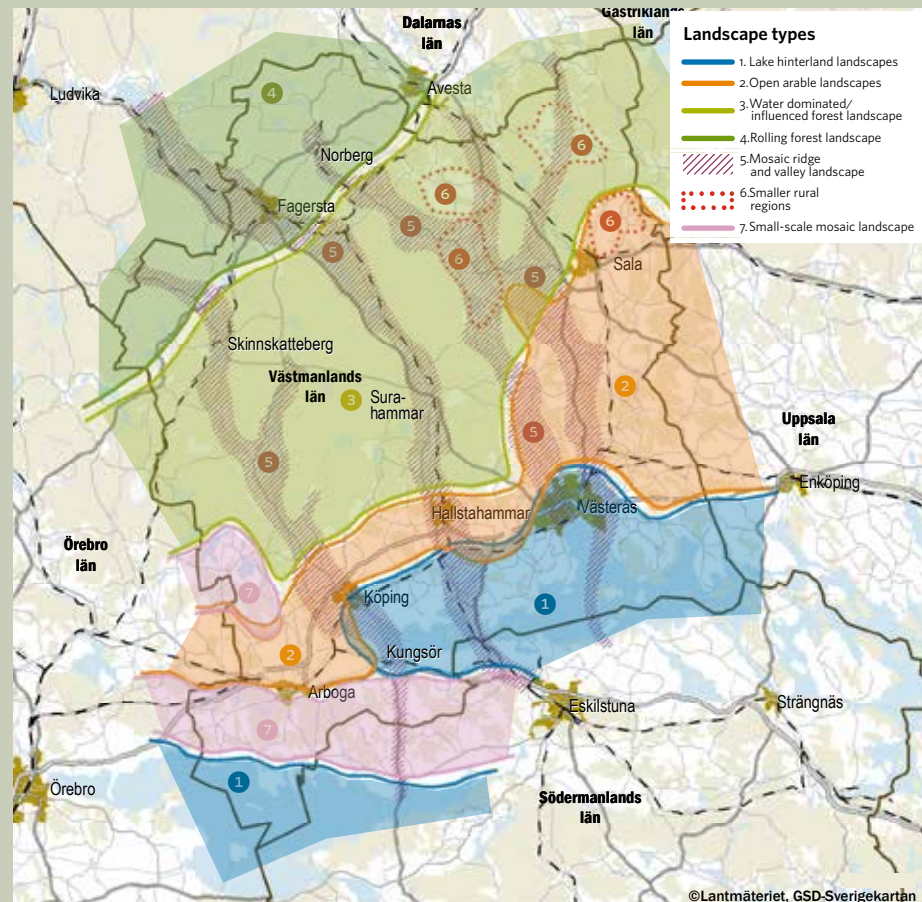


Figure 41 (left). The different landscape types of Västmanland. A characteristic of the landscape is the communication corridors, or arteries, that extend from the county's mining district in the north to the shipping ports on the Mälaren. Along ridges or valleys are roads and waterways that have been used to transport the iron to the Mälaren and onward to other parts of the country or for export. Example from an ILCA of Västmanland county in 2016. Map: Befaringsbyrå. Background map: ©Lantmäteriet, Geodatasamverkan.

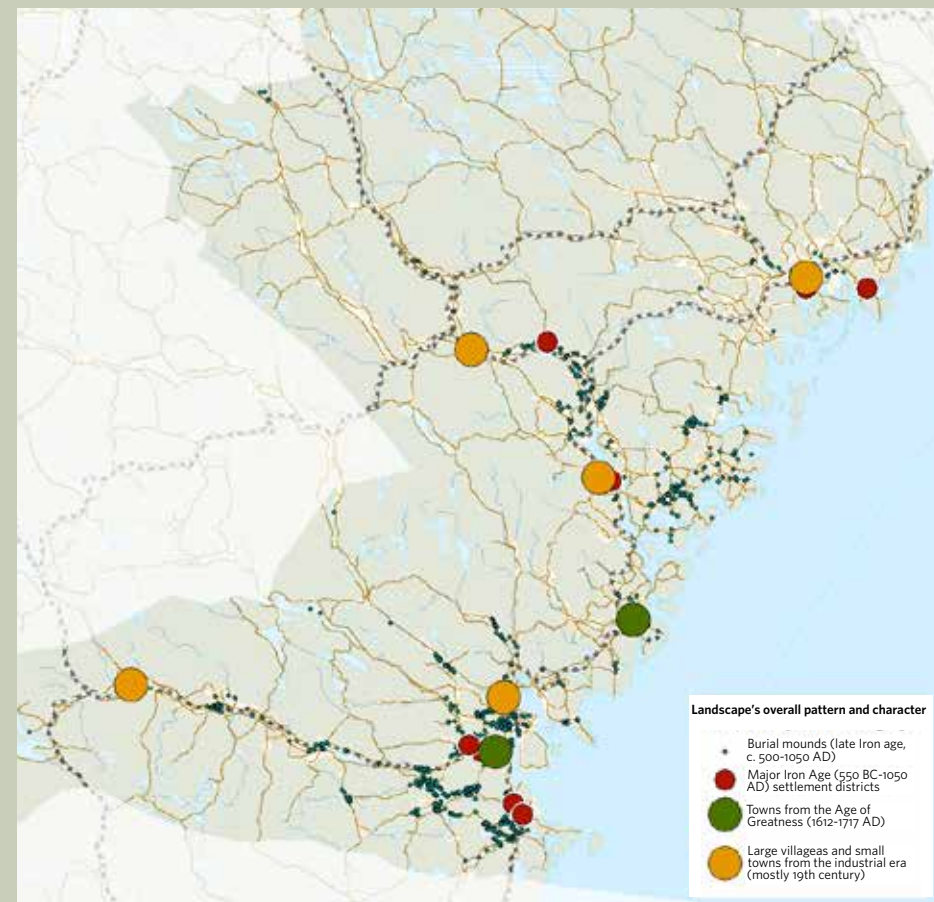


Figure 42 (right). The overall settlement patterns in the landscape in Västernorrland. Västernorrland county is characterised by extensive upland forest landscape, the large and smaller rivers that cut through the landscape from west to east, and the densely built-up coast, clearly industrialised in some places. Historically as well as currently, settlements are concentrated to the coastal landscapes and to the river valleys, while the large tracts of forest are dominated by an industrial forestry landscape. The coastal locations have offered good conditions for fishing, transport and communication, both towards the inland and the Baltic, and the dense settlements along the coast have considerable continuity. At the same time, establishment of the coastal towns has been closely linked to the national interest that the forest industry in Västernorrland continues to represent, and the patterns in the landscape need to be read against the background of the county's significance from a national perspective. Understanding the landscape's overall structures and its development over time is important, particularly prior to the construction of new road and railway sections that may affect settlement patterns and structures in the future. Example from an ILCA of Västernorrland in 2015. Map: KMV forum. Background map: ©Lantmäteriet, Geodatasamverkan.

Examples of political and administrative manifestations

Administrative borders and political decisions and conditions have left physical manifestations in the landscape, and are among the several models used for understanding the current landscape.

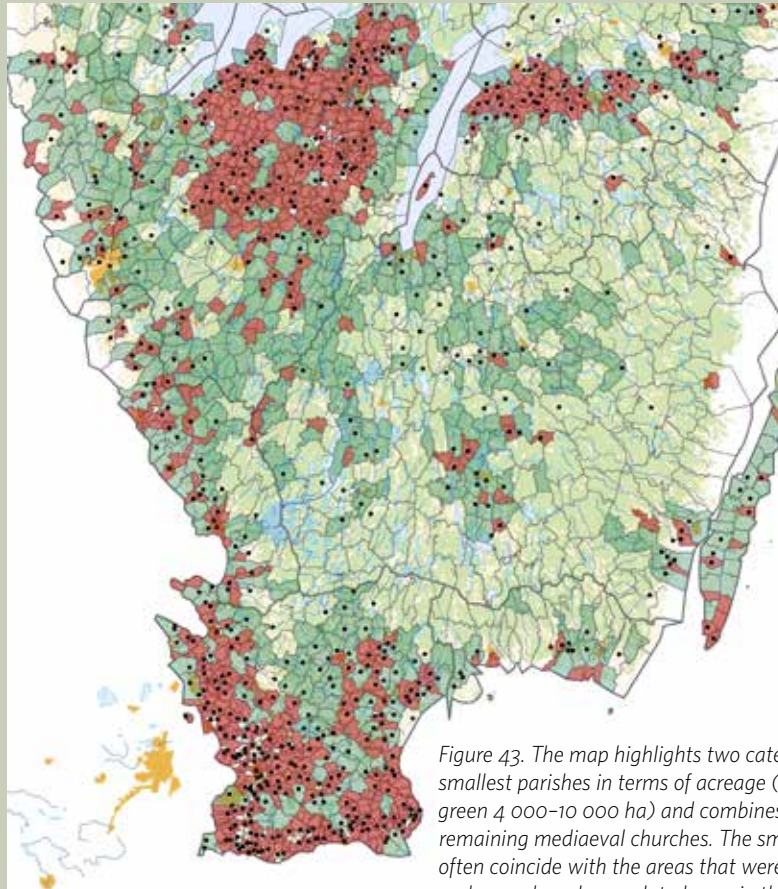


Figure 43. The map highlights two categories of the smallest parishes in terms of acreage (red < 4 000 ha, green 4 000–10 000 ha) and combines this with remaining mediaeval churches. The smallest parishes often coincide with the areas that were settled early and were densely populated even in the Middle Ages,

while the bigger parishes are often made up of woodland areas with a lower population density even later. By combining parish acreage with mediaeval churches you get an indication of the mediaeval core areas in southern Sweden, and also of which ones have preserved a parish centre with a mediaeval church. The plains areas in Skåne and Central Sweden are clearly visible in the map above, and contrast with the more peripheral and sparsely populated parts of e.g. Småland and Halland. Until the end of the 17th century, Sweden's southern and western borders were the borders with Blekinge, Skåne, Halland and Bohuslän. The political border had consequences for the border areas during long periods of time, and also coincide with the otherwise more peripheral areas along the border between Småland, Blekinge and Skåne. Example from Comprehensive landscape character assessment, southern Sweden – high-speed railways study, 2015. Map: KMV forum. Background map: ©Lantmäteriet, Geodatasamverkan.

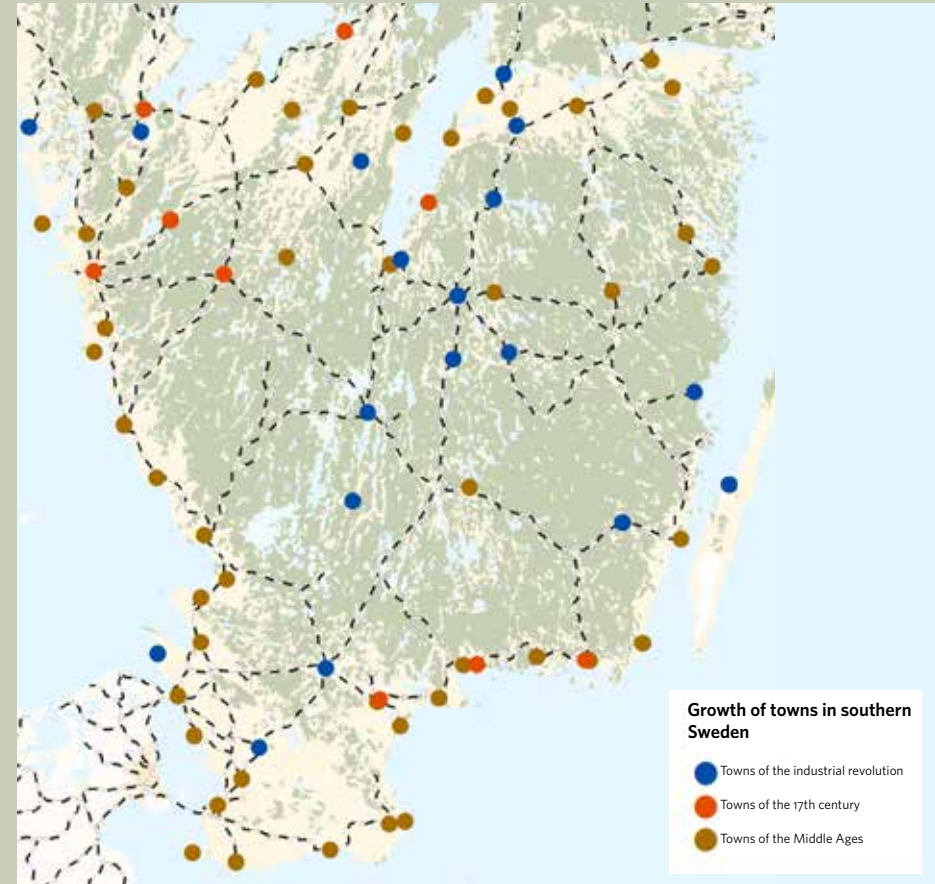
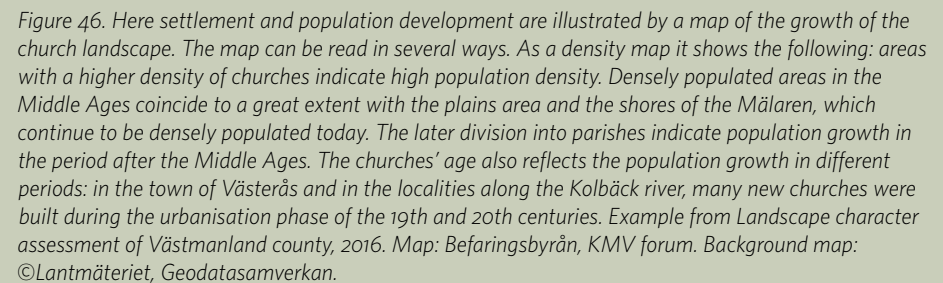
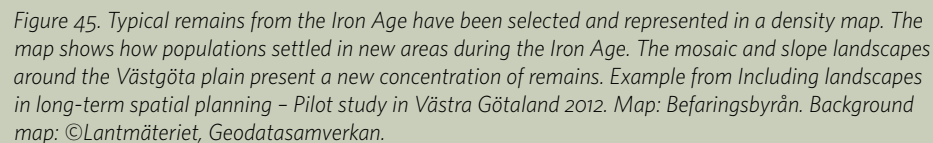
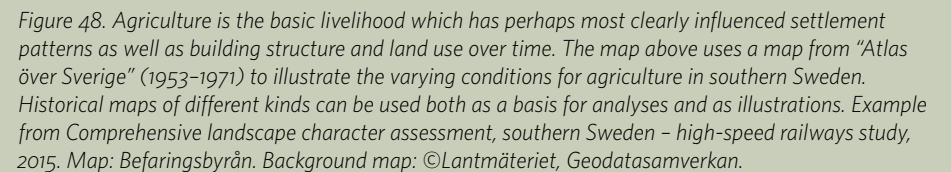
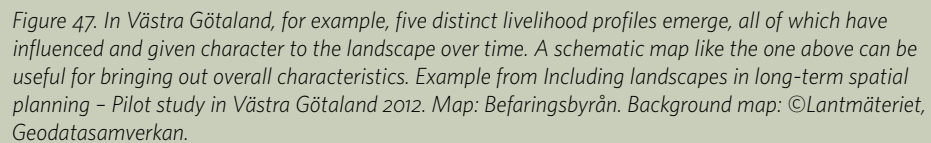


Figure 44. Southern Sweden's different generations of towns that have emerged or evolved because of various political or practical reasons (communications, trade, business activities etc.). The map shows the overall establishment patterns of towns in different eras, and is one of several important considerations when an entirely new railway line is going to be constructed in the landscape. Example from Comprehensive landscape character assessment, southern Sweden – high-speed railways study, 2015. Map: KMV forum. Background map: ©Lantmäteriet, Geodatasamverkan.

Prehistoric settlement patterns can be studied by means of aggregated maps of the presence of ancient remains in different landscapes.

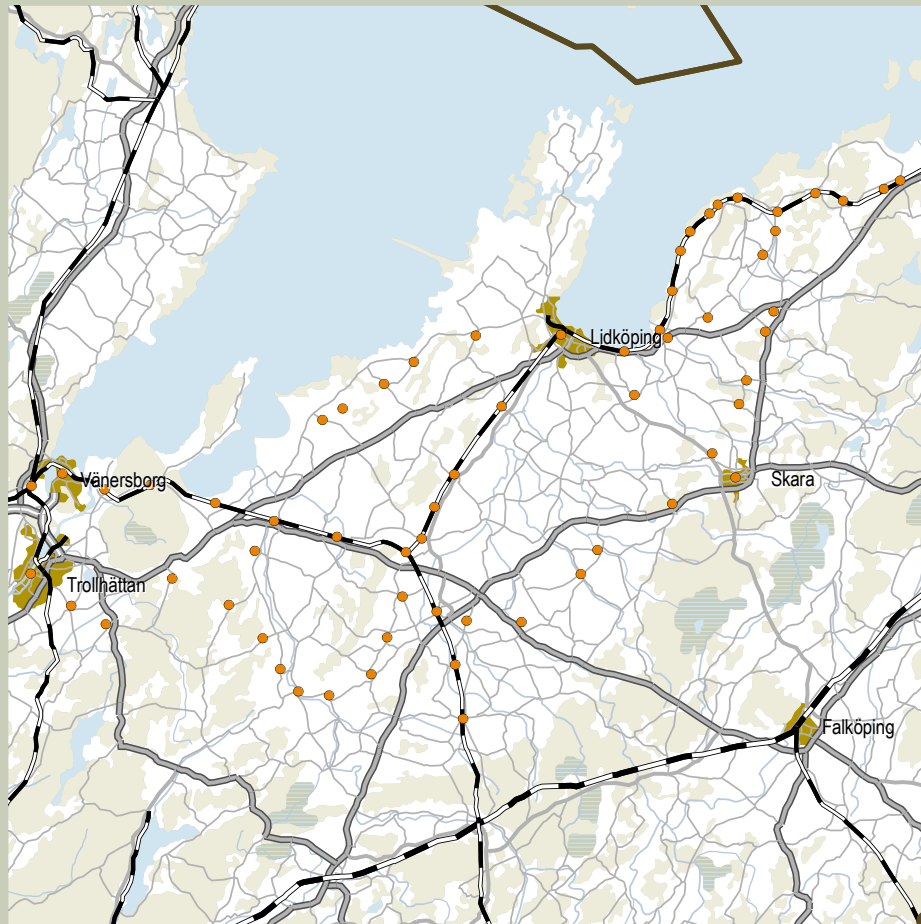


Different natural conditions and the proximity to means of communication are two of the factors that have influenced the livelihood profiles of different landscapes.



Examples of communications and movement patterns

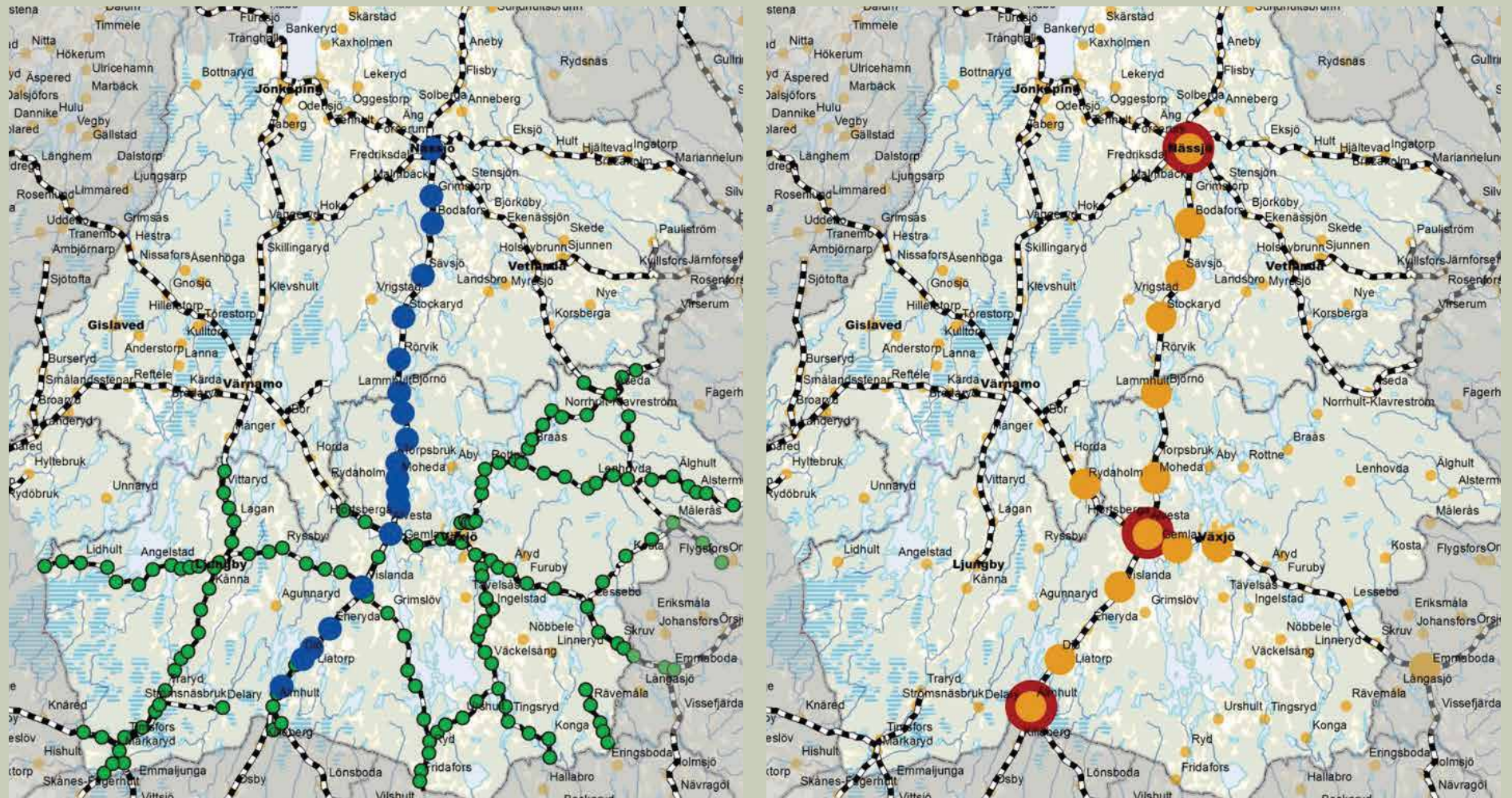
The pattern of communications and their relationship with settlement patterns and towns are an important building block of the landscape's character.



Figures 49, 50 and 51. The orange dots on the map show station communities and more important stops with a preserved structure and settlement along some of the railway lines south of the Vänern. On the right we see the station community's characteristic structure in Lovene in Lidköping municipality, one of the stations along the Kinnekulle line. The expansion of the railways had an enormous significance for economic development at the end of the 19th century, creating the conditions for industrialising rural areas and for more efficient transportation. It also created a wholly new locality structure in station communities that still mostly exist today, even if the railway might have gone. It is often helpful to use both maps and pictures in order to capture the patterns and characteristics of the landscape. Example from Comprehensive landscape character assessment, southern Sweden – high-speed railways study, 2015. Map: Befaringsbyrå. Background map: ©Lantmäteriet, Geodatasamverkan.

Examples of communications and movement patterns

Further examples.



Figures 52 and 53. The postwar development of the railways has meant that a large part of the smaller railway lines have been removed, but has also brought a reduction in traffic stoppages along the trunk lines. The maps above show the number of stations and stops in Kronoberg county (green symbol) and the number of stoppages along the southern trunk line (Älmhult–Nässjö) during the peak in railway line numbers around 1939 (blue symbol). The map on the right shows railway lines with stops in use today. The yellow symbols show those stations that are used by regional traffic, while the red symbols show those at which long-distance trains call. On effect of ending the use of many stops is that the former station communities lose vitality and attractiveness; another effect is that closed or demolished station buildings and railway tracks make the area's planning structure and character harder to read. The maps were produced in connection with Comprehensive landscape character assessment, southern Sweden – high-speed railways study, 2015. When traffic pressure on the trunk lines is reduced, there is the potential for strengthening regional commuting and the readability of the station communities by reopening previously closed stations. Maps: KVM forum. Background maps: ©Lantmäteriet, Geodatasamverkan.

Examples of communications and movement patterns – at a more detailed scale

Image series 54. The previous examples have shown a bird's eye view of the landscape's communication patterns, allowing overall patterns and structures to emerge. As the scale of the analysis is reduced, it may be necessary to highlight the character of roads and railways, and their relationship with the surrounding settlements. When guidelines for a measure selection study of the Kinnekulle line were being drawn up, a number of categories of measures were identified – possible measures that might bring changes to the character of the line. Here the line's sensitivity and potential are elucidated in relation to eg the layout and location of the line in the landscape, objects of cultural interest and installations linked to the line, its stops and its relationships with other movement patterns in the landscape. Example from The Kinnekulle line – guidance for landscape issues. Photos: Befaringsbyrån.

Remember!

Thematic studies are intended to give a simplified and pedagogic picture of different phenomena that are important to an understanding of the current landscape. Select, limit and link the studies to the physical landscape using photos, maps or illustrations.

Measures in station settings

because these settings are significant for the travel experience and are sometimes the key element for the character of the entire locality. The settings are built up of installations and equipment, which means that the character of the material and equipment plays an important role.



Measures for corridors that traverse an area

because roads and pedestrian corridors link farms and localities and sometimes, as in plains, make up key elements of the landscape's structure. Measures for waterways that traverse an area are also significant, because they are important for biological diversity in both the open and the mosaic-type sections of the plains. Level separations break with the dominant character, where none or only small level differences exist around the line. Barrier effects may arise.



Measures on technical infrastructure

because vertically prominent objects on a plain, in the form of technical buildings and overhead contact poles, change the character of the landscape. Electrification of the line means protected tree zones in a wide swath along the line. The design of equipment has an impact on character.

Measures to profile and level

because a raised railway embankment and curve straightening means that the line is no longer subject to the landscape it traverses. In a plain, a raised line can mean that long vistas are interrupted. Barrier effects may arise.

Measures that change use

because less frequent traffic threatens to impoverish station communities. More frequent traffic may bring traffic safety measures that create barriers around the line.



Figure 55. The ecology of the landscape stylised in a watercolour. Ecological structures in a mosaic landscape.
Illustration: Emily Wade.

THEMATIC STUDY: THE ECOLOGY OF THE LANDSCAPE

The natural environment is, in itself, a very important provider of character in the landscape. At the same time, it is a direct result of the form of the landscape and its historical time depth. Topography, geology and human influence throughout history have shaped the natural environment. The natural environment itself, of course, is made up of a number of biological creatures, each with their own history and function. The conditions for coexistence between and long-term survival of the organisms of the natural environment are determined by a combination of climatological and landscape-given factors. Human beings' natural resource needs and continued development of infrastructure and settlements can have a big influence on the natural environment and its biological diversity.

Thematic studies of the ecology of the landscape are important for understanding the natural environment's sensitivity to landscape changes. They can also

be used to understand the potential there may be in improving ecological relationships and to make better use of different ecosystem services. To a great extent, thematic studies are about producing documentation that will make it easier for planners to find sustainable solutions and allow us to achieve the defined national environmental objectives.

Underlying assumptions for the thematic study

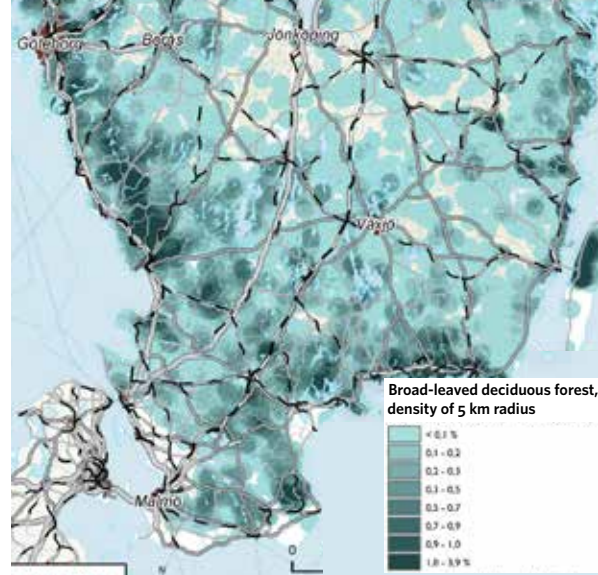
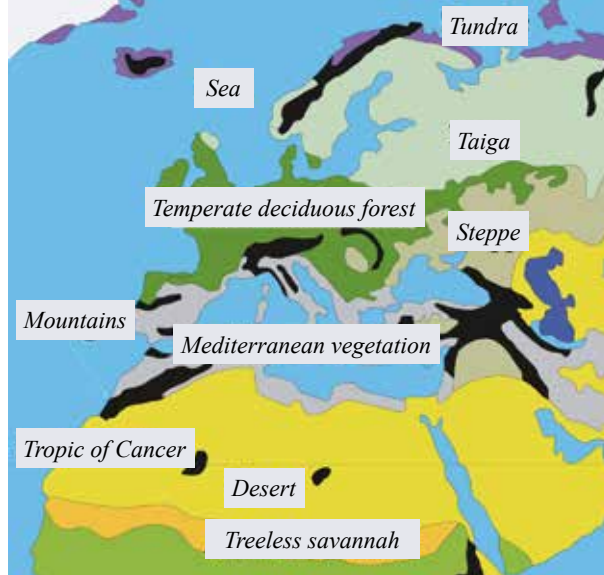
Habitat types and species

An important assumption is that the thematic studies will provide a picture of which habitat types predominate in the landscape and which ones of these may be particularly valuable. Important habitat types can be those that are particularly common in the landscape, but they can also be ones that constitute especially important habitats for a large part of the biological diversity in the landscape. Of particular value will be those habitat types and species whose occurrence makes up a relatively large share of the habitat type

from a national or even global perspective (see Figures 56 and 57). The same reasoning can be applied to habitat types and species whose regional distribution makes up a relatively large share of the total. In order to achieve the environmental objective 'A rich diversity of plant and animal life', each region needs to take responsibility for supporting the regional species and environments. Such regional responsibility status is not determined only on the basis of the species' or habitats' representativity and occurrence in the landscape, instead there is a series of criteria that decide how valuable the habitat or species is. Essential aspects in this context are which category of red-listing (of endangered species) they are in, and any connection with the Species Protection Ordinance and international conventions and directives.

Livelihoods and land use

Forestry and agriculture have a considerable impact on the character of natural environments and their occurrence in the landscape. The profitability of the



Figures 56 and 57. Overall biomes in Sweden. The northern limit of the temperate deciduous forest zone is in Sweden, which made it particularly interesting to study the density of broad-leaved deciduous forest in the comprehensive landscape character assessment for new trunk lines in southern Sweden. A denser area can be seen extending from Halland to Blekinge. Map on the left ©Lars Theng. Map on the right: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

livelihoods can influence how natural environments will develop in the future. For example, the occurrence of valuable meadow and pastureland is dependent on the existence of farmers who keep livestock. If the profitability of agriculture decreases, there is a risk that the land becomes wooded and overgrown. Profitability can be affected by measures in the landscape. Since a large part of biological diversity is linked to pastureland which has been maintained in a traditional manner, it is important to identify where the sensitivity to ending pasturage is greatest.

Choosing the scale

The scale of course needs to be adapted to what questions need to be answered. In these situations it is often a matter of applying quite a small scale, which allows you to get a picture of the ecological relationships in the entire landscape. Also, the available data generally does not allow for very detailed analyses. A large proportion of the national maps that can be used to analyse the distribution of different habitats have a resolution of 10 x 10 m. For information about the occurrence of species in landscapes, the resolu-

tion is usually even higher – up to 5 x 5 km for birds. A good rule of thumb is to choose as high a resolution as the data allows, but the scale of analysis should not be more detailed than that data points with the lowest accuracy.

Results that provide guidance

If thematic studies make a point of highlighting how ecological values should be ranked in the landscape in question, it will become easier to use the results of the study in subsequent planning. It is hardly of much help in a measure selection study if the documentation does not allow for fairly obvious choices. If all habitats were valued equally, all landscape sections would appear equally sensitive to development and land transformation. Choosing which species and habitats to study from a regional responsibility perspective in relation to national environmental objectives and commitments makes it far more likely that the results will be able to provide the necessary guidance in subsequent planning.

Adapting it to the aims

The selection of species and habitats to study needs to be adapted to the integrated landscape character assessment's aim and use. If the main aim is to produce a planning basis for new infrastructure, it may be important to prioritise analyses that elucidate ecological consequences of expected barrier effects and distribution relationships. If instead they are plans for establishing new residential areas or building wind farms, it may also be important to analyse expected effects of the loss of habitats for the long-term survival of species and ecological function.

Aspects to analyse

There are many different aspects of the natural environment that are important to analyse in order to better understand the sensitivity and potential of the landscape. It is important to try to select those analyses that, given the existing material, will add the greatest amount of new knowledge that is relevant to the presumed future development in the landscape in question. It can also be a good idea to choose analyses

that capture ecological functionality in several occurring habitats, so that the landscape in turn is reasonably well covered in geographical terms. It may be a good idea to choose analyses that can be made on the basis of existing data – this in order to make use of existing resources in the best way. Below is a description of some of the most relevant types of analyses which it is usually possible to carry out for most landscape sections.

Responsibility environments and species

If information does not already exist on what species and habitats it is particularly important to protect in the region in question, it may need to be compiled before you choose what other analyses to make. There are often a large number of documentation dossiers produced by municipalities and county administrative boards that indicate regionally important species, groups of organisms and natural environments. Should such information not exist, or if the existing information is deemed insufficient, the necessary analyses can be made relatively quickly.

It may also be appropriate to carry out specific habitat networks analyses for habitats that are affected by protected areas, particularly if they are Natura 2000 areas. This in order to obtain documentation that can be used specifically to understand the sensitivity of indicated habitats and species, which may affect the permissibility of future development projects.

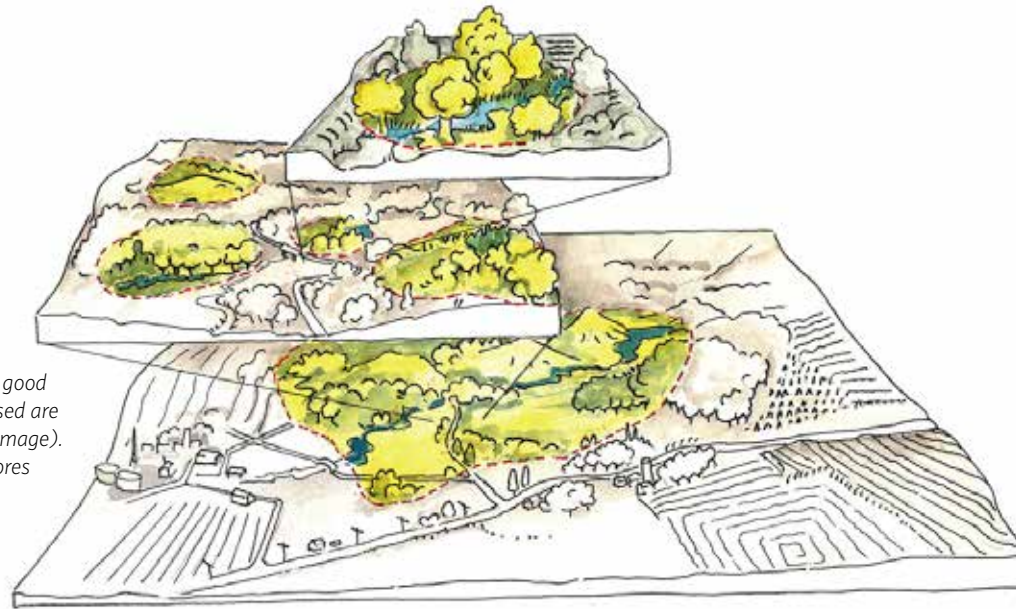
Essentially it is a matter of roughly quantifying how large a share of the national occurrence of each species/habitat is present in the landscape section in question. A good method is to calculate the area of occupancy (AOO) for each occurring species/habitat for a given grid size (e.g. 5 x 5 km). Make this calculation for the country as a whole as well as for the selected landscape section. Then compute the region's share of national occurrence by dividing the regional figure with the national one. This operation should preferably be limited to such species as have been designated particularly valuable or sensitive from a national perspective. This includes species linked to the Species Protection Ordinance and the red list.

From the list of potential focus species and habitats it may then be appropriate to select a few completely different environments that can provide additional detail to the picture of the landscape's nature conservation values.

Historical analyses

In much of the country, landscapes have gone through great changes with respect to the occurrence of various natural environments. Historical changes to land use have also affected the quality and distribution of many important habitats. When the habitat for a species has been reduced historically, what is known as an extinction debt often arises. This term refers to the delay in the disappearance of a species that is almost always to be expected when a habitat becomes fragmented into ever smaller and more isolated patches of the landscape. It is important, therefore, to get a picture of what changes have occurred to the occurrence and distribution of habitats. Have these changes been happening since far back in time or have they only begun recently? Is it an ongoing trend? These are important questions that can

Figure 57. Zones that provide particularly good environments for the species being analysed are usually referred to as value cores (upper image). Areas that are particularly rich in value cores may be designated as value areas (lower image). Illustration: Calluna.



provide guidance as to which species may be expected to decrease in the area in years to come. Underlying the analyses are of course the analyses made to understand the historical time depth in the landscape. What needs to be done additionally is to describe the changes in terms of which groups of organisms or individual species are expected to be affected in the future as a result of the changes.

Value cores and value areas

In order to understand the sensitivity of the landscape it is important to get an overall picture of how different habitats are distributed spatially. Zones with a certain type of habitat may possess different qualities that make them more or less valuable for the species. Such zones that provide particularly good environments for the species in question are usually referred to as value cores. Areas that are particularly rich in value cores are designated as value areas. Usually, individual value cores situated within such areas have an even higher value for biological diversity. The reason for this is that the species' populations become much more stable in areas with ample access to the habitat. For various reasons, species become

extinct in local patches of the habitat. If these patches are not located too far from areas where the species has managed to survive, there is the possibility that the habitat will become repopulated.

Different types of frequency analyses based on knowledge about different environmental factors' geographical distribution, or on direct mappings of value cores and habitats, can be made in order to get a picture of the distribution of value cores in the landscape. It is also possible sometimes to use information about species' occurrence in order to get an idea of the distribution of the habitat. In that case it is a good idea to choose a group of species in which all are tied to the same habitat, and then analyse the frequency of species and/or species observations in order to get an indication of where the habitat seems to be.

Ecological relationships

In order to be able to assess the sensitivity and potential of natural environments in the face of future changes in the landscape, it is important to map important ecological relationships. This involves setting out from species, groups of species or habitats

that have been designated important in the landscape section under study. Analyses can then be made on the basis of what is known about the species' biology of movement and use of biotopes and substrates in the landscape. The analyses are intended to provide a spatial image of what migration corridors are used and what barriers occur in the current landscape.

There are several approaches and modelling tools that can be used to analyse ecological dispersion relationships in actual landscapes. One useful tool is a *habitat network analysis*. This involves indicating areas with the habitat on the basis of the species' environment requirements. You then calculate the expected dispersion potential from each area with the habitat. These calculations must consider different intervening habitats' relative perviousness. Depending on the species' traits and needs, they be variously inclined to move through different environments. For example, a forest-dwelling species may prefer to follow narrow corridors with occasional trees, rather than crossing completely open fields, even if the corridor implies a considerably longer distance than a straight line.

Figure 58. Verges and edge zones alongside established infrastructure can often develop into habitats that may become valuable for certain groups of species, creating a corridor effect – a strengthened dispersion connection.
Photo: Tobias Noborn.



For large mammals such as elk and deer it is often not quite clear what can be regarded as habitat and is likelier to be intervening land. In the case of these animals it might be more relevant to try to identify which migration corridors are most important if the species need to move through the landscape. It can also be useful to identify areas where game can still move freely, and to study in what way existing infrastructure influences movement patterns.

Ecological function

Natural environments offer a variety of ecosystem services. The value of these can vary a great deal, depending on the composition of the landscape and where people live and work. Frequently the full potential of the ecosystems is not used. This is often due to the fact that the functions that people would be able to benefit from do not occur exactly where they are needed. In order to better be able to use ecosystem services it may be helpful to make maps of where in the landscape potentially important ecological functions occur. This is not least important in order to be able to guarantee the generational goal.

Effects of infrastructure measures in the landscape

Within the thematic study of the ecology of the landscape there are terms that are usually employed to describe effects and consequences in environmental assessments. These terms are also useful for describing development trends, sensitivity and potential in the landscape. The following suggested terms largely correspond with the Swedish Transport Administration's *collective effect assessment*.

Loss of habitat

The construction of new infrastructure also risks bringing the immediate loss of important habitats. Losses of habitat have a direct effect on species' possibilities of surviving in the landscape. This is in part because the total habitat volume is reduced, and in part because the habitat becomes fragmented into smaller and more isolated spaces, which in turn leads to a deterioration at the landscape level of dispersion relationships and survival among the affected species. The focus here should be on regional responsibility species and species affected by the Species Protection

Ordinance. The latter category is essential as it can be a cost driver in all types of development projects.

Barrier effects

For many species, a road or railway can mean a dispersion obstacle that limits individuals' possibilities of moving between different parts of the landscape, creating a *barrier effect*. This in turn can lead to reduced chances of surviving in the landscape for the affected species.

Corridor effects

Verges and edge zones alongside established infrastructure can often develop into habitats that may become valuable for certain groups of species, creating a *corridor effect*. This applies mainly to vascular plants and insects, that do not usually require their environments to be part of large, coherent areas. These environments can often also facilitate the movement of open-land species through landscape sections dominated by woods. The establishment of new infrastructure can thus open up new dispersion routes and sometimes reinforce ecological relationships for certain species.

Disturbances

Traffic noise can have a negative effect on various animal species' survival. This applies mainly to species in which acoustic communication between individuals is crucial to reproductive success, which include birds, batrachians and bats. A review of various studies of birds shows that intensely used roads affect at least half of the occurring bird species negatively.

Mortality

Infrastructure and the traffic that comes with it can also lead to increased mortality among animals due to collisions. Mortality in infrastructure can also be caused by electrocution from railway components, collision risks with overhead contact lines, traps for small animals in cable chutes etc. This increased mortality in turn can lead to the gradual population reductions of the affected species in the areas around the infrastructure, despite the fact that no valuable habitats needed to be used for its establishment.

Invasive species

Species that do not belong to the natural flora and fauna can become established or spread through infrastructure. The spread of non-native species can sometimes lead to negative effects for the species that live in a region. There are many examples of how invasive species successfully compete with the previously occurring species, sometimes driving them to extinction. There are also examples of predation by non-native species leading to the disappearance of indigenous species.

Sources for thematic study: the ecology of the landscape

- The National Atlas of Sweden for plants and animals
- National and regional nature conservation plans
- The meadow and pastureland inventory (TUVÅ)
- Nature conservation value inventories
- SLU Forest map (Swedish University of Agricultural Sciences)
- The key biotope inventory (Swedish Forest Agency)
- Databases of trees designated for protection
- Databases of species observations (ArtDatabanken, Svenska LifeWatch)
- Species facts including the red list (ArtDatabanken)
- The Species Protection Ordinance
- Spatial environment data (Geodataportalen, Miljödataportalen)
- Habitat mappings (KNAS, CadasterENV) and biotope databases
- Svenska Marktäckedata (Swedish Environmental Protection Agency)
- General maps (Lantmäteriet) – Comprehensive, Road, Terrain, and Property maps
- Orthophotographs (Lantmäteriet, Google Earth etc)
- The Swedish Board of Agriculture's block database
- Existing landscape assessments

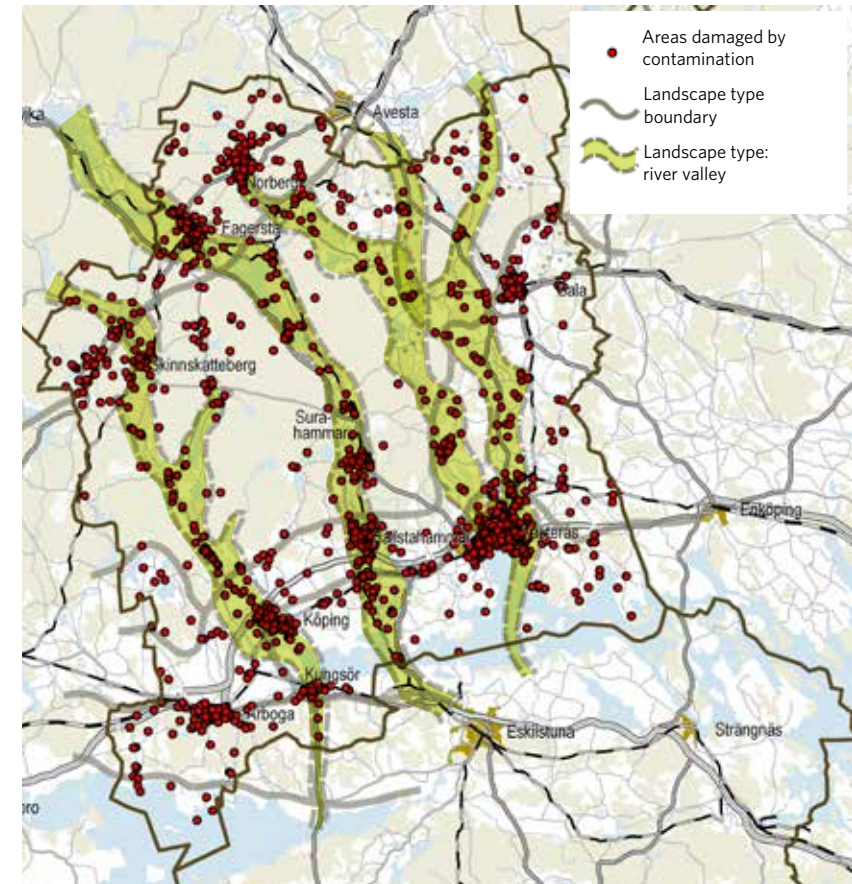


Figure 59. The analyses are adapted to conditions that are specific to different landscapes or regions. In the example above, contaminated land has been indicated on a map where landscape type boundaries are shown in faint grey lines. The example is from an ILCA of Västmanland county. We can clearly see that contaminated land is linked to activities, including the mining areas in Bergslagen, to the north, and the river valleys between Bergslagen and the Mälaren. These have also been home to numerous mill and works communities which have affected the ecology of both the land and water. Map: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

Examples of historical analyses

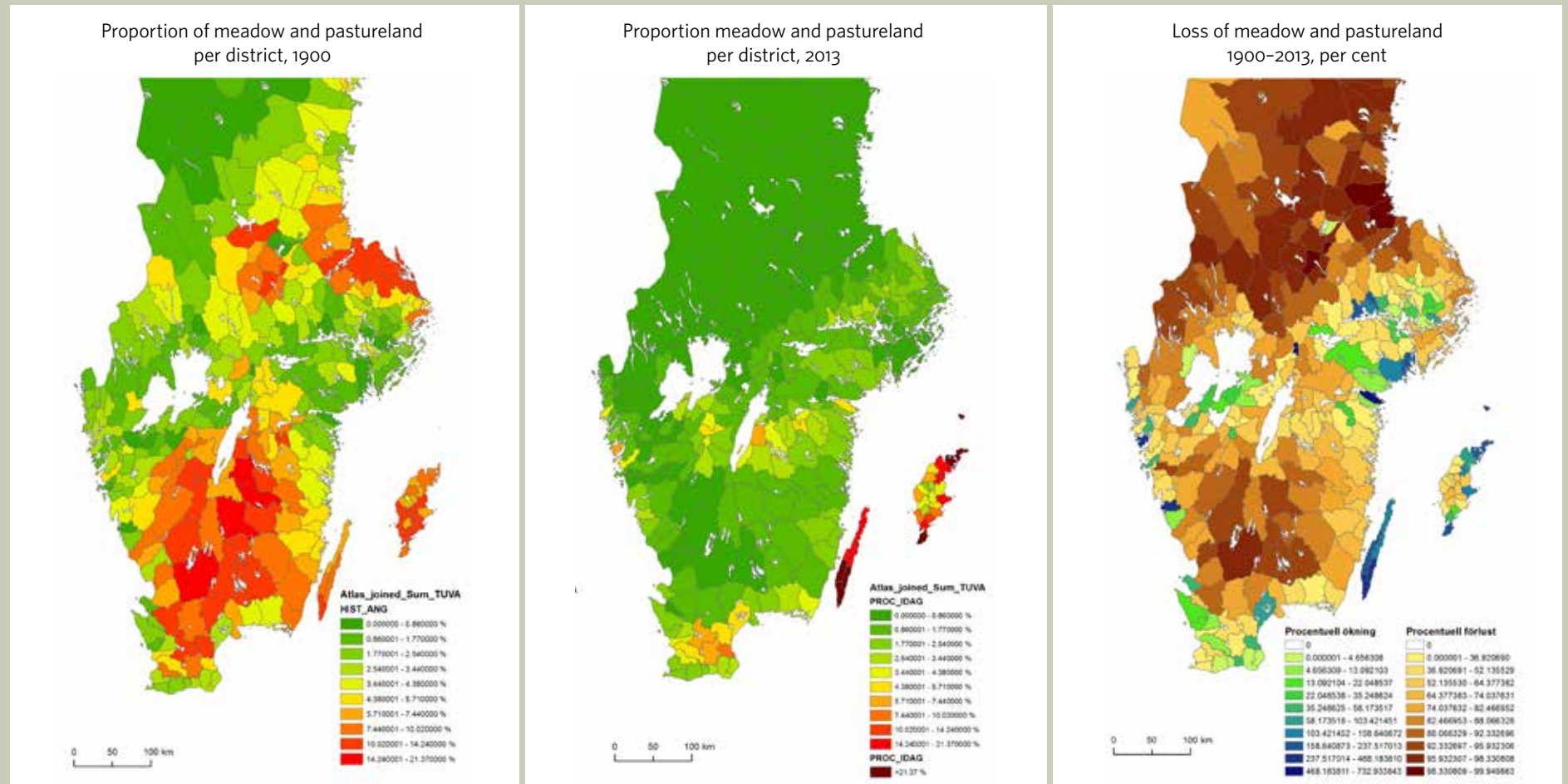


Image series 60. People have always influenced the ecosystems, and vice versa. The series of maps above shows the proportion of meadowland per district between 1900 [“1990” in the original] and 2013. The loss of meadowland is due to a great extent to the changed methods of farming and forestry, but also to infrastructure and other, more urban, land uses. The consequence is biological depletion. Human beings have built up a considerable extinction debt. Extinction debt means that we currently have many species that live on in the landscape despite changes in or fragmentation of the environment, or that the population has been adversely affected by inbreeding. These species run a considerable risk of becoming extinct but have not yet reached that point [original has “had time to do that”]. Example from Comprehensive landscape character assessment for new trunk line in southern Sweden, where this landscape change was highlighted as a decisive factor for the character and function of the landscape. Maps: Calluna.

Examples of analysis of ecological connections with habitat networks analyses

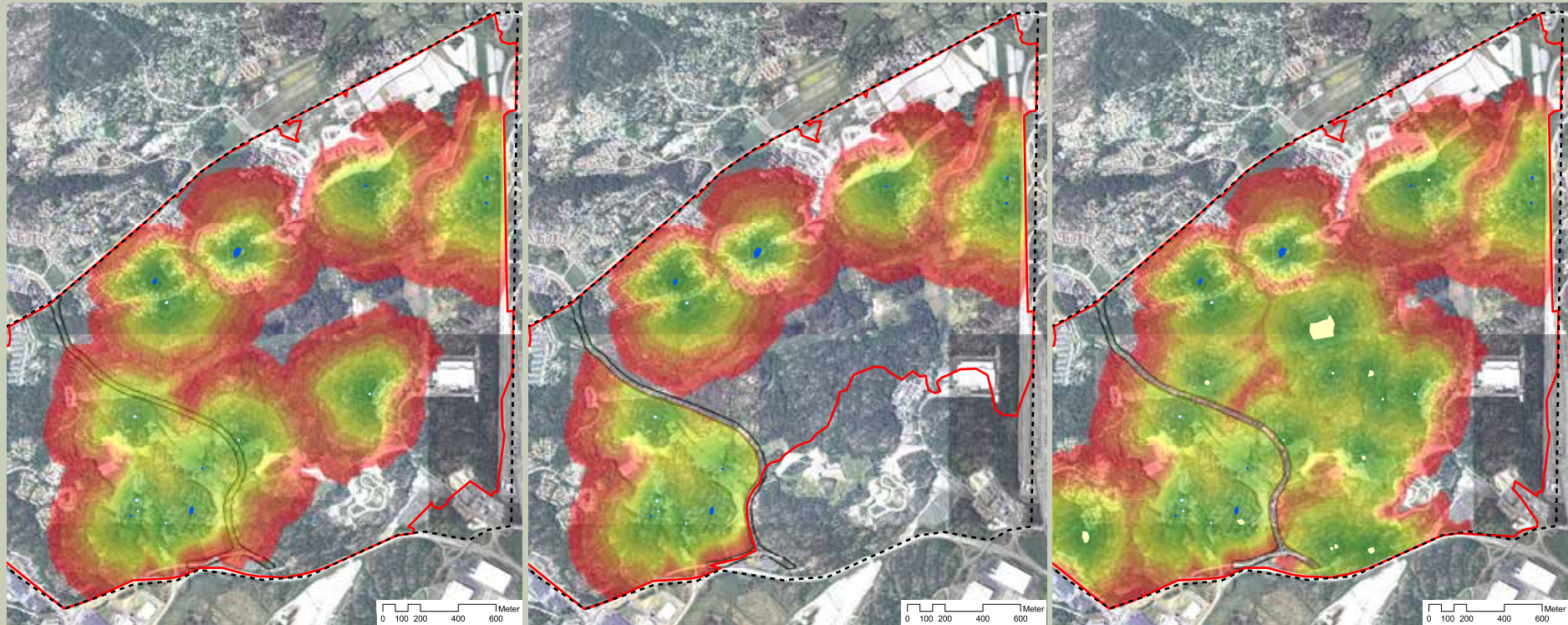


Image series 61. An example of a habitat networks analysis for northern crested newt in Hisingen, Göteborg. The colours in the figure indicate the strength of the dispersion relationships for three different scenarios: before the development of a transverse link (left), after development without special measures (centre) and after development in combination with fauna passages and restoration of small waterways (right). The results of the analysis should be interpreted such that green shows relatively strong dispersion relationships, while red indicates considerably weaker relationships. Uncoloured areas indicate that relationships are non-existent or at least much weaker than in the coloured areas. The map series shows the potential in the landscape – for strengthening dispersion relationships and achieve a better situation after the measures than before. Maps: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

Examples of ecological function

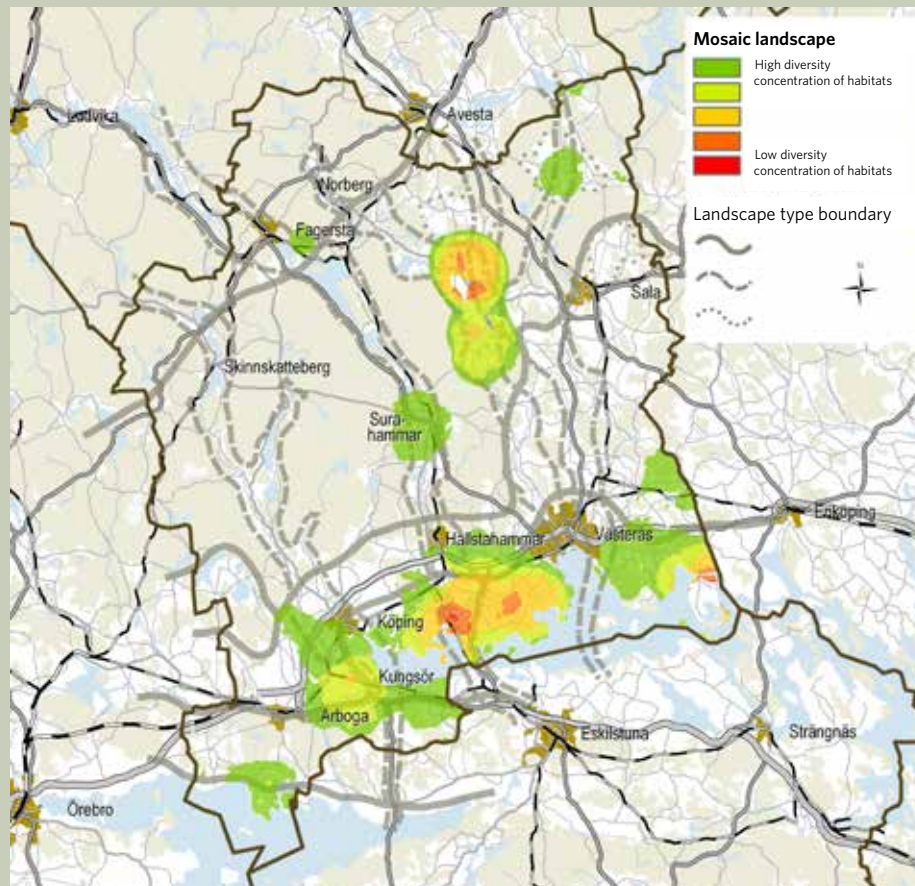


Figure 62. Two examples of maps that show conditions for ecological function. This map shows a mosaic where key biotopes in woodland as well as meadow and pastureland are added together and analysed on the basis of dispersion distances for species related to these environments. The redder an area, the better the conditions for biological diversity in mosaic environments. Map: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.

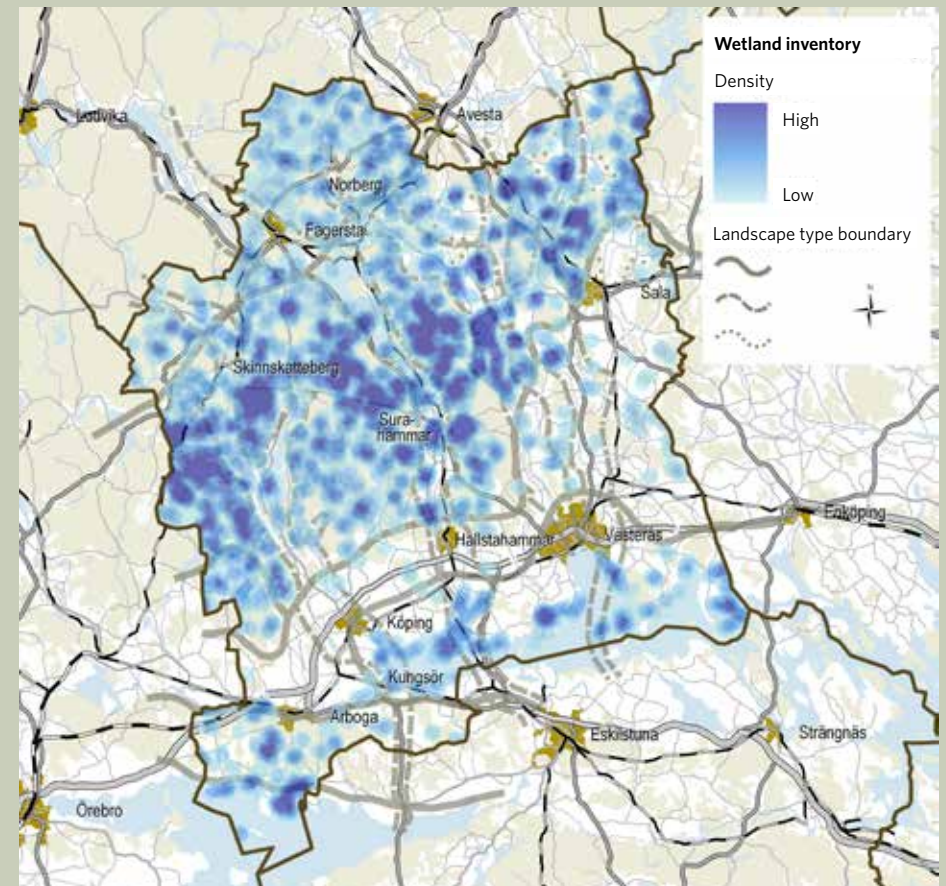


Figure 63. This map shows wetland density. A clear wetland corridor through the woodlands is shown, as is an area near the shore of the Mälaren. Between these two the cultivation landscape is scarce in water. Both maps are from an ILCA of Västmanland county. Map: Calluna. Background map: ©Lantmäteriet, Geodatasamverkan.



Photo: Bengt Schibbye.



Chapter 6

Development trends, sensitivity and potential

DEVELOPMENT TRENDS

Development trends are worked out from a qualified evaluation of patterns of change, based on what is visible or interpretable today. Where is the landscape headed? What development paths can be imagined? It is not a judgment of whether this development is good or bad. In order to judge development there must be formulated objectives for comparison. For example, is continued overgrowth good or bad? Is the continued conversion of coastal fishing sites into tourist villages good or bad? The analyses merely state what is happening. Neither are they an enumeration of known or unknown plans for different landscapes; instead they are an assessment of the future in the sequence *past–present–future*.

When these questions begin to be discussed, the strengths of the method become clear. Integrated landscape character assessment establishes a common understanding of the landscape and its diversity in the region – as a prerequisite for development. This also brings to a head the need for a common

strategy for different landscape sections. Read more on goals in the *Objectives, evaluation and environmental assessments of landscapes* chapter.

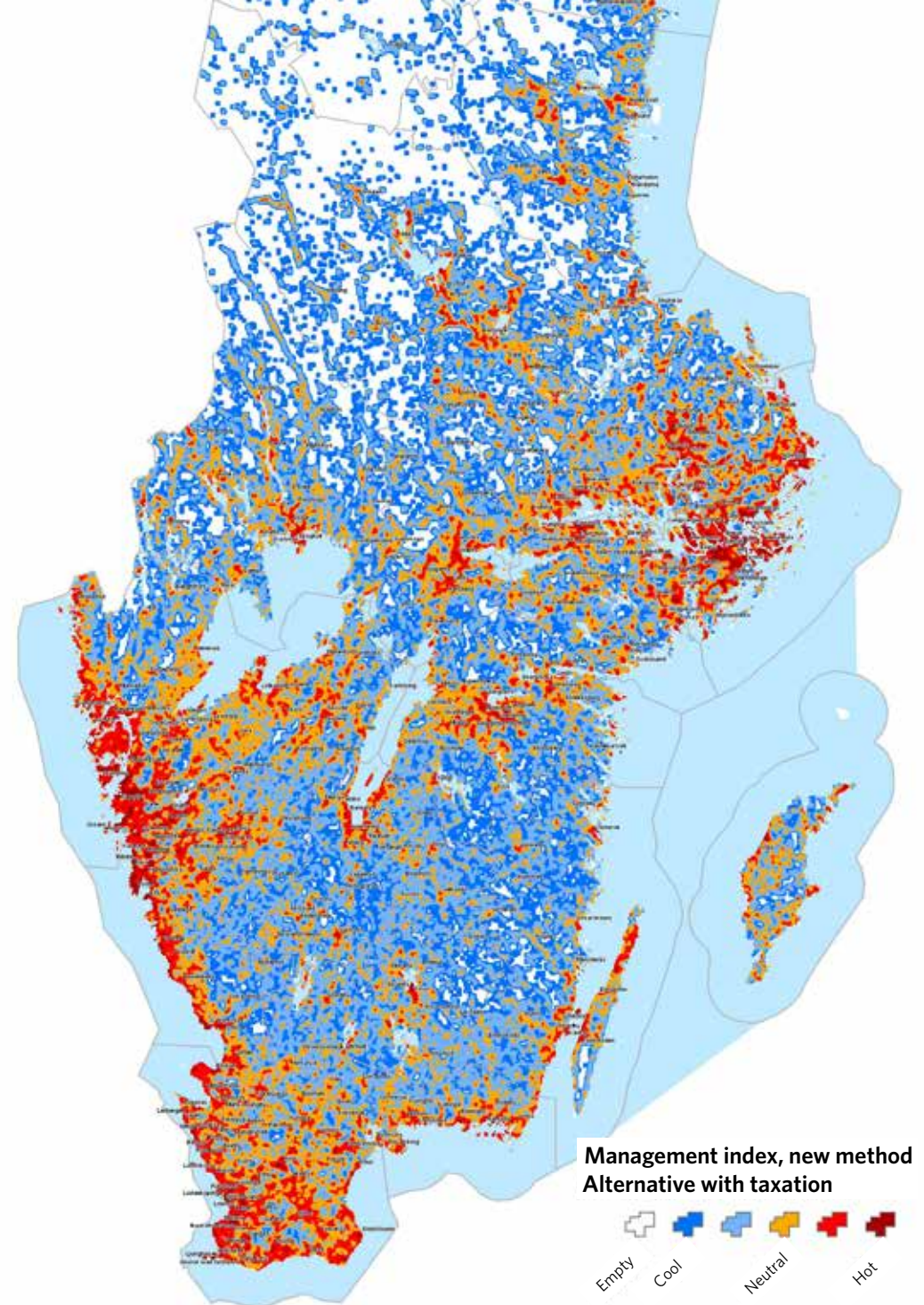
The map on the next page is an example of analyses that can underpin the assessment of development trends. It was produced for the Swedish National Heritage Board and shows a ‘Management index’ – a method for calculating whether change pressure is high or low. The index is made up of a combination of several statistical variables, and colours areas in a scale from cool to hot.

Knowledge about development trends can be used to make analyses more long-term, for strategic considerations and for impact assessments – e.g. the zero alternative.

► Figures 64, 65 and 66 on page 73. The map shows the “Management index” – a method for measuring change pressure, which leaves traces in the landscape. In the upper photo is an example of building pressure in Bohuslän, which here leads to non-traditional building locations in order to have a view. The lower photo shows a clear sign of an area with low change pressure. Map: WSP for the Swedish National Heritage Board.



Figures 64, 65 and 66. Caption on page 72.



SENSITIVITY

The assessment of sensitivity concerns the *character area's* or *landscape type's* sensitivity. The conditions and building blocks that are character-bearing features of the character area are also those that are generally sensitive to change of the specific character, if it is to endure.

By dividing the description of a landscape type or character area into three parts, the following questions can be posed:

- **Character** – what key characteristics/building blocks are sensitive to change?
- **Function** – what ecological and cultural systems are sensitive to change?
- **Relationships** – what social systems and structures are sensitive to change?

And in what way are they threatened by measures that are now being planned, discusses and analysed, on the basis of the goals for what we want the systems to be?

At this stage, then, we need to have knowledge of measures and of the effect they may have on the landscape. Sensitivity is not described in general terms, instead it is directed towards those measures that are current in infrastructure planning.

We also need to have insight into what goals there are for different parts of the landscape. If there are no specific goals, the assessments are made on the basis of the goal for a sustainable, functional landscape and on the basis of the overall objective expressed in Sweden's environmental quality objectives. Sometimes there are more specific goals for the environment or landscape formulated by the county administrative board, region, municipality or similar. Sometimes there are planning or project goals. Read more about

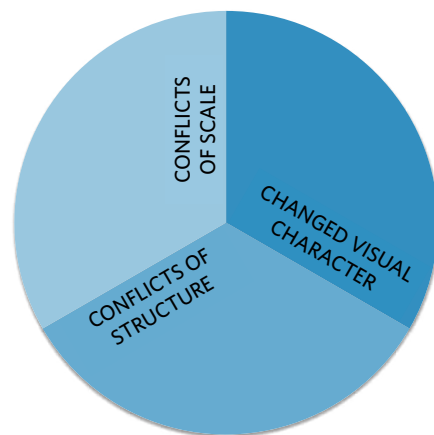
goals in the *Objectives, evaluation and environmental assessments of landscapes* chapter.

The terms *sensitivity* and *resilience* describe different sides of the same coin. The term *sensitivity* is used for the sake of clarity.

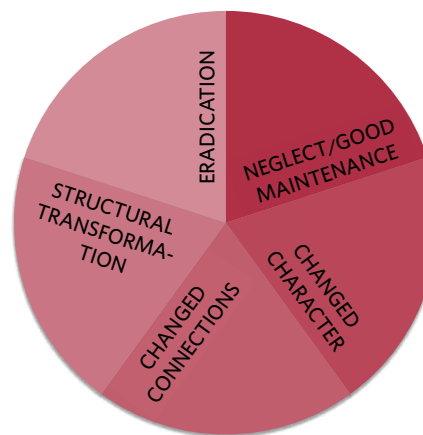
The effect terms used in the sensitivity assessment are most often used in sectoral assessments (see the three pie charts on the next page). These effect terms are explained under each thematic section of the *Thematic studies* chapter.

If we divide the effect terms by character, function and relationships instead of thematically, we can end up with the yellow pie chart shown on the next page. This is also the way the effect terms are listed in the *Check list for field trips* (page 2 of the appendix).

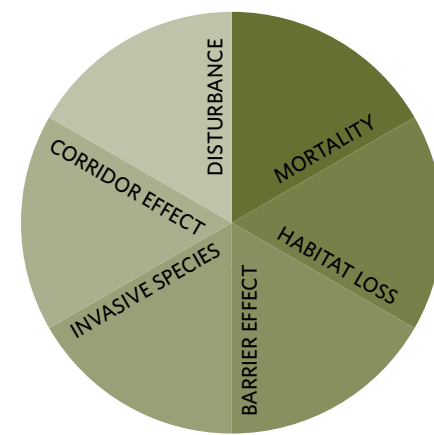
Examples of illustrations of both sensitivity and potential are in Figure 68 on page 77.



Effect terms, thematic studies of form



Effect terms, thematic studies of historical time depth



Effect terms, thematic studies of ecology

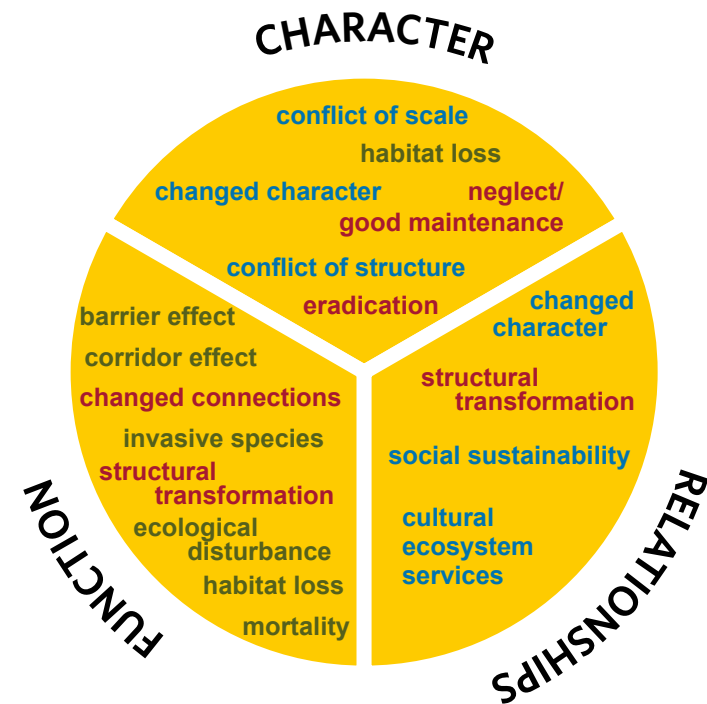


Image series 67. The lower pie charts show common effect terms (positive, neutral or negative) in sector-wise effect assessments. The yellow pie chart sorts the effect terms under character, function and relationships. The effect terms are used in the check list, see appendix. Illustrations: Befaringsbyrå.

POTENTIAL

The landscape convention decrees that the landscape is a shared arena and a framework for social development and management of environmental values. In the past, damage prevention measures were often considered in order to make development projects more environmentally acceptable. But with knowledge gained from an ILCA, landscape and environmental values can be *created* and *promoted* in connection with the development of infrastructure: the landscape has a potential that can be put to use.

In other words this is not about either damage prevention measures or compensatory measures, intended to minimise damage or compensate for a negative consequence until a zero level is attained from a broader perspective. Potential is about a measure that has an improving, strengthening or promoting net effect.

Seeing the potential in the landscape and using that in the planning of measures is a way of letting the

investment in infrastructure measures contribute to achieving sustainable development. Working with potential alongside commonly used problem and needs descriptions makes the work forward-looking.

How can the landscape be strengthened?

With the three-way description of a landscape type or character area, we can ask the following questions about possible measures:

- **Character** – what potential/possibilities are there of strengthening key characteristics in the landscape, and the perception of them, for attractive and interesting landscapes?
- **Function** – what potential/possibilities are there of strengthening functions in the landscape, e.g. ecosystem services, for more functional landscapes?

- **Relationships** – what potential/possibilities are there of developing people's opportunities for a good, sustainable life and the opportunities for livelihoods – including cultural ecosystems – to achieve sustainable development in the landscape?

In other words, how does the installation interact with the landscape to add and create something that contributes to goal fulfilment of the broad range of goals that exists for the function and quality of landscape and infrastructure? The analysis of potential can also be a basis for discussions about shared goals and landscape strategies.

By means of character–function–relationships and the thematic studies we can identify, for example, the landscape's development potential for strengthening ecological functions, make the landscape's cultural history more visible, and so on. In this connection we can also be helped by gap analyses of various kinds.

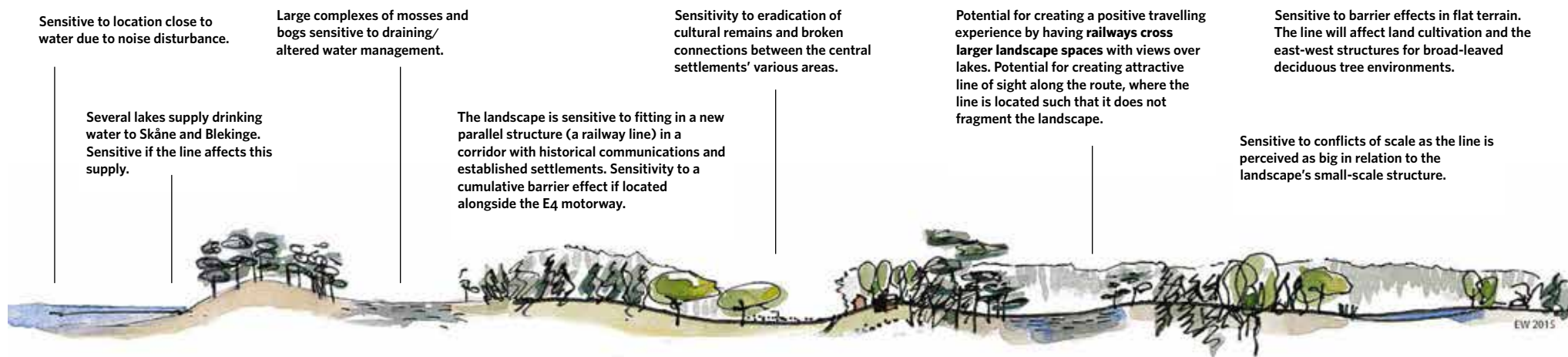


Figure 68. Examples of sensitivity and potential described for the landscape type "flat landscapes with abundant lakes". Identified for possible landscape change due to construction of a high-speed railway line. Example from Comprehensive landscape assessment, southern Sweden. Illustration: Emily Wade.

Measures with potential

For both sensitivity and potential, solutions can be sought in

1. measures in the infrastructure systems (direct measures)
2. measures where infrastructure measures can contribute to creating improved functions in the larger system/landscape where the infrastructure is present (indirect measures). We can call them 'opportunity measures', when we are there to invest in other things as well.

When we are seeking measures to cover broader needs and shortages in the landscape, we can benefit greatly from an ecosystem service perspective. We can incorporate measures that have a direct or indirect influence on the quality and operation of the installation itself, as well as on the functionality of the landscape. This might be for the landscape's capacity for water diversion in order to avoid flooding

by means of terrain management, establishment of wetlands, and so on.

In planning cases with measure selection studies, planning challenges are focused on the terms *problems*, *gaps* and *needs*, leaving the term *potential* out. Potential can be said to become a *need* if someone identifies a demand for it. Thus projects and processes require the presence of individuals with such competence that they can see and highlight these potentials, in order for the project to achieve the maximum benefit.

Examples of potential for a high-speed railway

The measure of putting a viaduct across an open field landscape is a strategy or a measure to mitigate or prevent a negative effect on character, function or relationships. In that case it is not a potential, but something that mitigates a negative effect.

But the same viaduct provides the potential (enhanced quality) for experiencing the open landscape from the train – the traveller experience.

Further potential that can be incorporated into solutions for high-speed railways include:

- The potential for adding dispersion routes by means of measures in the rail side zone – on embankment slopes, in protected tree zones etc.
- The potential for adding small biotopes in rationally cultivated landscapes through adapted biotope-characterised surfaces on e.g rail embankments or spoils.
- The potential for using the line as a building element that strengthens the distinctive character of the landscape and the place, as well as perception values, e.g by means of carefully executed bridge constructions for urban passages.





Chapter 7

Objectives, evaluation & environmental assessment of landscapes

protect (conserve) // uphold, maintain // strengthen // develop // create

OBJECTIVES FOR LANDSCAPE QUALITY

In order to be able to assess sensitivity and potential for the landscape, it needs to be held up to an overall goal – how do we want landscapes to be? What do we want the landscape to provide us with? In other words, objectives are needed. Indeed, the European Landscape Convention (ELC) is clear on this point:

‘Each Party undertakes to define landscape quality objectives for the landscapes identified and assessed...’ (ELC, Section 6D)

Specific objectives for the landscape, or landscape strategies, have not been formulated in very many places in Sweden. However, among the 16 environmental objectives there are many that have a bearing on a functional landscape, and in the absence of anything else the assessments have to be made on the basis of the ‘sustainable landscape’ objective. This has to be defined more clearly in each individual planning situation. The Swedish Transport Administration, or another actor planning infrastructure in the

landscape, can consult with regional bodies in order to formulate goals and strategies for the landscape in their planning work.

The governments transport policy objectives emphasize the importance of both ‘function goals’ for the transport system and ‘consideration goals’ for safety, the environment and health. The Swedish Transport Administration uses models for ‘delivery qualities’ for infrastructure, where the system has to deliver not just transport quality and robustness, but also a landscape-adapted infrastructure. Guidelines have been drawn up for these purposes, including a ‘Landscape guideline’ that sets out the Swedish Transport Administration’s fundamental positions and functional requirements regarding landscapes.

STRATEGIES FOR LANDSCAPE DEVELOPMENT

The landscape convention should not be interpreted as a tool for the conservation of landscapes. On the

contrary, it focuses on the constant process of change and development in landscapes. The description and assessment of the landscape’s sensitivity and potential can be held up to the expectations we have – what do we want to do here? Will today’s landscape character be an essential resource in the future as well? If so, how should it be developed? How can planned measures contribute to a development that is sustainable in all aspects? The above scale can be used as a starting point for such discussions.

TO EVALUATE OR NOT TO EVALUATE LANDSCAPES

Integrated landscape character assessment is fundamentally a non-evaluative method. Its aim is to identify and express that which builds the landscape’s character and functions, and to describe why it looks and functions the way it does. The purpose is not to weigh the constituent parts against each other. One basic premise of an ILCA are the objectives for a sustainable landscape formulated in the European

Landscape Convention, in Sweden's environmental objectives or in other actors' more specific goals for the environment and landscapes. The description of the landscape's sensitivity and potential is therefore intended to provide guidance as to what types of measures can strengthen or build on those functions or characteristics that are fundamental in today's landscape and significant for sustainable landscape development.

ENVIRONMENTAL ASSESSMENT

An integrated landscape character assessment can be one of several significant bases for the environmental assessment process, and in the assessment of the consequences for the landscape of a particular plan or measure. One purpose of coordinating the environmental assessment and the integrated landscape character assessment is to counter sectoral environmental consideration and instead promote holistic solutions that take several environmental aspects into account at the same time.

The Swedish Transport Administration has tried using integrated landscape character assessments as a basis for environmental assessment in the geographically extensive measure selection studies for high-speed railways between Linköping and Borås and between Jönköping and Malmö. The Linköping–Borås study emphasised the coordination of both processes and reports in the integrated landscape character assessment and the environmental assessment. The integrated landscape character assessment presented the conditions for the landscape-related environmental aspects, which included natural and cultural environments, settlements and land based industries. On the basis of the ILCA, the environmental assessment assessed and described the environmental effects that the studied measures could give rise to.

One method for linking the ILCA to the environmental assessment was to use 'key factors'. Key factors can be defined as character-making or function-based factors that are significant for the character and function of a landscape type or delimited area. If the current landscape character or function is to remain,

these key factors are sensitive to influence. The key factors were used as a way of measuring the total effect of the various solutions on the landscape's character, and as an alternative to measuring effects on sectoral interests or designated areas.

In ongoing work on a national plan for the transport system 2018-2029, the Swedish Transport Administration has used those integrated landscape character assessments that have so far been produced when assessing the plan from an environmental perspective. The principle of having key factors for different landscape types is again part of the work process, but now at a strategic and national level. Overall this has meant that the administration has been better able than previously to assess the influence on landscapes of a future national transport plan. Achieving that kind of improvement of landscape considerations in national planning work was one of the aims of the R&I project 'Including landscapes in long-term spatial planning'.

USING ILCA IN SUBSEQUENT STAGES

The ILCA method was specifically made for the early stages of the infrastructure work process, including a national and a regional plan for the transport system and measure selection studies. There are indications from several professional groups, within and without the Swedish Transport Administration, that an integrated landscape character assessment should be able to provide decision support in subsequent stages as well. This has emerged during surveys of and dialogues about the Swedish Transport Administration's processes, as well as at seminars, workshops and various pilot projects in the method development of ILCA. For example, ILCA can provide valuable support in the transition from measure selection study to planning process, and a basis for some of the Swedish Transport Administration's established products with a landscape focus in planning and design. An ILCA can also serve as a communicative tool. Below we highlight some examples of this.

Measure selection studies

During a measure selection study, a broad analysis is carried out of different conditions with several collaborating stakeholders. An integrated landscape character assessment provides a good knowledge basis about what resources there are in the landscape and what systems and relationships are important for an area, in the same way that information is produced about regional commuting patterns or school catchment areas. The integrated landscape character assessment becomes one of several decision support documents for formulating goals and guidelines in the measure selection study.

Road and railway plan – basis for location and design

In location and design, landscape assessments, cultural heritage analyses and nature conservation value inventories are all part of the decision support documentation. The most important task of these three

analyses is to contribute to landscape considerations in the location and design of infrastructure measures. In other words they should underpin the creation of alternative corridors, discussions about choices of possible corridors for locations within a larger area, and then also be the basis of choices of corridors or locations. Read more about this in 'Landscape assessment for planning roads and railways'.

Designs that take the landscape into consideration are a statutory requirement in road, rail and environmental legislation. When a regional integrated landscape character assessment is available in the early stages of location and design work, knowledge is transmitted about the affected area to all those involved. This facilitates the transition from early planning to the location process. It also provides an opportunity to relate the in-depth knowledge produced in landscape assessments, cultural heritage analyses and nature conservation value inventories to an overall context.

Basis for architectural work

Architectural work in infrastructure projects also needs to be based on knowledge about the landscape. The landscape assessment, which incorporates elements of the cultural heritage and nature analyses, is a knowledge basis for the production of architectural intentions and architectural programmes in road and railway plans. There is knowledge chain from the integrated landscape character assessment in the early stages, to analyses during the location and design stages and to the transformation into architectural characterisation of what is going to be built. Good architectural characterisation is about making use of the features of the place in order to make the installation interact with its surroundings. With the knowledge from the landscape assessment, architectural characterisation can support and highlight both the traffic installation's and the landscape's function and character. Architectural work must begin early and continue throughout the project, from the planning stage, through design and construction and on into the management stage.

Basis for consultation

In many ways, integrated landscape character assessments are well suited to constituting an important part of consultations with external stakeholders: residents, associations, municipalities, county administrative boards and other involved parties. It is easy to generate interest around neutral landscape descriptions, and to discuss how the landscape as a whole might be developed and changed. Since an ILCA sets out from the physical place, it can be a good starting point for a dialogue with residents and those who work in an area. Those who live and work in an area have a different type of connection and perception than those who travel through it. Infrastructure must therefore always be planned on the basis of both the conditions of the place and the function of the traffic installation, both the residents' and the travellers' perspectives. Sweden's ratification of the European Landscape Convention is an official acknowledgement the significance of the landscape for landscape-related identity, i.e. the individual's or the group's sense of connection to the landscape.

By means of various participation processes, and in consultations, we can obtain knowledge about how people use and perceive the landscape in their everyday lives, and what significance different areas have e.g. for their recreation and outdoor life.

8 Terms

Befaring

A Norwegian word for a field survey. In the context of ILCA it means a field study or an inventory with the aim of studying, discussing and analysing the landscape – in the landscape. To be carried out jointly by all involved competences among the providers. Clients and examiners are also to take part.

Ecosystem service

Ecosystem services are the ecosystems' direct and indirect contributions to people's well-being (Swedish Environmental Protection Agency). Often divided into supporting, regulating, maintaining and cultural ecosystem services.

Integrated landscape character assessment (ILCA)

A method for landscape assessments which is based on – but does not copy – the British method of Landscape Character Assessment (LCA). It aims to provide a holistic picture of the landscape's principal content,

its character, features and values. In it, functional, visual and sense-of-place aspects can be analysed together with ecological and historical analyses of the area in question.

The integrated landscape character assessment asks the questions: What does the landscape look like and why does it look and function in the way it does? What changes are going on in the landscape? What is the landscape sensitive to? What potential is there for strengthening, protecting or developing functions and characteristics in the landscape?

Character (landscape character)

A specific interplay between landscape elements resulting from the natural conditions, historical land use and the spatial and perceptual conditions that define an area and distinguish it from surrounding areas.

Characterisation

The work of finding and describing a character, function and relationships – to characterise. An element of integrated landscape character assessment.

Character area

An area of a certain character (see below) which is unique (e.g. the Dalbo plain).

Compensatory measures

Measures intended to compensate for a negative influence, to make up for the damage to some extent. They can be close to the planned measure or farther away. One example is to designate new protected areas if such areas are damaged by the measure.

Sensitivity

Changes that can affect a character area's key characteristics, functions and/or relationships. What key characteristics are sensitive to change? What ecologi-

cal and cultural systems and structures are sensitive to change? What social systems and structures are sensitive to change?

Landscape

‘An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’ (from the European Landscape Convention, COE 2000b, Chapter 1, Article 1a).

Landscape assessment

A broad term that includes various types of analyses for the understanding of an area’s geography: its history, current situation and future possibilities. A systematisation of knowledge in order to understand the characteristics of a place or an area.

Landscape type

Designation of an area that has a certain structure and can therefore occur in several different places

(e.g. plains). Landscape types occur at different scales – the term is generic.

Key characteristics

Characteristics, building blocks that constitute the character of the landscape. Can be divided into *character*, *function* and *relationships*.

Potential

In ILCA the term is used to assess what possibilities there are of strengthening an area’s character, function and relationships. What possibilities are there of strengthening key characteristics in the landscape – and the perception of them – for attractive and interesting landscapes? What potential is there for strengthening functions in the landscape, e.g. ecosystem services, to achieve more functional landscapes? What potential is there for developing people’s opportunities for a good, sustainable life and sustainable development in the landscape?

Relationships

The landscape convention sets out from people’s relationships with the landscape by emphasising, in its definition of landscape, ‘as perceived by people’. Current convention-linked research about landscapes focuses on the three terms *character*, *function* and *relationships*. Relationship here means the landscape as territory and identity area, to which people have special bonds and where they feel a sense of place.

Damage prevention measures

Measures intended to minimise or preferably prevent damage by a given measure. One example is the construction of a viaduct across a valley in order to maintain functional connections along the valley.

Development trends

Patterns of change in the landscape, on the basis of what is visible and interpretable today.

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Character area: _____

Landscape type: _____

Checklist

Landscape character, function and relationships

CHARACTER	
<p>Spatial, natural and cultural features in the landscape that define the character</p> <p>Land form/topography, relief, height variation, structural direction, topographic scale</p> <p>Bedrock, soil, watercourses, drainage</p> <p>Spatial context, interconnected spaces, scale of spaces, enclosed, open, complexity, texture</p> <p>Natural landscape, habitats, biotopes</p> <p>Typical vegetation or planting structure</p> <p>Land use that gives character</p> <p>Communications, road and rail network</p> <p>Settlements, character, density, age, structure, scale, function</p> <p>Other site-specific key elements or specific forms of landscapes/seascapes not mentioned above</p>	
FUNCTION	
<p>Functional aspects. How the structures and systems work in the landscape.</p> <p>Spatial functions (boundaries, edges, patterns, structures, spatial rhythm, paths, nodes, districts, landmarks, orientation, views)</p> <p>Communication (local movement, access, public paths, barriers)</p> <p>Ecological functions (connectivity, natural ongoing processes etc.)</p> <p>Historical context (land use, former settlements and colonisation, cultural heritage, physical structures and interrelated structures)</p>	
RELATIONSHIPS	
<p>Peoples relationship to the landscape/sense of place. Have inhabitants and stakeholders participated in the process?</p> <p>Identity and relationship to place, landscape, names, districts</p> <p>Cultural ecosystem services (use of the landscape)</p> <p>Places of significance, relevant to people's lives (symbolic, representative, nodes)</p> <p>Cultural references (places depicted in literature, art, music etc.)</p>	

Date of field observation _____

Character area: _____

Landscape type: _____

Checklist

Development trends, sensitivity and potential of the landscape

ONGOING PROCESSES AND DEVELOPMENT TRENDS		
What goes on in the landscape? Status of present land use (agriculture, forestry etc.) Planning, urbanization and infrastructure Ongoing natural processes How is the landscape transforming? Patterns of change that can be observed or expected Neglect or good maintenance Distinct/Indistinct, fast/slow?		
ASPECTS AND ASSESSMENT OF EFFECTS	SENSITIVITY	POTENTIAL
Character		
Alterations of scale Disturbances of structure Change in landscape character (visual character openness/ complexity/ texture) Habitat loss Eradication	Sensitivity towards or ability to accommodate change...	Potential to create/ enhance/ develop/ protect/ mitigate...
Function		
Changed context or functionality for humans Structural alteration Barrier or corridor effects Mortality Habitat loss Invasive species Disturbance of ecosystems	Sensitivity towards or ability to accommodate change...	Potential to create/ enhance/ develop/ protect/ mitigate...
Relationships		
Social Sense of place (as perceived by people that complements the assessment of character and function above) Available cultural ecosystem services (recreation, places of significance, cultural heritage etc.)	Sensitivity towards or ability to accommodate change...	Potential to create/ enhance/ develop/ protect/ mitigate...from a social/ democratic/ cultural point of view

Date of field observation _____



The Swedish Transport Administration, SE-781 89 Borlänge, Sweden. Visiting address: Röda vägen 1
Telephone number: +46 771 921 921, Text telephone: +46 10 123 50 00

www.trafikverket.se