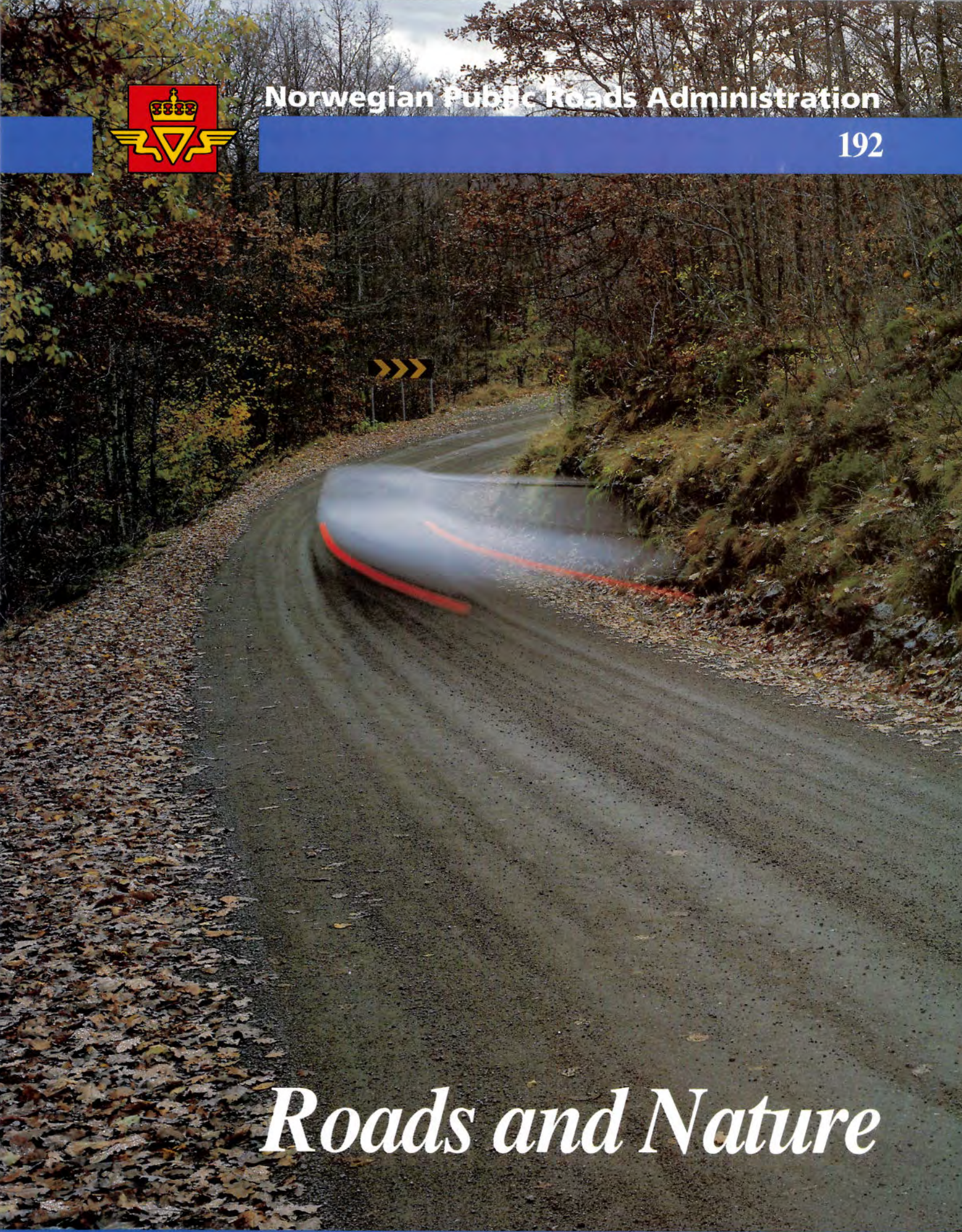


Norwegian Public Roads Administration

192

Roads and Nature

DIRECTORATE FOR
NATURE MANAGEMENT

Roads and Nature

Norwegian Public Roads Administration Handbooks

This is one of a series of handbooks prepared and issued by the Norwegian Public Roads Administration - a collection of consecutively numbered books which are primarily written for use within the Administration.

The books are for sale and may be ordered from the Directorate of Public Roads at prices given in the available guidebook - handbook No. 022.

Responsibility for preparing and updating the books rests with individual departments within the Directorate of Public Roads.

The Handbook Division deals with general tasks associated with the production of the handbooks.

The handbooks from the Norwegian Public Roads Administration are issued in two categories;

Category 1: Red stripe on the cover - covers Regulations, Standards and Guidelines approved by the authority responsible or the Directorate of Public Roads with authorisation.

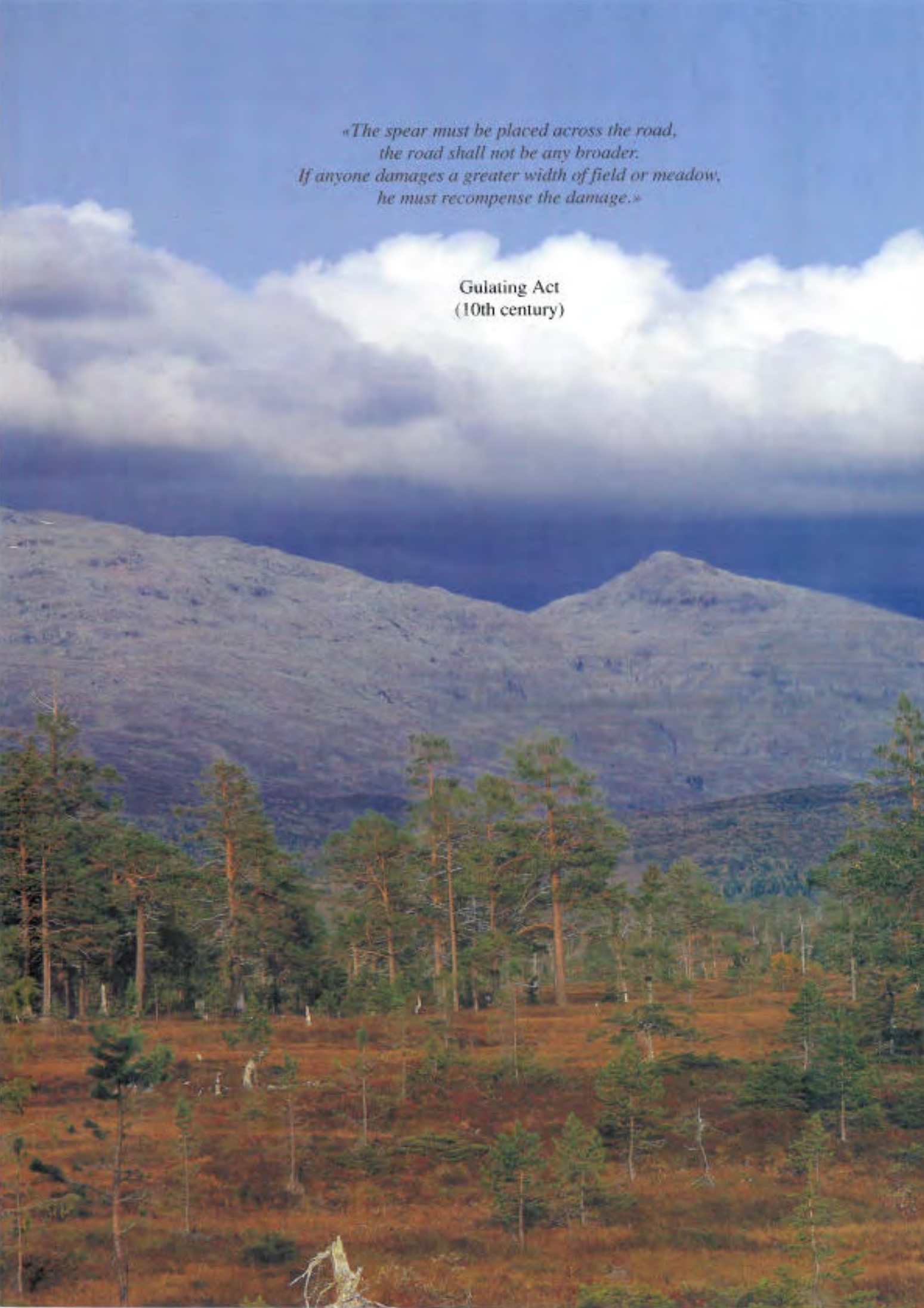
Category 2: Blue stripe on the cover - covers Instructions, Teaching Manuals and Road Data approved by individual departments within the Directorate of Public Roads.

Roads and Nature

No. 192 in the Norwegian Public Roads Administration's handbook series.
Cover photo: Grimestad in Vestfold, Jon Arne Sæter
Typesetting and layout: Trondheim Reklamebyrå AS
Handbook Division, Directorate for Public Roads
Translation: Richard Burns
115g Multiart silk, environmentally-friendly paper
Issue: 2000
Printed by: a.s Joh. Nordahls Trykkeri

ISBN 82-7207-417-6

Fongskaftet, Roltdalen
Photo: Jon Arne Sæter



«The spear must be placed across the road,
the road shall not be any broader.
If anyone damages a greater width of field or meadow,
he must recompense the damage.»

Gulating Act
(10th century)


Outdoor recreation spaces near towns and other built-up areas
Extensive, uninterrupted areas of open countryside
Agricultural landscape
Green space
Shore zone

Preface

When the Norwegian Public Roads Administration in 1992 formulated a number of strategic goals it intended to meet, a primary one was to have due regard for valuable areas of countryside, important relicts of cultural history and the surroundings of the road. Government White Paper no. 46 (1988-89) on "Development and the Environment" clearly states that environmental considerations must be integrated into planning processes and undertakings in every sector and at all levels.

With this in mind, the Directorate of Public Roads and the Directorate for Nature Management have prepared an "awareness handbook" to increase the general level of knowledge about natural assets and areas of open countryside and about environmentally-friendly solutions when planning roads. Areas of countryside that are particularly valuable in the contexts of natural and cultural environments, scenery and outdoor pursuits are dealt with separately under the headings:

- extensive, uninterrupted areas of open countryside
- shore zones
- cultural landscape associated with agriculture
- areas for outdoor recreation near towns and other built-up areas
- green spaces

It should, however, be emphasised that features that are valuable in a conservation context are also to be found elsewhere. Comprehensive descriptions of relationships between aesthetic aspects of the landscape and road construction can be found in other publications in this series of handbooks from the Norwegian Public Roads Administration.

This publication is intended to help road planners and those working in the public environmental management sector to take natural assets and the countryside into greater account when planning roads and to encourage them to seek additional information at appropriate stages in the process.

This handbook has been prepared by Kari Øvrelid in the Department for Assessment of Environmental Impacts at the Directorate for Nature Management, in co-operation with the Norwegian Public Roads Administration in the Directorate for Public Roads. The advisory panel has consisted of: Egil Lundebrekke, Planning and Construction Department at the Directorate for Public Roads, Sunniva Schjetne, Environmental Affairs and Traffic Safety Department at the Directorate for Public Roads, Øyvind Firman, Norwegian Public Roads Administration in Vestfold and Arne Matthiessen, Department for Environmental Affairs in the office of the County Governor for Hordaland.

Directorate of Public Roads, April 1994

Planning and Construction Department Environmental Affairs and Traffic Safety Department
Directorate for Nature Management, April 1994

Trondheim Photo: Fjellanger Widerøe A/S

Contents

Summary

Our natural heritage as a link in a sustainable development. The road network often comes into contact with valuable areas of countryside which Norway is obliged to protect for the sake of both national and international interests.

In very many areas of open countryside, public and private roads are the primary and most important factor affecting and reducing the quality of the natural environment. Roads and road traffic change the natural conditions for flora and fauna through noise, pollution, physical disturbance and, often, pressure from related forms of land-use along the road.

Roads create a problem for areas of open countryside when they:

- reduce the size of the areas
- sever important ecological relationships
- affect the degree to which the countryside remains unspoilt.

It will always be important to take into account the qualities of areas of open countryside in their entirety and the way they interact. It is therefore essential to obtain the best possible information about such areas as early as possible in the planning process. Information on natural assets can be obtained from the Department for Environmental Affairs in the offices of the respective County Governors and from a number of other authorities, organisations and data bases. If the following principles for planning roads in open countryside are also applied they will help to preserve valuable aspects of the natural and cultural environments, the landscape and opportunities for outdoor pursuits.

1. The developer has the overall responsibility for taking environmental considerations into account.
2. Base the planning process on a sound knowledge of Nature and the environment.
3. Analyse and assess the entire area affected by the road.
4. Avoid disturbing or transecting valuable areas of open countryside.
5. Safeguard the migration routes of animals, do not hinder fish from swimming freely, and protect links between neighbouring areas of open countryside.
6. Accommodate the road to the natural and cultural environment, the landscape and opportunities for outdoor recreation.
7. Apply alleviatory measures if undesirable encroachments are unavoidable.

This handbook first and foremost describes areas of open countryside that are of exceptional value in the context of the natural and cultural environments, the landscape and opportunities for outdoor recreation:

- extensive, uninterrupted areas of open countryside
- shore zones
- agricultural landscapes
- areas for outdoor recreation near towns and built-up areas
- green spaces in urban settings.

Each section concludes with good advice for road construction in such areas. It must be emphasised that features of interest for nature conservation are also to be found outside these areas. The aesthetic aspects of scenery are not fully covered here.

The handbook also contains information about protected areas, legislation, concepts and where to obtain information on natural assets. It concludes with a check list for road planning in areas of open countryside.

Romsdalen
Photo: Per Jordhøy, Biofoto

Nature

Nature is the very foundation for our own existence and that of future generations, and is important for our enjoyment and identity. Nonetheless, we are seeing valuable and vulnerable areas of open countryside being reduced both in quality and size. Nature is valuable in its own right. Every encroachment on Nature affects its ecosystems.

Innerdalsporten, Trollheimen Photo: Roar Lund

Sustainable development - a national goal

Sustainable development is one of many national goals. The Norwegian Government's White Paper no. 46 (1988-89) entitled "Development and the Environment" gives the following definition:

"By sustainable development we mean development which ensures that the needs of people today are met without compromising the ability of future generations to meet their own needs. Sustainable growth assumes that the processes of change in society must occur within the bounds set by Nature and the resources available."

A natural consequence of this goal is that the precautionary principle of "look before you leap" must be applied, requiring that those intending to undertake constructional work or any other type of project influencing the environment can show that it will not lead to irreparable damage.

Areas of open countryside are systematically being put to alternative uses and being affected by a multitude of major and minor encroachments. This threatens the diversity of species and the wealth of variety in Nature. Sæveli Nature Reserve for broad-leaved deciduous forest at Grimstad in Aust-Agder. Photo: Helge Eek, NN, Samfoto

Biodiversity - a prerequisite for sustainable development

Nature consists of a multitude of plants and animals. The species have adapted to each other and to their surroundings over thousands of years. This is "biodiversity" and is defined as:

- the variation in and between all biological species in all groups of organisms, i.e. all plants, animals and micro-organisms

- the environment, ecosystems and ecological processes of which these species and organisms are a part.

Diversity beneath your feet

A Swedish survey (ecology of coniferous forests) found the following worms and arthropods within the area of a human footprint (254 cm^2):

400	ringworms
1,500	springtails
15	beetles
20	mosquito and fly larvae
10	spiders
19,000	mites
100,000	roundworms

Biodiversity is specially high in ancient woodland that has not been planted. Storaker, Hyllestad in Sogn & Fjordane. Photo: Mari-Lise Sjong

Biodiversity is a prerequisite for:

- life-producing ecosystems
- processes which regulate the climate
- processes which form the soil
- processes which cleanse water and air
- future food production
- development of new medicines
- development of other products which are useful for mankind
- traditional outdoor recreation
- varied scenery.

In Norway, we are responsible for our share of the biodiversity. A long distance from north to south, and considerable ranges in altitude, create big differences in temperature and climate. Together with great variations in geology and geomorphology, these lay the basis for many different types of countryside and different conditions for plants and animals. Even though Norway has a relatively small variety of species, these factors create large genetic variations within the individual species. In Norway several species live on the fringe of their range and are specially adapted to extreme conditions; these are therefore particularly vulnerable to change. As with tropical rainforests, Norway has areas that are critical for species or particular ecological interrelationships. Similarly, several species of plants and animals are found primarily in this country and Norway has an international responsibility to protect them.

Biodiversity in Norway is being reduced

During this century, the landscape has been reshaped and areas of open countryside redeployed at an ever-increasing rate. Extensive development of public and private roads, and other kinds of development, have meant that the diversity and size of areas of open countryside have been considerably reduced in the last 50 years. Extensive portions of the larger, unbroken habitats for flora and fauna have been lost or altered. The natural landscape has become more uniform.

A typical feature is that "the specialists" or exclusive species are being reduced in numbers, whereas the "generalists" which thrive in a variety of environments are taking over. It is important, also in Norway, to preserve conditions which biodiversity requires if we are to maintain the assets of nature, the settlement pattern, primary industries and opportunities for outdoor recreation. Destruction of genes, species, ecosystems and areas of open countryside makes the quality of our own environment poorer.

Reduction of extensive, uninterrupted areas of open countryside situated more than 5 km from roads, railways, hydroelectric schemes and similar forms of 'technical encroachment' during the period 1990-1992.
Source: Magne Bruun GRID/National Mapping Authority, Aust-Agder

The number of species is being reduced at an increasing rate

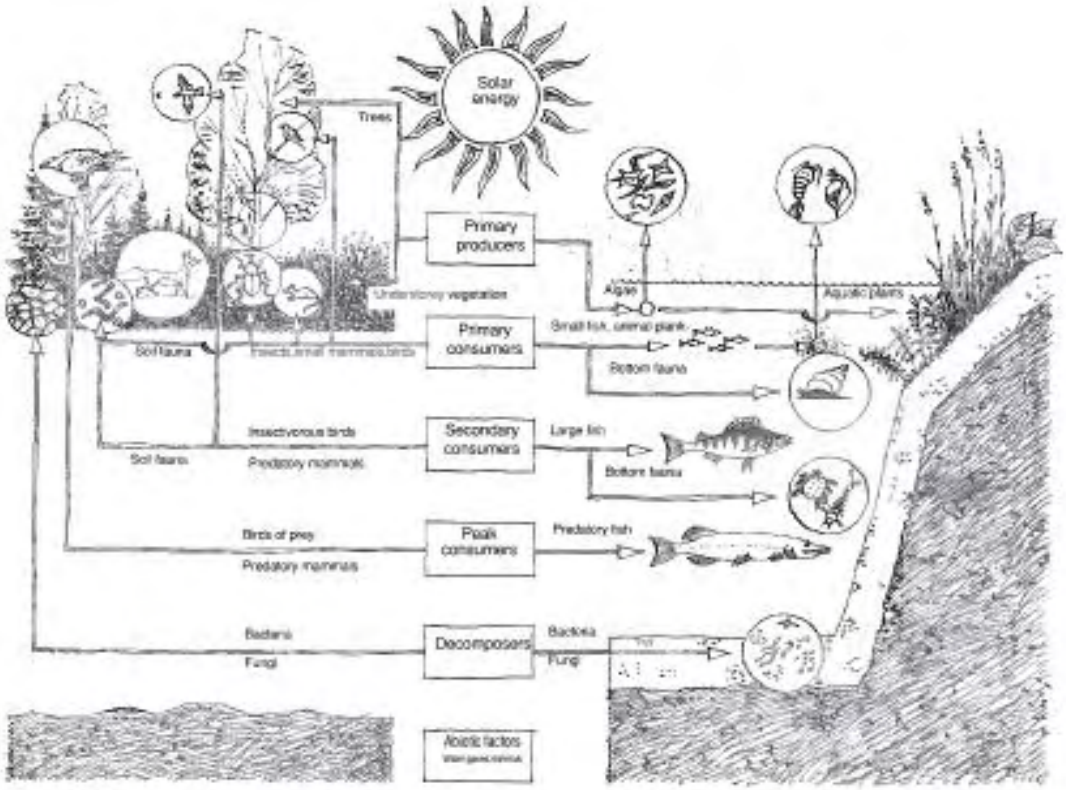
Mankind is making more than 200 species of living organisms extinct every day (Wilson 1993). Species are disappearing from the surface of the Earth 10,000 times faster than they were before Man began influencing the process.

There may also be consequences for ecosystems and for mankind of which we are not yet aware.

Ecology - the significance of continuity in Nature

The individual species depend upon their surroundings for their survival. Each species of plant and animal is part of major and minor ecological systems. An ecosystem is defined as:
- the interplay between living organisms and their environment within a specified area.

The fundamental principle of ecology is to understand the interplay within Nature. A particular area may be vital for interaction with other areas. It may, for example, be crucial as a resting place for migrating birds en route between Africa and Siberia. If such an area is destroyed, the ecosystems in Norway, Africa and Siberia will be affected.



Interplay between woodland and fresh water in an ecosystem.
Illustration: Tom Dyring
Source: The ecosystem 1978, Karl Baadsvik, Kommit.

Can Nature be restored?

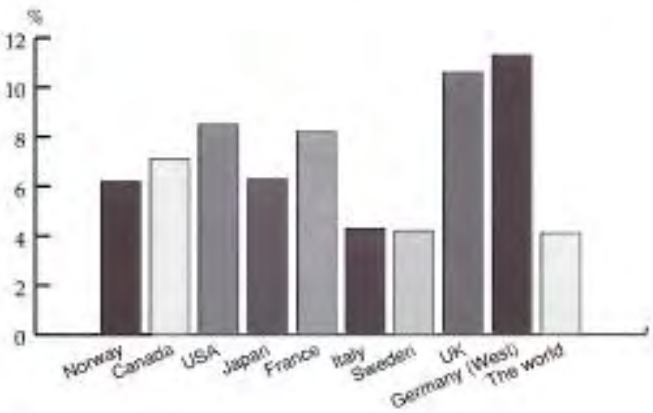
By replacing an ecosystem with a newly-planted system, we run the risk of destroying an adaptation to surroundings and local conditions which animals and plants may have taken thousands of years to develop. In short, "Ecosystems which are a thousand years old cannot be replaced by newly-planted berberis."

Individual elements in an ecosystem can to a certain extent be preserved or given new conditions when disturbance takes place. Birds and animals which can withstand contact with technical encroachments and people will sometimes find new localities in the vicinity, or be willing to use restored areas . Thus, it is possible to protect part of what we gain enjoyment from and some of the flora and fauna. However, the greater part of the original ecosystem, which consists of more vulnerable plant and animal species including micro-organisms, fungi, lichen and insects, will be incapable of being restored. Whether or not restoration is possible depends on the type of nature and conditions in the area in question.

It is not possible to recreate or restore areas of countryside within a time span of 50-100 years so that they acquire the same biodiversity as Nature originally had there. Nonetheless, through careful efforts and restoration we can reduce the damage we have inflicted on biological balances. The overriding principle ought to be to pave the way for speedy restoration of vegetation which belongs in the area. This means that a very restrictive policy should be followed with regard to fertilisation and liming, as well as the use of non-indigenous seed, since these will generally change the natural conditions for the vegetation. An evaluation of the status of the substratum and food supply along with the water management in the area will indicate what steps should be taken to ensure that the indigenous vegetation will be able to re-establish itself and thrive.

Nature conservation - a joint responsibility

International conventions (see Conservation of Nature) emphasise Norways responsibility for safeguarding unique and threatened areas of countryside and species. For some species and ecosystems, legislative conservation is a necessity, but, for the majo-



Protected areas in industrial countries in 1991
Source: World Conservation Monitoring Centre

rity of species, general conservation of their natural environment is the most important measure required. A number of white papers, Acts and regulations have put this into specific terms by emphasising the importance of protecting Norwegian nature.

The Planning and Building Act is important environmental legislation

Only six per cent of Norways land mass (exclusive Svalbard) is protected by law. The intension is to increase this to 10-15 per cent to ensure a representative selection of Norwegian nature. The protected areas consist for the most part of montainous and upland areas, and do not provide arepresentative sample of Norwegian nature. Conservation of 15 per cent of the country is insufficient to protect the biodiversity and assets for the natural and cultural environments, the landscape and outdoor recreation. How the remaining 85 per cent is managed is absolutely crucial for the extent to which these assets can be safeguarded and handed down to future generations. It is therefore not consevation efforts within the terms of the Nature Conservation Act which are of the greatest significance for preserving Norwegian nature. Of no less importance is the general attitude towards transport planning and other land usage within the sphere of the Planning and Building Act.

Two aims of the Planning and Building Act are to:
- provide a basis for decisions regarding develop ment and the use and conservation of resources
- enable land-use and building develpments to be as beneficial as possible to both individuals and society.

Planning for conservation and good management of resources is therefore just as clear a goal as planning for development. The Planning and Building Act is intended to provide a key channel for taking the environmental viewpoint into account through responsible management of the land and natural assets. It gives a legislative footing for systems of participation and co-operation which will ensure that

Indigenous vegetation on the verge. Averøy, Møre & Romsdal. Photo: Ann-Kjersti Johnsen

conflicts are clarified and consideration for the environment is incorporated early in the process. National guidelines are authorised by the Act and strengthen national environmental goals in important areas.

It is the responsibility of the individual developer to incorporate environmental considerations into the process, the planning and the product. The best results will be achieved if environmental considerations are present from the start of the process. They should provide a real and active premise for planning and not be an afterthought once the technical and economic aspects have been specified.

Roads

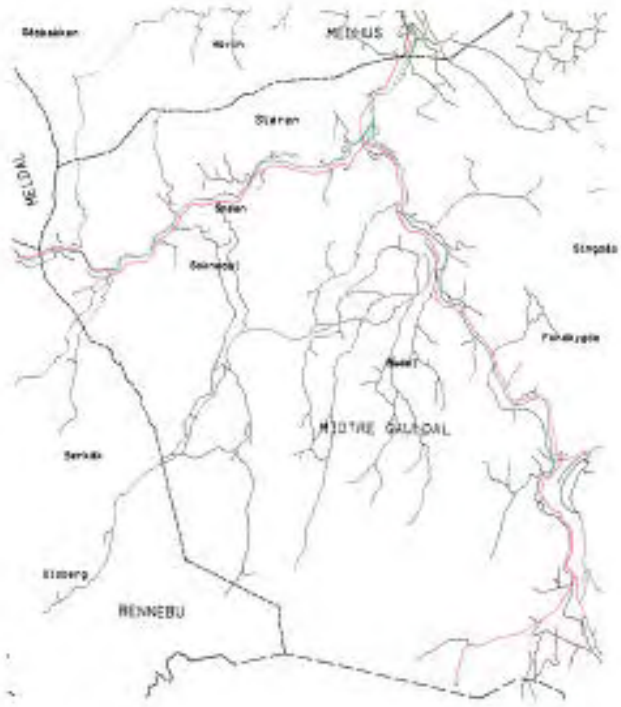
A well-developed infrastructure is of major significance for costs in the business sector and the welfare of the populace. The road network is particularly important in Norway with its scattered population and great distances.

There's life on the verges, too. Photo: Roar A. Lund

Approximately 90 per cent of all passenger transport takes place by road. Since 1970, the public road network has increased from 70,000 km to the present figure of 90,000 km. During the same period, traffic has increased by 250 per cent. In the 1970's, freight transport by sea was three times greater than freight transport by road. Today, the figures are almost equal. Freight transport on the railways has remained stable at around 10 per cent during this period.

Calculated in kilometres, the private road network is longer than the public system

The total length of forestry roads and tractor tracks connected with the forestry industry exceeded 88,000 km in 1990. In addition, there are roads belonging to, for instance, the Ministry of Defence and Norwegian Telecom, roads associated with power stations, and access roads to business parks, private houses, summer farms, holiday houses, etc. The private road network is therefore longer than the public one. These are roads which rarely need appro-



The private and public road networks in Midtre Gauldal and Rennebu in Sør-Trøndelag. red - public, green - private. Source: Norwegian Mapping Authority, Sør-Trøndelag

val through a public planning process, but which substantially affect the countryside.

The Norwegian Public Roads Administration

The Norwegian Public Roads Administration is responsible for planning, constructing and maintaining national and county roads. It answers to the Ministry of Transport and Communications for work connected with the national road network and to the county councils for work on county roads. It has adopted the following four goals for its work:

- good accessibility
- high road safety standards
- good environment
- good service to the public

The main goals were elaborated on in the Strategic Plan published in 1992 under three principal headings:

-the Norwegian Public Roads Administration will try to minimise the use of public resources for transport of goods and people by road

-the environment and road safety set the limits for the extent of road transport and the development of the infrastructure

-when deciding on measures to attain the goals, considerable importance must be attached to socio-economic considerations.

The Public Roads Administration has sectoral responsibility for the relationship between the environment and roads and road traffic. To enable this responsibility to be fulfilled, the Directorate of Public Roads has defined the following five strategic goals with respect to the environment:

-energy consumption and pollution for which road and ferry traffic is responsible must be reduced

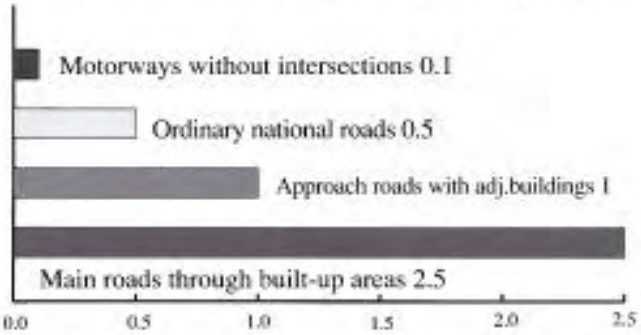
-people living near or using national and county roads or areas close to them must have a level of air pollution and noise that is acceptable in health terms

-extensive, uninterrupted areas of open countryside and valuable shore zones should be preserved

Road safety

Since early 1960`s, emphasis has been put on developing a function-divided road network of approproate standard to improve road safety by eliminating high-risk combinations of different groups of users. This has paid dividends. Results show that up to 1970 the number of accidents increased in line with the growth in traffic. Since 1970, accidents have gone down, even though traffic has increased by 250 per cent.

1970:	560 killed	12.000 injured
1992:	325 killed	11.500 injured

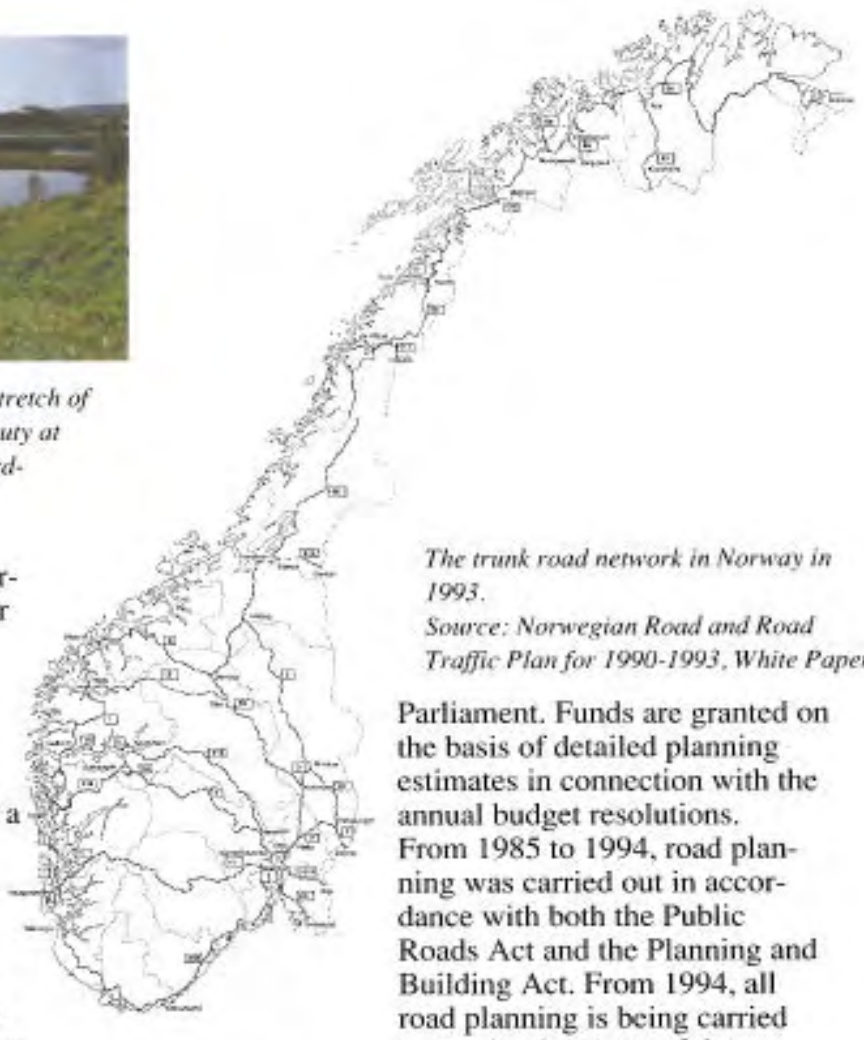


Accident frequency on different types of roads. Accident frequency is here defined as the number of accidents reported to the police per million vehicle-kilometres. The risks are lowest on motorways.
Source: Directorate for Public Roads

In 1990, permission was refused to construct a stretch of road across this area of outstanding natural beauty at Aunfoss on the River Fjerding in Namdalen, Nord-Trøndelag. Photo: Edvard Sollid

-the value of environments that are important for their cultural history, in particular urban environments and housing areas, must not be reduced

-the road, the traffic and the speed limit must be accommodated to the surroundings of the road and the road must have a high architectural standard.



The trunk road network in Norway in 1993.
Source: Norwegian Road and Road Traffic Plan for 1990-1993, White Paper

The planning process

The Norwegian Road and Road Traffic Plan is the main management document for the road sector and is reviewed every fourth year. In this, the government defines the major elements of its road transport policy and proposes a plan, including financial limits, for road development in each county. The limits are based on cost assessments in earlier phases of the planning process.

Contributions and improvements to the projects can come from many sources. Mostly they come from bureaucrats in the local and county authorities, elected representatives and employees of highways offices in the areas involved.The respective Chief County Highways Officer proposes the order of priority after the planning process has reached a stage where the consequences can be evaluated.

After the county authority has expressed its opinion, the proposal put forward by the Chief County Highways Officer is considered by the Directorate of Public Roads which then presents its proposal to the Ministry of Transport and

Communications. On this basis, the Ministry prepares a white paper which is debated in Parliament. Funds are granted on the basis of detailed planning estimates in connection with the annual budget resolutions.
From 1985 to 1994, road planning was carried out in accordance with both the Public Roads Act and the Planning and Building Act. From 1994, all road planning is being carried out under the terms of the Planning and Building Act. Consequently, local authority interim plans now form the most important basis for the Norwegian Road and Road Traffic Plan. Individual projects of great local interest will still be able to get into the road plan, whether or not municipal development plans exist. However, no project will be implemented before an approved area development plan exists.

Some important concepts

Accident density
Number of accidents per kilometre and per year.

Accident frequency
Number of accidents per mill.vehicle-kilometres.

Alignment
Curvature of the road in the horizontal and vertical planes.

Annual Average Daily Traffic (ADT)
Total number of vehicles which passing a given

point in the course of a year, divided by 365.

Capacity
Largest volume of traffic which, over a given period, can be carried under given road and traffic conditions.

Categories of standard
Evaluations of the road class and type of area form the basis for allocating a road to a category according to its standard. 12 categories are defined.

Cross section
Describes different dimensions in a section transverse to the road. Each category of standard has a set of dimensions depending on the volume of traffic.

Design speed
The speed on which the geometrical specifications for the road are based. This is often confused with the speed limit, which is decided administratively from criteria other than road geometry. A reasonable safety factor means that the design speed should be 10-20 km per hour higher than the speed limit.

Speed profile
A graphic portrayal of the expected speed along a road.

Type of area
Describes the density of houses and other buildings near the road.
Area 1 is undeveloped or has scattered houses.
Area 2 is moderately built-up.
Area 3 is densely built-up.

Road class
The road network is divided into 4 categories depending on what function the various roads fulfil: main road, feeder road, access road and combined pedestrian and cycle lane.

Width of road
Distance between the verges, i.e. the combined width of the traffic lane and the shoulders, and a central reserve if present. The width of other reserves, pavements, pedestrian and cycle lanes and the slope of a ditch adjacent to the road comes in addition.

Road Classes
The road network is divided into different types of road, within two broad categories, administrative and functional.

Administrative divisions
National roads: 26,000 km in 1992, including trunk roads.
The standard specifications vary greatly dependent on the volume of traffic and to what extent the area is built-up. They are decided according to provisions laid down in the Highways Standards and Specifications. 6,800 km of the national road network are defined as trunk roads. These are particularly important for communication between different parts of the country and abroad, and carry half of the traffic on the national road network. Parliament has decided that the trunk roads must have a high geometrical and functional standard.
The Ministry of Transport and Communication and the Public Roads Administration are responsible for national roads.

County roads:27,000 km in 1992.
The standard of county roads will generally be lower than that of national roads and is specified by the Highways Standards and Specifications. County councils and the County Road Offices of the Public Roads Administration are responsible for planning, building and maintenance.

Municipal roads:36,000 km in 1992.
The standard varies widely. The local authority can draw up its own standards. The majority use the Highways Standards and Specifications of the Public Roads Administration.
The Executive Committe of the local council is responsible.

Private roads:88,000 km in 1992 (only forestry roads and forestry tractor tracks).
There are also roads belonging to the Ministry of Defence and Norwegian Telecom, those associated with power stations, access roads to industrial sites and business parks, dwellings, summer farm areas and holiday cottages. Standard requirements: none. To obtain financial assistance from the State, forestry vehicle roads must be approved by the head of forestry resources in the local authority. Pedestrian and cycle lanes: Lanes for pedestrians and cyclists, separated from motorised traffic. Linked to the public and municipal road network. Varying standard. These roads are built and run by private individuals, institutions or government departments, e.g. the Ministry of Defence and Norwegian Telecom.

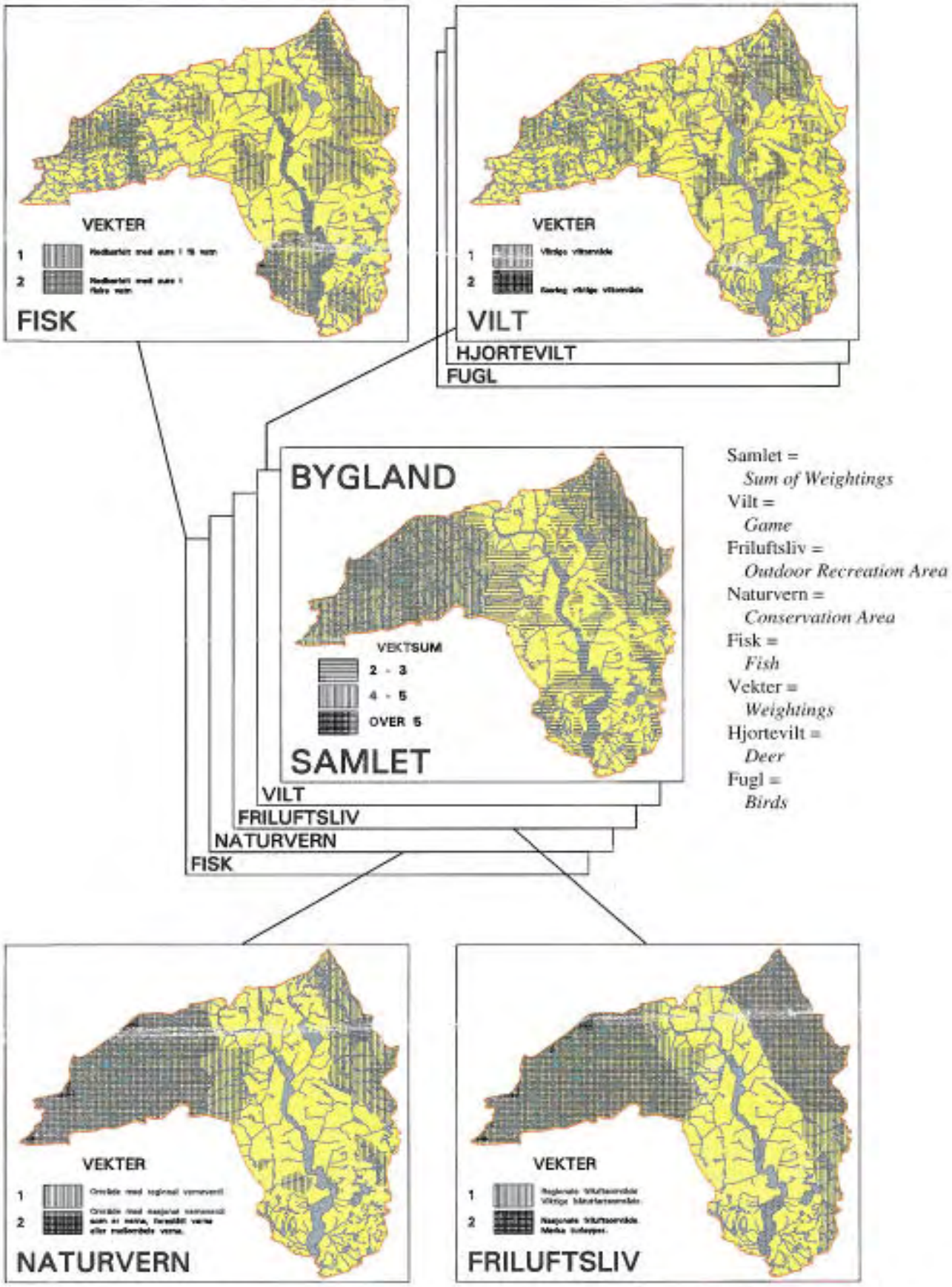
Functional divisions
Main roads:Principal roads in a road system where traffic is differentiated. In areas having scattered houses or that are moderately built-up, this road class will have no access roads, or have strictly regulated access roads if traffic is light.
Feeder roads: Combined transport and access function. The traffic should not exceed ADT (annual average daily traffic) 1500 outside towns.
Access roads: Roads connecting feeder roads with houses or business areas. ADT should be less than 300 and the roads should not be more than 3 km in length.

Roads and Nature

Expansion of the road network and protection of nature are both national targets. Conflicts often arise between them.

The new road crossing Strynefjellet blends well into the scenery thanks to its alignment and the way the immediately adjacent terrain has been landscaped. Its unusually great breadth is designed with an eye to winter maintenance and disturbs Nature more than traditional cuttings and embankments. Priority has been given to blending the road into its surroundings and less emphasis has been placed on limiting the physical encroachment.
Photo: Directorate for Public Roads

It is a national goal for Norway to have a well-developed, high-standard road network providing good access to large parts of the country. It is also a national goal to look after our natural heritage as a link in a sustainable development. The road network often comes into contact with valuable areas of countryside which Norway is obliged to protect because of their attributes on a national or international scale. Driving a road through one such area will always ultimately have an effect on other areas with corresponding assets. The consequences will depend on the size and content of both the



The existence of natural assets and having respect for them are not two completely separate entities. Natural assets can be envisaged as layer upon layer of "shaded areas", where the individual assets and conflicting interests overlap each other. Bygland in Aust-Agder.
Source: Bygland Council, the County Governor's office in Aust-Agder, Asplan Viak Sør, Geodata sentret AS

encroachment and the area concerned.

Based on knowledge of both the natural environment and the road network, simple principles for road planning can be drawn up which show more confederation for Nature both in general and in particularly important areas. This chapter describes the general guidelines, specific ones being dealt with in succeeding chapters which consider the various types of environment in more detail.

Taking the whole into account

Every aspect of Nature interacts. Links between areas can be just as important as the individual areas. The cultural environment, outdoor recreation and how we experience scenery also depend on how the individual elements stand in relationship to each other and their surroundings. Thus, it is not enough to record, map and evaluate important individual areas which may, for example, be protected and are perhaps registered in the NATURBASEN or SEFRAK date bases (see Information on Nature). In simple terms it may be said that the ecosystems constituting Nature are interwoven as layer upon layer of networks. The links between areas, specific localities and migration routes can be just as crucial for maintaining plant and animal life as the areas, localities and routes themselves. Similarly, the natural assets are important for scenery, the cultural environment and outdoor pursuits. Historic and prehistoric relics which are related to each other make up a cultural environment. Our enjoyment of scenery and our involvement in outdoor pursuits allow us to experience the whole.

By comparing information on valuable aspects of the natural environment, historic monuments and other features that make up the cultural environment, the landscape and outdoor pursuits, we obtain a more detailed picture of the assets of an area. Experts advice generally needs to be sought to evaluate this information in the right way.

Show consideration for endangered species and habitats

Endangered or rare Norwegian species are recorded and ranked in the "red list" (see "Further Information" in the chapter on Nature). Red lists provide an idea of the state of plant and animal life. In 1992, the Norwegian red lists classified the approximately 11,000 Norwegian species that were evaluated into the following categories:

The smooth newt is "directly endangered" in Norway because pools and small lakes, upon which it depends, are being drained and destroyed through agriculture, forestry, building and road construction.
Photo: Ove Bergersen, Biofoto

Extinct, 45 species
Species that have not been seen in for 50 years.

Directly endangered, 150 species
Species that are in danger of becoming extinct if negative factors continue to affect them.

Vulnerable, 279 species
Species that may become directly endangered soon if negative factors continue to affect them.

Rare, 800 species
Species that occur in small numbers and are exposed because they are found in small areas or occur sporadically and sparsely over a larger area.

Indeterminate, 36 species
Species known to be directly endangered, vulnerable or rare, but where sufficient knowledge is lacking to place them in one of those categories.

Insufficiently known, 169 species
Species which it is assumed, but not verified, belong to one of the above categories.

Requiring consideration, 359 species
Species with more habitats than the vulnerable and rare species, but which are negatively affected by various environmental factors.

The Norwegian red list comprises 1,839 species. About 33,000 species are known to live in Norway today.

Areas of special ecological interest may be rare and/or endangered habitats and habitats containing rare and/or endangered plants or animals.

Such habitats may, for example, be:

-alpine habitats
-seashores
-broad-leaved deciduous woodlands, swamp woodlands, calcareous coniferous forests
-herbaceous hay meadows, particular types of cultivated land
-streams, ponds, lakes, wetlands, mires and bogs.

It must be emphasised that the natural environments described in this handbook do not represent all the rare or vulnerable habitats, or contain all the rare or vulnerable species in Norway. Areas that are of biological and geological interest for conservation will also be found in other settings.

Show consideration for valuable areas of countryside

This handbook deals with areas of countryside that are particularly valuable with respect to the natural and cultural environments, scenery and outdoor recreation:

- extensive, uninterrupted areas of open countryside
- shore zones
- cultural landscape associated with agriculture
- green spaces in towns and built-up areas.

Encroachment in these areas will have consequences for the cultural environment, the scenery and outdoor pursuits as well as for the natural environ

Part of a map of Trondheimsfjord showing that roads often run close to the sea and rivers. Source: Road map, Directorate for Public Roads Administration

ment. Some are particularly threatened by road development, e.g. shore zones and extensive, uninterrupted areas of open countryside.

Gathering together, limiting and accommodating encroachments

For scientific reasons, encroachment on Nature should be

- gathered together
As far as possible, encroachments into areas of natural environment should be gathered together to conserve as much Nature as possible in a state that functions ecologically.

- limited
The individual encroachment should be limited as much as possible to conserve Nature in a state that functions ecologically.

Conflicts with the natural and cultural environments and the scenery recorded in the environmental report from 1992 dealing with plans for a new stretch of Rv 11 in the Teigland-Lauvreid-Håland area. Source: Hordaland County Roads Office and Asplan Viak Bergen

KEY

- Conflict with the natural environment
- Conflict with natural resources
- Conflict with prehistoric relics and historic monuments
- Conflict with the cultural landscape
- Conflict with scenery
- Proposed road

Principles for Road Planning

The principles applied in road planning aim to conserve the biodiversity and natural and cultural environments, the scenery and opportunities for outdoor recreation when road building affects the countryside.

Seven principles for environmentally-friendly road planning

1. The developer has the principal responsibility for taking environmental concerns into account. Concern for natural assets must be evaluated on an equal footing with technical and financial aspects.

2. Planning should be based on a good knowledge of Nature and the environment, Mapping protected areas and protected objects is not sufficient. Experts should evaluate the scientific consequences of the various alternatives. Co-operation with specialist authorities early in the process is a prerequisite for a good environmental result.

3. Analyse and evaluate the entire area affected by the road.
Road works affect the natural and cultural environments, the scenery and outdoor recreation over larger areas than the road itself covers. Evaluate the consequences for longer stretches and larger areas than the actual road works will directly involve.

4. Avoid disturbing or cutting through valuable areas of countryside.
Division and fragmentation can lead to loss of assets for the natural and cultural environments, the landscape and outdoor pursuits. The remaining areas must have a form and size which make them functional for the natural environment.

5. Protect animal migration routes, opportunities for fish to swim freely and links bet ween areas of open countryside.
Ecological interplay which has evolved over a long period and which is perfectly adapted to the location and the surroundings can never be fully restored.

6. Accommodate the road to the natural and cultural environments, the scenery and opportunities for outdoor recreation.
Choose alignment, standard, materials and details which safeguard the assets of the countryside.

7. Use alleviatory measures if undesirable encroachment is unavoidable.

Revise plans which do not take the environmental viewpoint into account.

Illustrations: Tom Dyring

Extensive, uninterrupted areas of open countryside

Extensive, uninterrupted areas of open countryside are those which remain undisturbed by major man-made constructions.

Open countryside that has not been fragmented by man-made constructions such as roads, railways or hydroelectric schemes is classified as being undisturbed by major technical encroachments. Such areas still retain extensive tracts where plants and animals exist in an ecological interplay, little influenced by Man. They are chiefly mountainous areas, upland plateaus and large forests, but also include moorlands and skerries on the coast.

More and more people hike in the mountains

Extensive, uninterrupted areas of open countryside are important for the health of the population in Norway. Norwegian Mountain Touring Association statistics for 1987 showed that 190,000 people hiked or skied in the Norwegian mountains for periods of several days, camping or staying in huts. By 1992, this number had increased to 250,000. Skiing and hiking are forms of outdoor recreation where Nature can be enjoyed to the full, at relatively little cost to the individual. A survey in 1992 revealed the following main reasons for making such trips:

- to enjoy the peace and quiet of Nature
- to get out into the countryside, away from noise and pollution
- to escape from strain and stress.

Large areas are necessary

The large predators top the food pyramid and need large areas to find the food they require. It is vital that these animals have large, intact areas of countryside to roam in. Wolverines and lynx often travel 20-30 km in a single day. Swedish bears, fitted with radio transmitters,roam an area of 2,500km^2, almost 90 km in diameter.

During the last hundred years, technical encroach-

Page 27: Innerdalen protected landscape area, More og Romsdal. Photo: Roar A. Lund

Jotunheimen National Park. Photo: Mari-Lise Sjong

ments have reduced the number and size of the extensive, uninterrupted areas of countryside in Norway from 48% of the country in 1900 to 22% in 1992. The reduction is from 27% to 8% in southern Norway. No such areas are left in the lowlands. The dramatic decrease is largely due to:

-private and public roads
-hydroelectric schemes
-facilities for the Ministry of Defence, Telecommunications Authority, etc.
-aggregations of country cottages
-industrial activities.

Wear and tear from tourism may also be a problem in some areas.

The knowledge that extensive, undisturbed areas exist and are accessible gives a quality of life that is difficult to measure, but which is important for many people. Vanylven, Møre & Romsdal. Photo: Mari-Lise Sjong

International asset

In an international context, most large areas of unspoilt nature consist of glaciers, tundras, mountains or deserts. These have not been economically exploitable to any extent. Those in northern Europe are generally protected areas; access to them is difficult and they are in "economically unprofitable" districts. Norwegian ones however are varied and easily accesible. Norway has an international responsibility to protect the extensive, mostly undisturbed, areas of forest, coast and mountain which remain. In Sweden and Finland, such areas are protected by special laws. In Norway, only parts of them are protected. Dovrefjell in central Norway is the largest, almost completely intact, alpine ecosystem in Europe, with wild reindeer, wolverines and mountain foxes in natural co-existence. It includes the Knutshø peaks east of Kongsvoll, northern Europes richest locality for alpine plants.

Registering extensive, uninterrupted areas of open countryside

Based on a pilot project from Aust-Agder, extensive, uninterrupted areas of open countryside have been registered in a digitised map data base.The information will be available from the Department for Environmental Affairs in the office of the respective County Governor and elsewhere.

Cultural heritage sites tell an interesting story about the use of natural resources by earlier generations. Hellesylt, Møre & Romsdal. Photo: Roar A. Lund

What is important?

Important qualities in the extensive, uninterrupted areas of open countryside are the degree to which they remain unspoilt, the absence of technical encroachment and the size of the area. The presence of these areas has a major influence on our national characteristics and identity. They are also important for outdoor recreation and tourism, and consequently for business and employment.

Extensive areas of unbroken upland plateaus and forests are a prerequisite for much of the biological diversity. Many species depend on undisturbed, protected core areas. These include the large beasts of prey and several birds such as the golden eagle, gyr falcon, crane and snowy owl. Large areas which are as little disturbed as possible are also important as reference areas for monitoring pollution and changes in the ecosystem. Norways responsibilities as laid down in international conventions such as the Rio, Ramsar, Bern and Bonn Conventions (see "Glossary") reflect this and imply that we must protect the remaining areas of undisturbed countryside. To safeguard them, it is particularly important to take into account

-their size and variation
-the presence within them of core areas and other important areas
-the need to avoid establishing activities that follow in the wake of a road.

Size

Large undisturbed areas contain a mosaic of ecosystems which interact to form an entity. This and vital links between the various ecosystems are destroyed when areas are divided. Individual species living in large, uninterrupted areas may occur in sufficiently numbers to support genetic variation which is a necessity for them to be able to adapt to a certain extent to changes in the environment. Many of the animals found in these areas also need to be able to roam over large distances

Private roads often pose just as great a threat to the preservation of the flora and fauna in extensive areas of open countryside as public roads. This newly constructed road at Lofthus in Hardanger also cuts the pre-Reformation "Monks Path" several times. Photo: Jan Rabben, NN/Samfoto

to find the best food at a particular time of the year. When these areas are reduced or fragmented, the animals are forced together in smaller areas increasing the pressure on grazing. In climatically demanding environments such as mountains and upland plateaus, the flora and fauna will be unable to withstand even small changes in the environment.

Core areas and other important areas

Extensive, uninterrupted areas of open countryside may contain smaller areas of special significance:

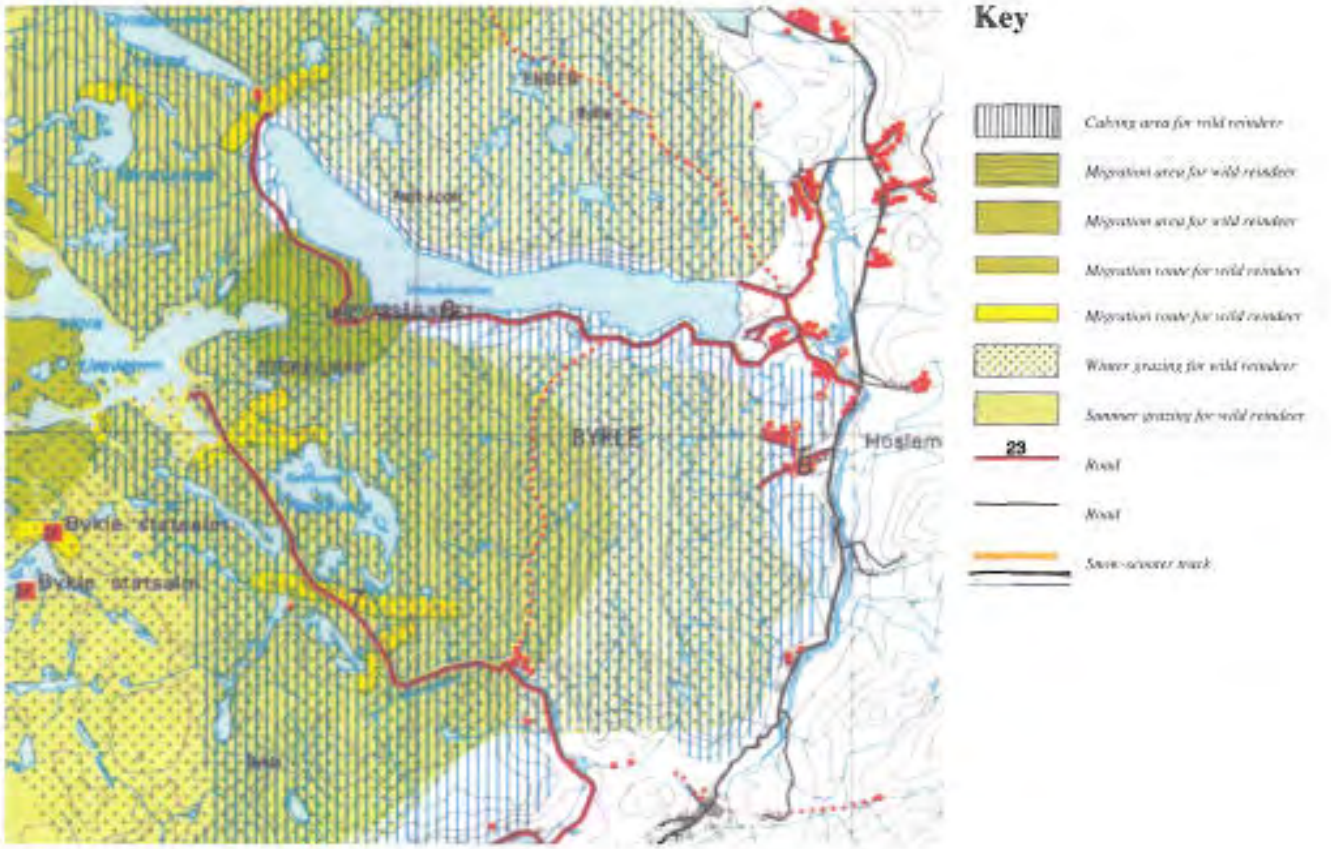
-core areas
-protected areas
-important areas for animal and plant life, outdoor recreation, scenery, historic monuments and the cultural environment
-rare habitats.

Protected core areas create opportunities for "specialists", as ecologists denote those animals and plants that place strict demands on the degree to which their habitat remains undisturbed and is little visited by people. Since the size of large, uninterrupted areas is steadily being reduced, core areas are in rapid decline in Norway.

Wild reindeer stocks are threatened

For nearly 100 years, the Norwegian mountains have held the last refuges in Europe where wild reindeer can live in their natural surroundings. There used to be a single Dovrefjell stock, but the railway and roads, with their traffic,cuttings and snow banks have split this into six smaller sub-stocks. The animal lifestyle of the reindeer involves migrations between areas where food is reasonably good and plentiful and climate-dependent migration, etc. is exactly adapted to this. Now these "nomads" are placed in six «enclosures». This makes the reindeer more vulnerable, resulting in fewer animals and a much less sustainable stock. The wild reindeer is the only Norwegian deer whose numbers have decreased over the last decade.

Mountainsides that are unbroken from the fjord to the summits have become less common ,especially recently as many ferries have been replaced by roads along coats that had not previously been disturbed. Vesterålen, Nordland. Photo: Jon Arne Sæter



The sum total of disturbance due to roads and the like in a vulnerable area, such as a calving area for reindeer, is often large, as this map from Bykleheiene in Aust-Agder shows. Source: Norwegian Mapping Authority, Aust-Agder and Asplan Viak Sør

Motorised traffic on marginal land (unfenced areas) is regulated by law

The Motorised Traffic on Marginal Land and Watercourses Act covers cars, motorcycles, tractors, snow scooters, tracked vehicles, motorboats and aircraft. It does not apply to roads constructed for vehicular traffic, except when they are blocked with snow.which are blocked by snow. The rules covering driving on open ground are stricter than those for driving on snow-covered ground. Dispensation can be given for driving for useful purpose. Such transport should be carried out on snow, and be channelled to routes and times when least damage will be done. Dispensation is given by the municipality conserned. The County Governor can forbid or limit driving in particularly vulnerable areas. Landowners may forbid motorised traffic on their property. The pressure from motorised traffic on unfenced land has increased dramatically in recent decades. The number of snow scooters has increased fourfold over a period of ten years and stood at over 35,000 in 1992.

The extensive, uninterrupted areas of open countryside may also contain smaller, well-defined areas of particular significance for plant and animal life, or cultural history. These may be migration routes, areas where geological or local climatic conditions are specially favourable, or areas containing prehistoric and historic monuments such as pitfalls to trap animals or relicts belonging to the Sami (Lapp) culture.

The largest protected areas, national parks and areas of outstanding natural beauty (protected landscape areas), are located within these extensive areas of uninterrupted countryside. Road development must not take place in areas that are protected under the terms of the Nature Conservation Act (see "Nature conservation").

E 6 over Dovrefjell. Photo: Kari Øvrelid

Avoid new road-related services and buildings

Increased traffic, and additional constructions and activities such as lay-bys, service stations, winter snow clearing, tourist services, holiday cottages and dwelling houses often follow in the wake of a new stretch of road. These spin-offs, along with the noise and disturbance they bring to previously undisturbed areas, frequently have just as great a consequence as the road and the traffic. This problem must be clarified with borough and county councils so that planning decisions can help to limit the undesirable side effects of road construction.

What problems can the road create?
A survey carried out in Aust-Agder in 1986-88 showed that 90% of the instances of extensive, uninterrupted areas of open countryside being reduced in size or fragmented were the result of public roads and forestry roads (Sævre 1993). Road construction creates barriers, divides up areas, or shaves them off at their edges.

Walls of snow that build up when roads are cleared can become physical barriers that are difficult to breach. The road then becomes an even greater barrier for animal life. Hardangervidda. Photo: E. Grønsdal

Road construction may give easier access to core areas that cannot tolerate much traffic. The presence of a road, along with inadequate clarification during the planning process of the interaction between it and the use and protection of the area it transects, often leads to other activities becoming established along the road. This increases accessibility and wear and tear, with all the consequences these have for previously undisturbed areas of countryside.

In such areas, snow clearance in winter can lead to the road becoming an additional problem for animal life during the most demanding time of the year. It may also make vulnerable core areas, such as spring calving areas for reindeer, more accessible. Roads that are closed in winter due to snow or whose position in the terrain means that snow blows off them are usually better alternatives than roads which act as a barrier for animals.

It is the sum total of encroachments and influences which creates the threat for flora and fauna in the extensive, uninterrupted areas of open countryside. The fragmentation of the areas, the paring down of their borders, pollution, increased accessibility and wear and tear together represent an

ever-increasing threat to vulnerable ecosystems and species. Most birds of prey and the larger beasts of prey have suffered an enormous decrease in numbers this century, and species such as the wolf and the peregrine falcon are seriously endangered. Fragmentation, reduction of flora and fauna, wear and tear and disturbance also reduce the thrilling experiences to be had from outdoor recreation in such areas.

Good advice

The importance of having regard for extensive, uninterrupted areas of open countryside is emphasised in the Strategic Plan presented Roads Administration in 1992:

"Extensive, uninterrupted areas of open countryside and valuable stretches of shore must be protected."

Six good ideas for road planning which take into account the extensive, uninterrupted areas of open countryside:

1.Avoid severing or disturbing extensive, uninterrupted areas of open countryside.

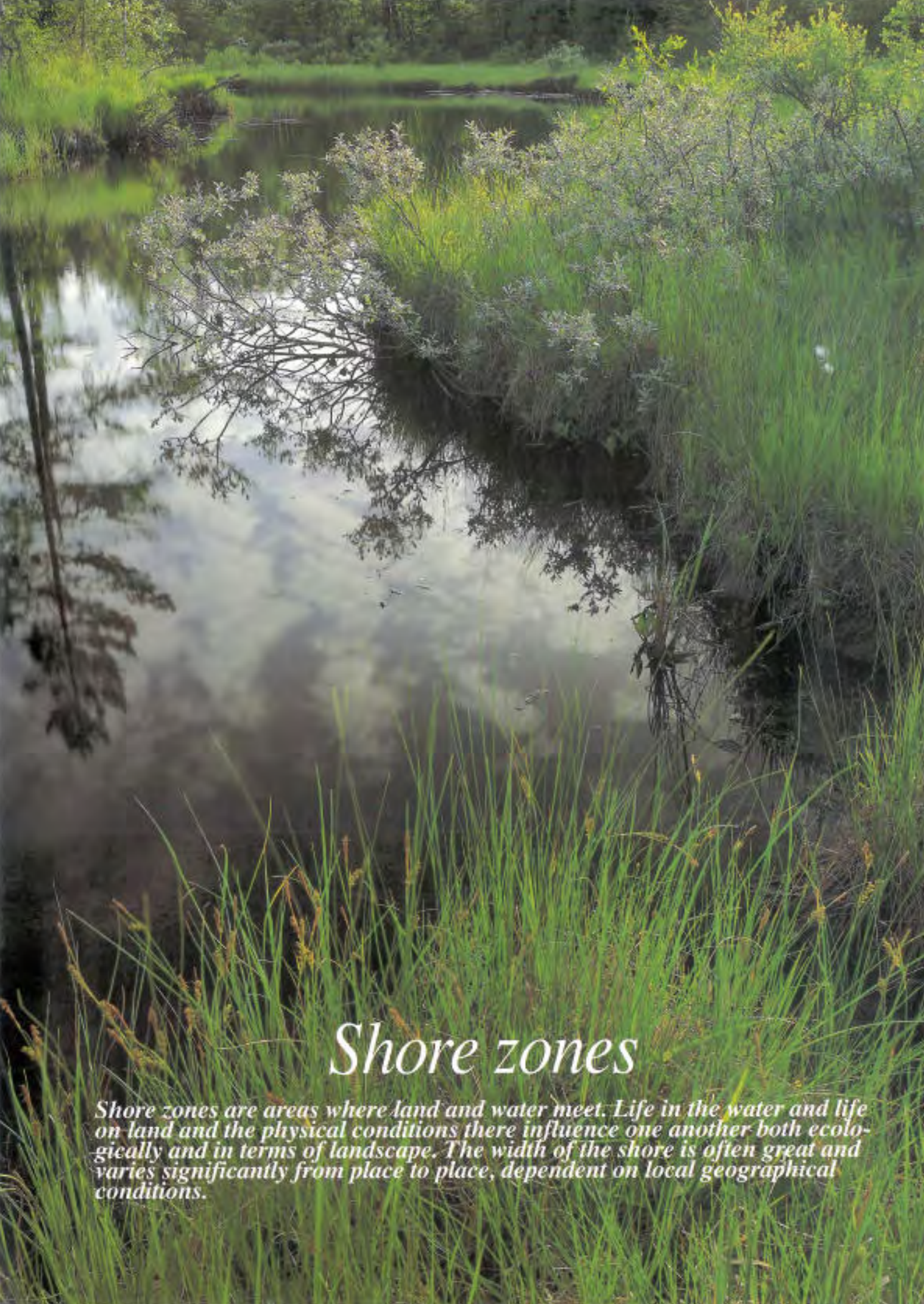
2.If disturbance of such areas is unavoidable, the road should be situated as far as possible from core areas and other areas which are highly vulnerable or of major significance.

3.Ask specialists to evaluate the assets of the various areas, say what must be taken into consideration, and propose possible measures to alleviate conflicts.

4.Use measures which reduce the barrier effect of the road for plants, animals and outdoor recreation. Include such features as game corridors and crossing points for paths in the planning phase. Measures taken as an afterthought do not usually work.

5.In co-operation with borough and county councils, limit the size and number of road-related constructions and activities, such as lay-bys, parking areas, tourist services, holiday cottages and dwelling houses.

6.Limit snow clearance. If the road must be cleared, do not let it become a barrier in winter.



Shore zones

Shore zones are areas where land and water meet. Life in the water and life on land and the physical conditions there influence one another both ecologically and in terms of landscape. The width of the shore is often great and varies significantly from place to place, dependent on local geographical conditions.

All life depends on water. The close relationship between life in water and life on land enriches our shore zones. When different types of habitat meet, more species are usually present than the individual habitat can boast. This is called the "ecological fringe effect".

Very many prehistoric and historic monuments are linked to seashores and freshwater shores. Throughout history, water has attracted settlement, commerce and industry in its roles as a vital resource and a means of transport.

Water excavates and shapes the landscape. The water level changes throughout the day and the time of year, with the ebb and flow of the tides, spring floods and periods of drought. Rivers, lakes and seas supply and take up water at different rates dependent on the nature of the ground, the topography, climate and vegetation. Zones at different distances from the water`s edge are therefore influenced in differing degrees by the interplay with the water. Plant and animal life has adapted to the external influences in such a way that it is ideally adapted to its ecological "niche".

Shore zones can be divided into a number of broad categories each of which will contain a rich variety of types of vegetation and of plants within these. The main categories are:

Salt water
- seashores
- sandy, pebbly and rocky beaches
- bedrock

Fresh water
- lakes

Deltas are threatened

A survey carried out for the Directorate for Nature Management by the Centre for Development and the Environment at the University of Trondheim (1992) showed that 90% of the total land area in 15 major saltwater deltas between Sogn and Namdalen has been developed. In Hordaland, all the large saltwater deltas have been developed (Lundberg 1989).

Photo on p. 35: From Fløyta, Vestmarka in Bærum, Akershus. Photo: Bård Løken, Samfoto

A selection of shore zones
Photos: Mari-Lise Sjong and Jon Arne Sæther

- straight stretches of river
- river plains
- swamps
- river mouths
- deltas
- inlets

Shore zones emphasise the lines in the landscape and form attractive areas for recreation and outdoor pursuits. Water is always moving: it reflects the surrounding landscape and follows and describes the terrain forms.

Water offers opportunities for swimming, fishing, boating, and various forms of sport and other outdoor activities. In built-up areas, the beach and the water are often the only areas that are open and accessible for outdoor recreation.

What must be safeguarded?

Shore zones have a number of qualities:

- rich types of vegetation
- rich in birds and insects
- home for many species of animals and birds
- dispersion routes and corridors for game
- exchange of nutrition between land and water
- food, concealment and shade for fish
- pollution filter
- erosion-limiting vegetation
- flood-suppressing vegetation
- scenic elements of outstanding natural beauty
- desirable outdoor recreation area
- opportunity for fish to migrate to tributaries.

To safeguard the assets of shore zones, three characteristics of the shores must be taken into account:

- width
- continuity
- vegetation.

Width

The interplay between water and land not only influences the shore or tidal zone, it also affects areas with vegetation behind what we normally associate with the shore, as well as underwater areas. Correspondingly, food and shade sometimes provided by vegetation at the waters edge may be very important for fish. For this interplay to be able to function, the ecosystem of the shore zone is dependent on the shore being sufficiently wide to provide adequate space, food and cover for the plants and animals whose habitat this is. Generally, this interplay is important for wider areas than we immediately associate with shore zones.

Outdoor recreation in the shore zone
Photo: Birger Areklett, NN/Samfoto.

Continuity

The shore zone ecosystem not only functions across the zone, equally important links in the zone are often found along the water`s edge, both on land and in the water. The continuity of the shore is vital for migratory routes of animals, movements of fish, outdoor recreation, fishing, enjoyment of scenery, distribution of vegetation, supply of food to the water, erosion, etc. A shore zone which is repeatedly interrupted by encroachments will not be able to offer the same living conditions for flora and fauna as one extending continuously for a long distance. In this connection, it is important, for example, to plan bridges which are sufficiently long that their piers do not extend into the water, completely breaking up the continuity of the shore. A bridge alignment perpendicular to the water line will also disturb the shore zone as little as possible.

Vegetation

In the shore zone, the vegetation itself occurs in zones that are determined by the rhythm of the water level and the flow of water through the year. Shore vegetation provides concealment and food for life both on land and in the water. The vegetation utilises the water and passes it on through the surroundings; it can act as a filter for pollution and reduce erosion and flooding. Vegetation along the water`s edge can also enrich the landscape and may contribute positively to outdoor recreation.

Conserving river systems

Parliament has adopted four conservation plans for river systems, totally or partially protecting 325 rivers from exploitation by the power industry. Although these resolutions concern protection from hydroelectric development, Parliament has expressly stated that:

"other encroachments in the protected areas which might reduce the assets of the rivers and lakes for nature conservation, outdoor recreation and science must be avoided."

National guidelines are now being drawn up relating to protected river systems. The intention is to avoid other encroachments reducing the conservation assets along those that have been protected. In addition, the Norwegian Water Resources and Energy Administration is preparing a procedure for differentiated management and individual case treatment of protected river systems. These initiatives are being co-ordinated and aim to safeguard the conservation assets of all the protected river systems in a uniform and predictable way.

Norway has signed several important international agreements which are concerned with the conservation of natural and cultural assets. One of the most important of these in this context is the Ramsar Convention from 1971 and 1982 regarding wetland areas of international significance, particularly as a habitat for aquatic birds. (See the chapters on "Nature" and "Nature conservation".)

Underwater vegetation in sea water and fresh water is vital for life and fertility. Photos: Roar A. Lund and Olsen & Sørensen, NN/Samfoto

If vegetation in shore zones is removed when road works take place, serious efforts should be made to re-establish it. When deciding blasting techniques and how to shape rock and earth fills it must be remembered that slopes should be constructed and formed in a way that enables indigenous vegetation to establish itself. Investigations of the substratum, the nutritional status and the water management can indicate how this should be done. Soil and fertilisers are not necessarily the right solution. Indigenous seeds and plants should be used when re-establishing vegetation.

What problems can roads create?

Road building has disturbed or destroyed more shore zones in Norway than any other type of encroachment.
Main roads along fjords and valley floors frequently run parallel with, directly alongside, or on embankments in the shore zone. The reasons for this include the nature of the topography, land-use conflicts and historical concerns.

Shore zones are often highly productive capacity and home to a large variety of species, but they tend to be considered worthless because people have seldom been able to produce anything useful there.

Roads running in or alongside shore zones lead to

-breaks in the interaction between water and land
-flora and fauna being reduced to a minimum
-exchange of nutrients being reduced to a minimum
-natural habitats of shore organisms disappearing
-production in the water being reduced
-creation of a barrier for animals and for outdoor recreation

The main road, local roads, the railway, buildings, agricultural land and shore zones fight for space in Romsdal. Photo: Jon Arne Sæter

-noise, dust and dominance of traffic
-runoff of water from the road
-the cultural landscape associated with the water losing contact with it
-the landscape qualities being reduced.

When road improvements are taking place or new roads are being constructed, often only short stretches are planned at a time. Little attention is paid to assessing conditions along the entire arm of a fjord or the whole of a river system. It is then difficult to decide which parts can best tolerate the disturbance and which should be protected.

When connections are being built to link islands to the mainland, or new stretches of road are constructed to replace ferries or shorten driving distances to them, the link roads are often placed on undisturbed shores along fjords and beside the sea. The number of fjord arms where there is unbroken continuity between mountains and the water is being severely reduced in Norway.

Good advice
The importance of taking shore zones into account is also emphasised in the Strategic Plan drawn up by the Norwegian Public Roads Administration (1992):

Eight pieces of good advice for planning roads that do not spoil shores

1.Place the road as far as possible from the shore; take the width of the shore zone into account.

2.Take into account the continuity of the shore over long distances; give thought to migratory routes of animals, fish migrations and the space for outdoor recreation along the shore.

3.Protect as much shore zone vegetation as possible.

4.Use bridges to cross rivers and small streams.

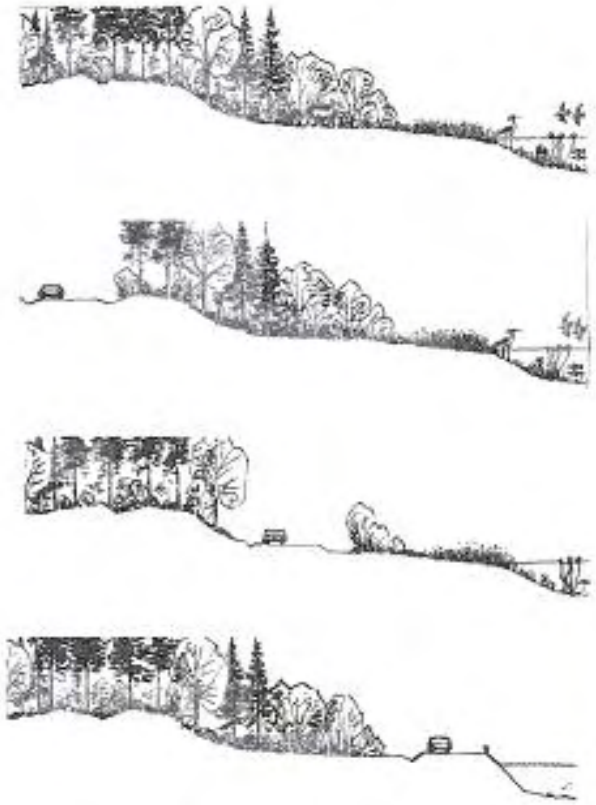
5.Align the road to suit the lines of the shore and landscape.

6.Take into account the possibility of re-establishing vegetation when choosing blasting techniques and designing embankments and walls. Establish indigenous vegetation on the embankments.

7.Avoid building embankment in water.

8.Occasionally it may be possible to construct a new shoreline beyond the road if hydrological and erosion-related conditions permit.

The delta of the River Londal in Hordaland
Photo: Mari-Lise Sjong



An illustration of what may be lost or disturbed with different positioning of the road in relation to the shore zone. Sketch: Tom Dyring Source: Roads and shore zones

"Extensive, uninterrupted areas of open countryside and valuable shore zones should be protected."

The road from Gudvangen was originally planned to run along the beautiful, unspoilt Nærøyfjord. Partly to share natural assets and qualities in the landscape, the road was re-routed through tunnel to Undredalen. Map: L. Bergum and F. Loftesnes

At Horg in Sør-Trøndelag, a new stretch of the E 6 was placed close to fit into the river. The road only slightly disturbing the landscape, thus protecting the shore zone and the rich diversity of species in the undergrowth along the river. Photo: Kari Øvrelid

At Støren in Sør-Trøndelag, the E 6 was routed through a tunnel to avoid destroying a crag which is an important element in the landscape. The rest of the shore zone was destroyed. Photo: Egil Lundebrekke

At Jorekstad in Oppland, a new link between the E 6 and Rv 255 avoided the Lågen Delta Nature Reserve. Thickets along the river separate the new road from the reserve, protecting it. This alignment, however, cost more cultivated land. The bridge over the River Lågen was extended to reduce disturbance to an abandoned river bed and give better conditions for people walking beside the river. Photo: Kari Øvrelid

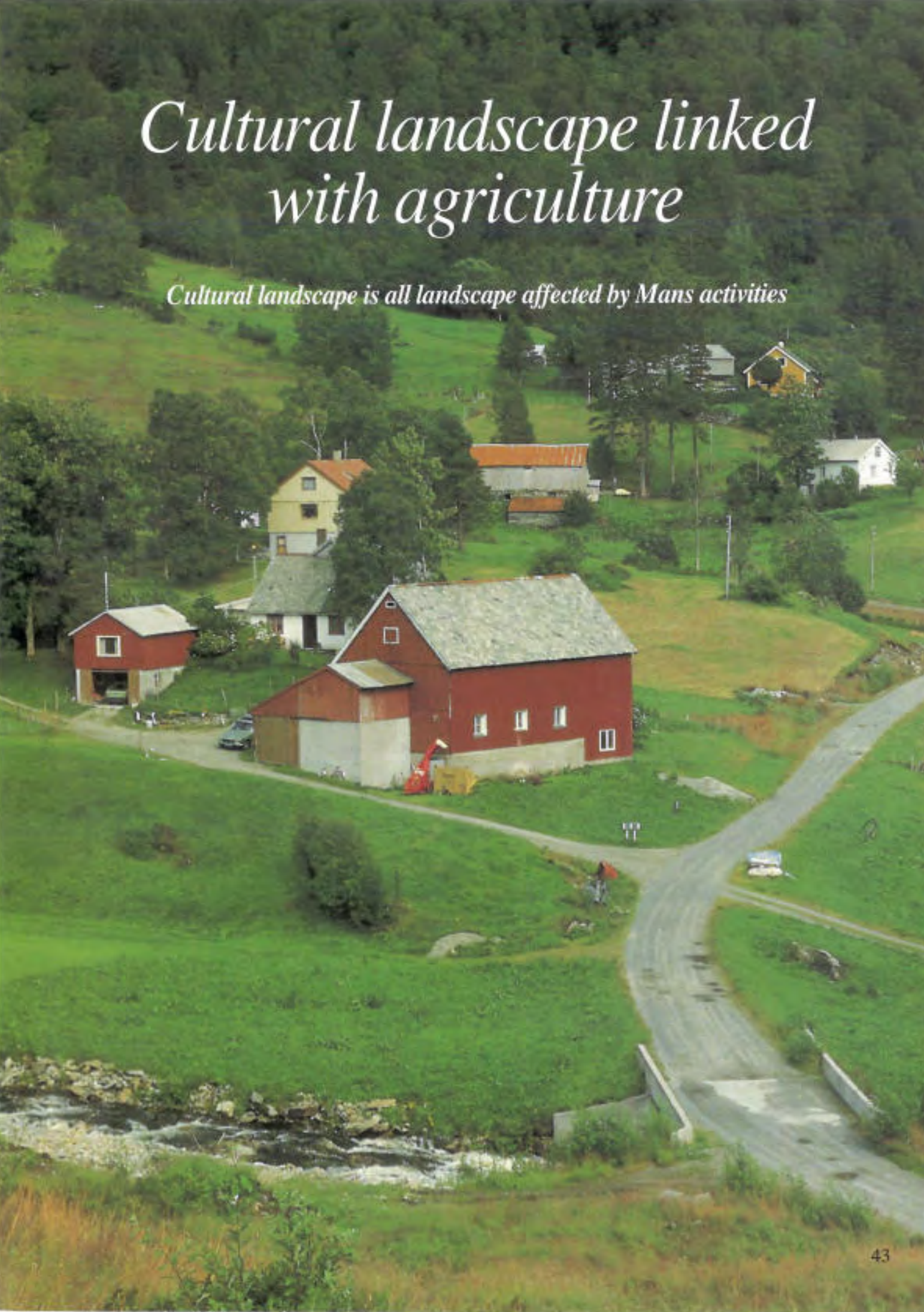
Near Vinterbru in Ås, Akershus, the original proposal for a new stretch of the E 6 involved culverting Årungselva for 200 metres. This would have been a serious detriment to a valuable stream containing both sea trout and salmon. The stream was instead re-routed in a new bed alongside the road, specifically designed to create good conditions for fish to grow up in. (NB: the stream had dried up when this picture was taken.) A short culvert under the road was constructed with thresholds

It can be difficult accommodating a high-standard road to a narrow valley floor. The impression of a fine wall is spoilt by a destroyed shore zone. E 6 in Drivdalen, Sør-Trøndelag. Photo: Sunniva Schjetne

The text in this chapter is mostly taken from the publication "Veg og Strandsoner" (Roads and Shore Zones) published by the Directorate for Nature Management, the Norwegian Water Resources and Energy Administration and the Directorate for Public Roads in 1994.

Cultural landscape linked with agriculture

Cultural landscape is all landscape affected by Mans activities



Cultural landscapes range from those in open countryside to urban landscapes. Between these, we find mixed forms and gradual transitions. The concept is often limited to areas where the cultural impact comes primarily from agriculture. Natural conditions, different forms of use, methods of cultivation, settlement patterns, building traditions, historical and cultural conditions vary from place to place and form different types of cultural landscapes associated with agriculture. Rich and varied agricultural landscapes are important for such aspects as:

- variety in scenery
- biodiversity
- our identification with a place and our understanding of history
- well-being and recreation
- tourism and business development.

Our surroundings are vital for our identity, our feeling of belonging to somewhere, and our well-being and enjoyment. The agricultural landscape has been formed by Man over several thousands of years. The first arable land was cleared in the Late Stone Age, and continuous change has been taking place ever since in line with technological developments and changes in society. Until the beginning of the 1900's, agricultural methods and livestock management changed little, thus helping to keep the ecosystems of the agricultural landscape stable. However, this century has seen dramatic developments in technology and in the way we utilise the agricultural landscape.

Traditional farming methods, such as the use of pastures and hayfields, created open and characteristic ecosystems. These cultivated fields are the natural habitats of species that have adapted to farming methods. Because these methods have changed, some of these types of landscape, such as meadows used for grazing on upland summer dairy farms, pastures and meadows, are in danger of disappearing. Such areas usually have a large biodiversity with beautiful plants, such as oxeye daisies and harebells, which need a great deal of light.

Different kinds of cultural landscape. Photos: Akse Østebrøt and Mari-Lise Sjong (including that on p. 43)

Old meadow. Photo: Grethe Horn

What must be taken into account?

To safeguard biodiversity and the quality of outdoor life in the cultural landscape that is associated with agriculture, it is particularly important to take into account the following:

-entirety and continuity
-prehistoric and historic monuments and the cultural environment
-the natural environment.

Roads have often been placed between farm buildings and boathouses in cultural landscapes such as this one. This severs the connection both visually and functionally between the farm buildings and the boathouses. Unbroken landscapes, for instance from the shore to the home fields and through meadows to unfenced rough grazing, are of particular interest and help to increase the value of individual elements in the cultural heritage. Osen in Sør-Trøndelag. Photo: Jon Arne Sæter

Entirety and continuity

The value of the individual elements in a cultural landscape depends upon them occupying a natural position in their surroundings and on related elements also being safeguarded. For example, a *stabbur* (a traditional wooden storehouse, mounted on pillars) centuries ago still standing in the cluster of farm buildings where it originated will say more about the building, the farm and the surroundings than one standing alone at the end of a parking area. In both instances, the element has been preserved, but in the latter case the continuity and the entirety have been destroyed. The same applies to links between natural habitats and cultivated land, and between natural landscapes and settlements.

Cultural monuments and the cultural environment

Cultural monuments (prehistoric and historic monuments) and the cultural environment are non-renewable resources and are important elements in the cultural landscape. By "cultural monument" we mean:
-traces of human activity in our physical environment, including sites linked with historic events, traditions and beliefs. Cultural monuments from before the Reformation (1537) are automatically protected.

The concept of a "cultural environment" covers:
-areas where cultural monuments form part of a larger entity, such as farmyards, groups of buildings, centres of villages and other areas where there is a functional connection.

Anfins bridge Dovrefjell. Photo: Jon Arne Sæter

Work on ancient roads carried out by the Norwegian Public Roads Administration

The County Roads Offices co-operate with other departments and organisations such as the Directorate for Cultural Heritage, municipal departments for cultural affairs, historical societies, etc. to preserve ancient roads and bridges. Since 1975, there has been a liaison person in each road office. The Norwegian Road Museum was opened in 1992.

A guide is now being prepared dealing with the use, protection and maintenance of ancient roads as a co-operative project between the Ministry of Agriculture, the Road Museum, the Directorate for Nature Management, the Directorate for Cultural Heritage, Oppland County Council and a firm of landscape architects.

As a result of human settlement and Man's use of resources, the agricultural landscape contains a wide variety of cultural monuments and cultural environments such as:
- buildings and farmyards
- roads and bridges
- groups of upland summer dairy farms, hunting and fishing cabins
- burial mounds and clearance cairns
- avenues and gardens.

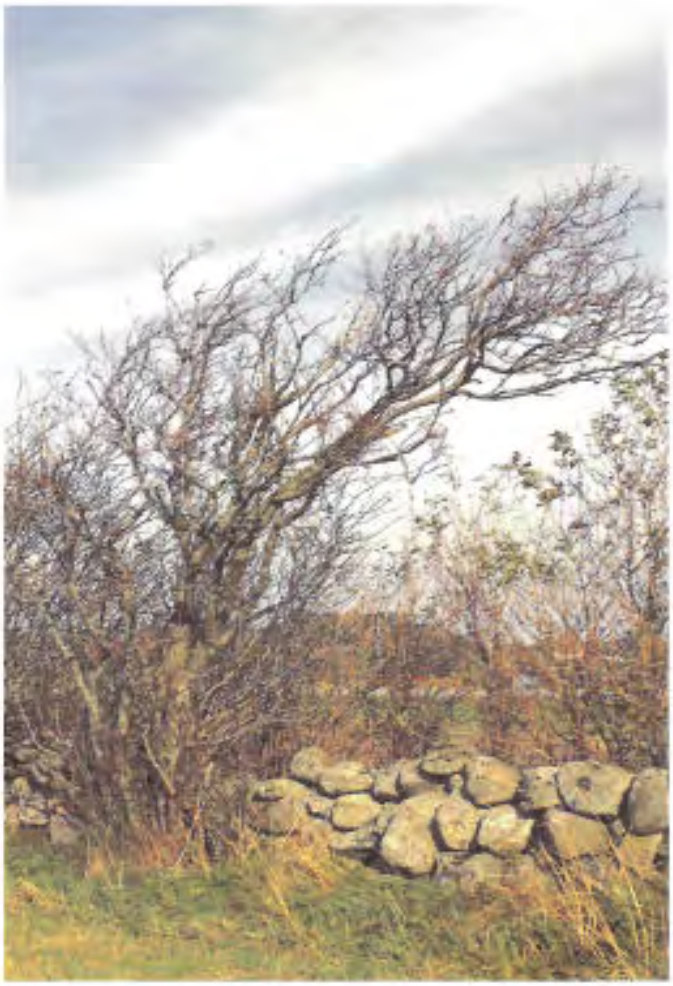
The history of the road is also part of the cultural landscape. The development of the road network from bridle paths and cart tracks to four-lane motorways is part of the history of the landscape. The greatest changes have occurred the last 20-30 years as a result of rationalisation in agriculture and growth in densely-populated areas, and a great deal of road construction has taken place in and around, and between, towns and villages.

The natural environment

Countryside associated with past and present forms of agriculture helps to create diversity and historical depth in the cultural landscape. However, former cultivated areas and species that depend upon them are becoming rarer elements in the landscape, because the areas are starting to be used in other ways, being built on, fertilised and forested.

The most important types of cultural environment are:
- heaths
- areas with pollarded trees
- hayfields

Indigenous vegetation on the roadside.
Photo: Grethe Horn



An, overgrown stone wall supports many species of plants and animals which make the agricultural landscape as a whole better able to withstand outside influences.
Randaberg, Rogaland. Photot: Akse Østebrøt

- unfertilised pastures
- horticultural land
- ponds.

The roadside

In recent years, attention has been paid to both the appearance and the treatment of the roadside. The road-authorities have for the most part stopped spraying with weedkillers and, instead, trim the vegetation at certain times during the growing season. Good tips for protecting the indigenous vegetation along roads in agricultural areas are:

-trim at the right time using the correct cutting height
-do not trim too often
-remove the trimmings so that they do not act as fertiliser
-adjust the maintenance to the requirements.

These assets of cultural history that are in danger of disappearing if they are not specially protected.

Open countryside interspersed with farmed land forms a rich and varied cultural landscape and provides vital habitats and migration corridors for plants and animals in intensively cultivated areas.

Ecosystems in transition zones between unfarmed and farmed land contain species not found in open, cultivated areas. It is therefore important to avoid disturbing these. Censuses of the number of species has shown that there may be 60 times as many on a patch of scrub as in the fields of wheat surrounding it. If the island of scrub is destroyed, useful insects will also disappear,

Natural vegetation in agricultural areas improves the local climate, prevents erosion and balances the water in the soil. Thickets along streams and rivers absorb some of the pollution and reduce the flow of nutritive salts into the water. It is therefore desirable to maintain the cultural landscape as a varied and fertile mixture of arable land, cultivated fields and areas with natural vegetation.

What problems can roads create?

In many agricultural landscapes, roads are the most obvious man-made constructions. They are continuous, often prominent, and the traffic on them catches the eye. Their alignment and form are therefore vital for the appearance of the cultural landscape as a whole. Their dimensions must harmonise with the dimensions of the landscape and important assets and links in the landscape must also be taken into account.

Conflicts often arise between the values to be found in the natural history and cultural history of an area and the economic assets to be gained by farming it. Areas with the lowest economic value are often those that have cultural monuments, remnants of former cultivated land, or natural vegetation. In an intensively farmed agricultural area, these are pockets which are not yet considered worth exploiting. Nonetheless, they may often be very valuable from a scientific and/or cultural history aspect. Thickets along a river bank or on the side of a valley are seldom of any economic value, but they may have considerable ecological importance and provide great enjoyment.

Four pieces of good advice for planning roads which will fit into cultural landscapes

1. The project should be based on a landscape analysis of the entire area affected by the road.

2. Safeguard the entirety and continuity of the cultural landscape, pre-historic and historic monuments, former cultivated fields and cultural and natural environments.

3. Choose an alignment that fits the dimensions of the landscape and follows the lines in the landscape.

4. Use indigenous vegetation, walls, etc. where appropriate.

When a road is widened and improved, the accomodation to the landscape that has evolved is often more or less destroyed. Increasing demands for speed and accessibility, and cheaper techniques for earth-moving, often mean poorer accomodation to the landscape. The E6 near the Hammervatn Nature reserve in Nord-Trøndelag. Foto: Roar A. Lund

A characteristic detail in the cultural landscape at Dovre in central Norway was protected by putting a short tunnel through Klokkerhaugen when the E6 was being rerouted. The tunnel also maintained the continuity of the green fields and trees. Photo: Sunniva Schjetne

The tree-lined road is an important element of this cultural landscape. Sakshaug, Inderøy,Nord-Trøndlag. Photo: Mari-Lise Sjong

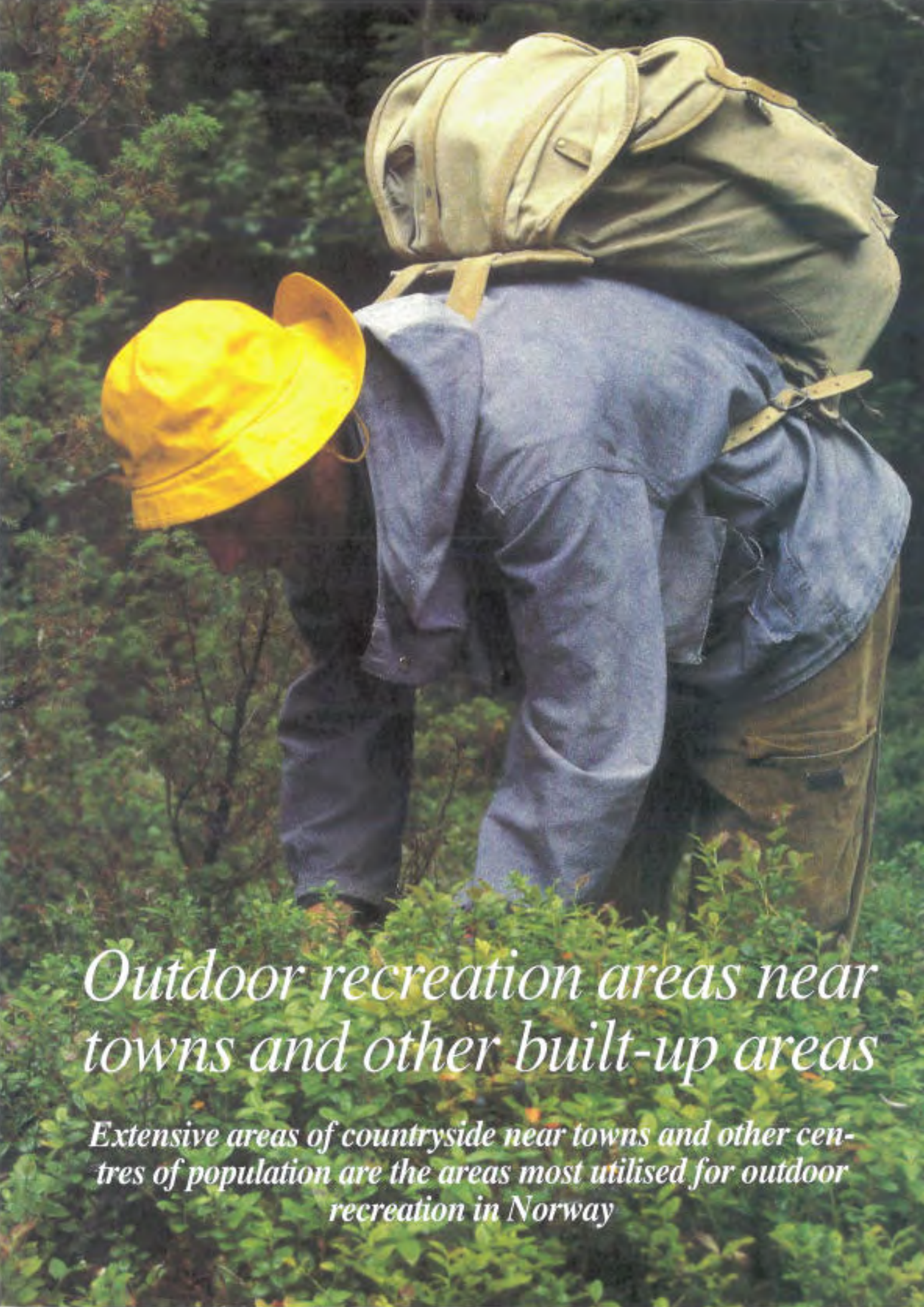
Old roads with a modest standard usually blend well with the landscape, but capacity and safety create problems. Geiranger. Photo: Mari-Lise Sjong

Good advice

The importance of taking the cultural landscape into account is emphasised in the Strategic Plan published by the Norwegian Public Roads Administration in 1992:

"The quality of areas which are of particular value for their cultural history, notable urban environments and housing areas must not be reduced. The road, the volume of traffic and the speed limit must be accommodated to the surroundings of the road. The road must be well designed."

Because heavy mechanical equipment is used, large eyesores are frequently created when roads are built or widened in difficult terrain. Cheap ways of moving rock and earth make it more economical to construct large cuttings and embankments than smaller ones limited by walls. Vadheim, Sogn & Fjordane. Photo: Anon.



Outdoor recreation areas near towns and other built-up areas

Extensive areas of countryside near towns and other centres of population are the areas most utilised for outdoor recreation in Norway

Outdoor recreation areas near towns and other built-up areas include a variety of landscapes such as wooded and boggy areas, beaches, skerries and other coastal areas, agricultural landscapes, heaths and barren mountains. Photos: Asbjørn Moen and Mari-Lise Sjong

As recent statistics (Central Bureau of Statistics 1990) show, Norwegians are very keen on walking in woodland and other kinds of countryside. The Sunday stroll or a swim is generally taken near where we live. Outdoor recreation close to home is the leisure activity which attracts the largest number of participants most frequently. It is also the form of activity which most Norwegians would like to spend more time on if they had the opportunity (Dølvik, Danielsen & Hernes 1988).

Outdoor recreation areas near towns and other centres of population are usually areas of natural beauty that have changed little. They are also large enough to offer a broad range of plants, animals

Local outdoor recreation areas are an attractive bonus for people living in towns and other built-up areas. Trondheim, Sør-Trøndelag. Photo: Mari-Lise Sjong

and scenery for our enjoyment, and to give opportunities for a variety of outdoor activities, challenges and, not least, peace and quiet.

Because they border onto urban and built-up areas, they are used by large numbers of people and are therefore often the most important outdoor areas in a municipality or region.

What should be taken into account?

To safeguard the assets of these outdoor recreation areas, it is specially important to take into account:

- their size
- their quality
- access to them.

Size

They may be large, forested areas little affected by major encroachments of a technical nature, or smaller areas that are intensively used, such as bathing beaches. In the latter case, a reduction in their size will mean greater wear and tear on what remains and thus a reduction in their quality. For the bigger areas, the opportunity for people to roam extensively and go for long walks is often one of the most important qualities.

Diversity in the flora and fauna also depends on there being areas which are screened and at a good distance from roads and the like. Many animals require very quiet and undisturbed core areas to be able to breed and raise their offspring.

Quality

These types of outdoor recreation areas often have other important qualities in addition to their size and location. They may have a rich plant and animal life, varied and distinctive scenery, offer fine views, have lakes and provide peace and quiet.

That an area is big enough for people to go for long hikes is a quality in itself, even though it may have few other qualities.

Relics of human activity can also be an attraction and contribute to the enjoyment. Hustveit in Rogaland. Photo: Mari-Lise Sjong

Access

The use of outdoor recreation areas close to towns and other built-up areas depends entirely on their accessibility. They must be available to both the general public and those working there, e.g. in forestry. Access should be ensured through public transport and a network of paths for walkers and cyclists in the green spaces within the urban zone, as well as by parking areas on their perimeters. Public roads should permit access, but not enter the areas. (Private roads and motorised traffic in open terrain are described in "Extensive, uninterrupted areas of open countryside".)

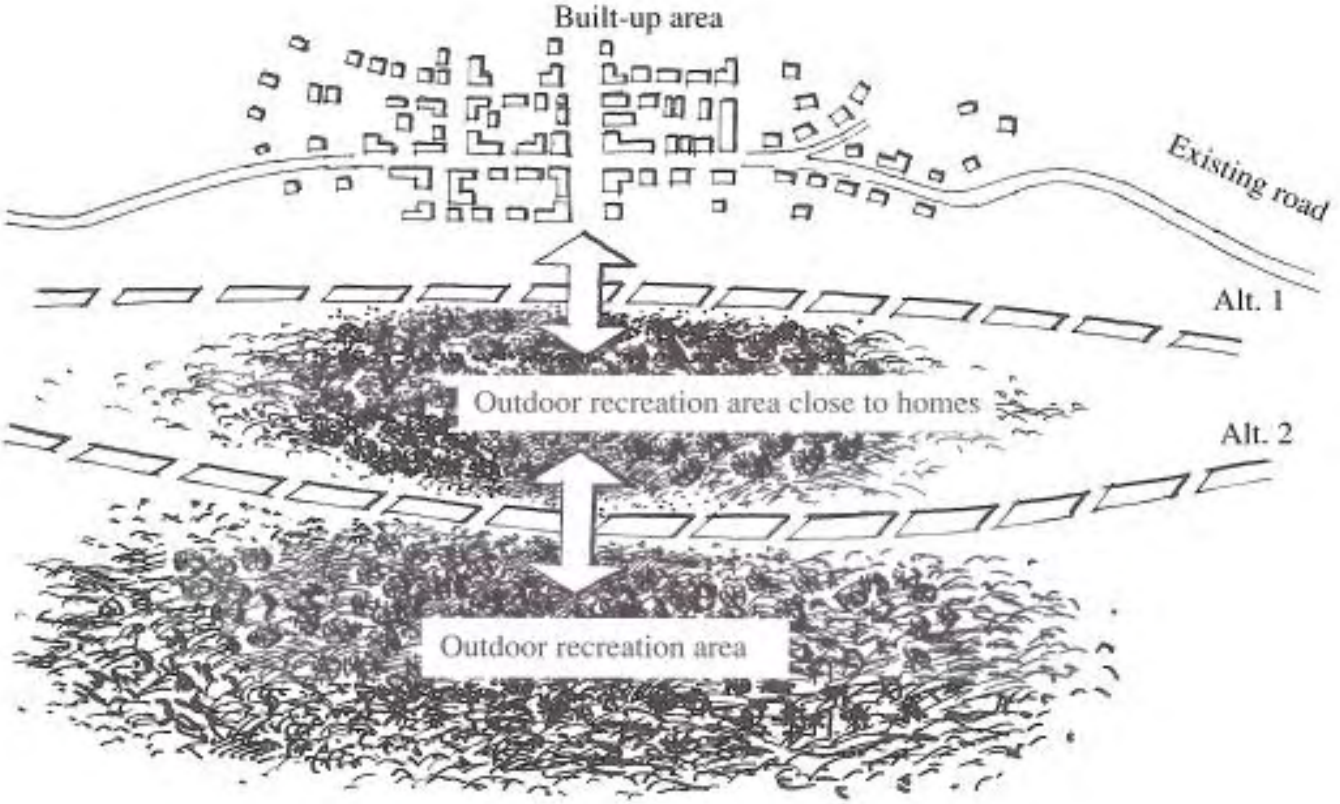
Research shows that those who enjoy outdoor recreation prefer to have only a short distance to travel to reach large areas of open countryside where they can go for long hikes or enjoy other activities than are possible closer to built-up areas. People who have a short distance to travel to such areas partake in traditional outdoor recreation more than others (Gåsdal 1992).

What problems can the road create?

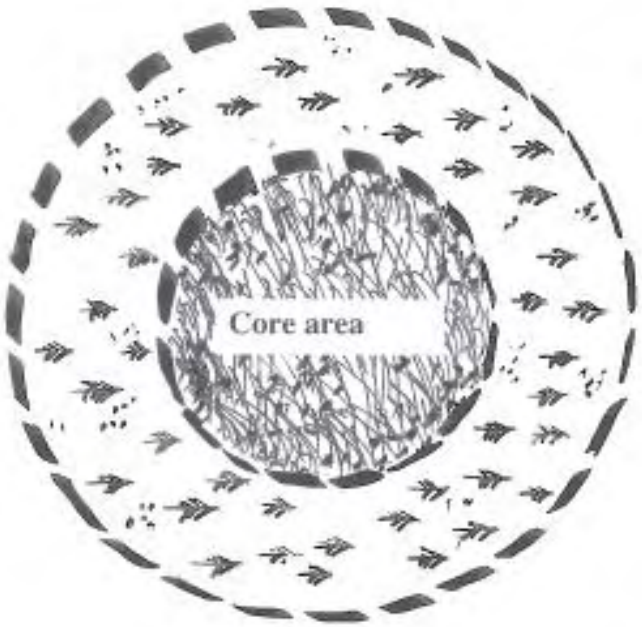
In situations where conflicting interests must be evaluated, the road is generally placed where the degree of conflict is least. Because of agriculture and housing developments, main roads are often forced out towards the recreational areas and may be located within them or along their boundaries.

A by-pass with its fast-flowing traffic will generally act as a physical and visual barrier between areas of open countryside and those who make use of them. If safe and attractive crossing places are not established at natural points, one or more of the following negative consequences will arise:

- access will be more difficult
- the area will be used less
- weak groups have difficulty obtaining access.
- dangerous "blind" crossings
- cars will be used as a means of access.



A typical situation: the road through a built-up area creates problems with a high volume of traffic, poor safety standards, noise, dirt and pollution. A by-pass must be built. Housing developments and agricultural land mean that it must be placed along the edge of the outdoor recreation area or even inside it. Both solutions will have consequences for the users of the outdoor recreation area.



Original situation

Sphere of influence of the road

It is especially important and environmentally friendly to protect the points of contact between the green spaces and public transport system and the recreational areas near towns and other built-up areas.

Much of the motivation for visiting these areas derives from the absence of mechanically generated noise and the desire to enjoy unspoilt nature. A road passing through or penetrating such an area will, with its noise, dust and visual impact, affect far larger areas than it actually occupies. This may be called the «puncture effect» of the encroachment on the outdoor recreation area. The width of area affected on either side of the road will depend upon factors such as the width of the road, the volume of traffic, the type of natural environment and the type of landscape, the climate and the time of year. A road running close to or bordering an area of unspoilt countryside will for the same reasons also affect the degree to which the area remains unspoilt. This may be called a «tangential effect».

A road within an outdoor recreation area near a town reduces the depth of the area and produces a puncture effect in its vicinity. Several intrusions of this kind may by degrees lead to areas of unspoilt nature «crumbling away». It is therefore desirable to keep areas that are as large as possible free from such foreign intrusions as roads, buildings and other forms of disturbance.

At the same time, we must bear in mind that some measures may be advantageous for users of such outdoor recreation areas. These may be paths, seats, quays, information signs, well-designed cafes, boathouses, small farms and environmentally-friendly forestry, etc. These demonstrate the significance and history of the area as common land near a town.

Good advice

The Strategic Plan prepared by the Norwegian Public Roads Administration in 1992 also emphasises the importance of safeguarding outdoor recreation areas close to towns and other built-up areas:

The protected core of an area where the natural environment is intact usually contains plant and animal species which require peace and a certain distance from roads, railways and other major constructions. Running a road through such an area will reduce the size of the core area. Often this reduction is so drastic that the area is no longer big enough or suitable to form a habitat for these species. Illustrations: Tom Dyring

"Large, uninterrupted areas of open countryside and valuable stretches of shore must be protected."

Six good pieces of advice for planning roads near outdoor recreation areas close to towns and other built-up areas

1.Traffic should not be led into or through them. Their cores must be protected.

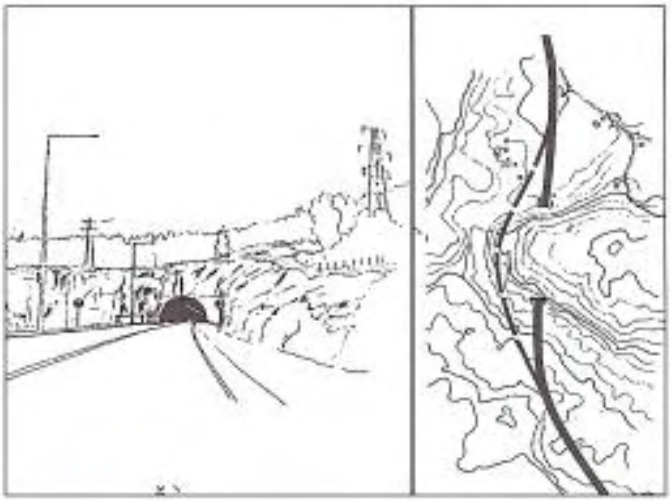
2.Avoid placing roads alongside areas of unspoilt nature.

3.Have a special concern for the qualities within the area and in adjacent areas.

4.Safeguard access points and make them attractive. Replace those which have to be destroyed.

5.The use of these recreational areas should generate the minimum amount of traffic possible. Safeguard contacts with the green spaces and the public transport system.

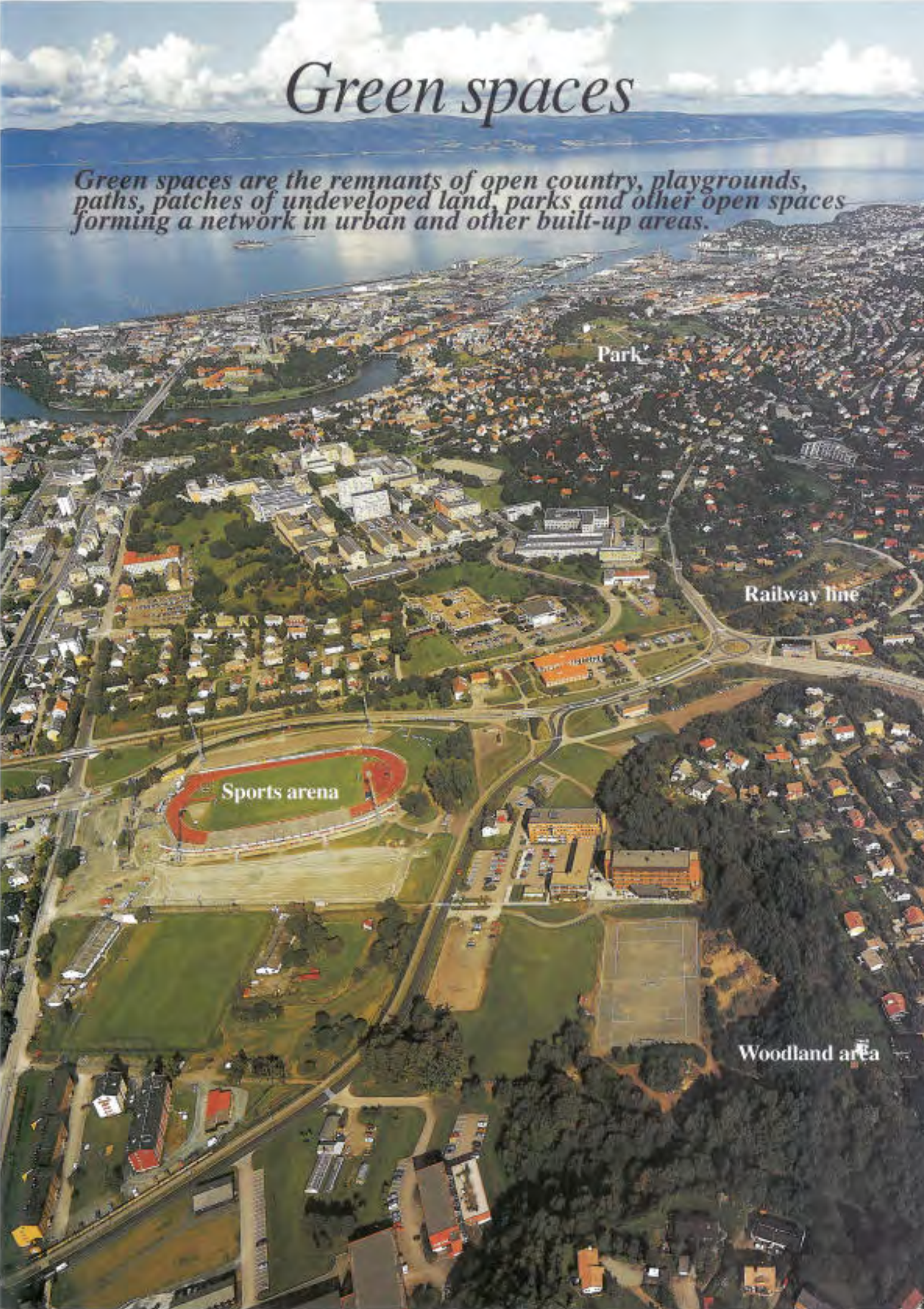
6.Take future developments into account. Pave the way for planned or future access requirements, for example in connection with proposed housing developments adjacent to the recreational areas.



The tunnel through Auglendshøyden was built to protect an important part of Sørmarka, near Stavanger.
Sketch: Egil Lundebrekke
Photo: Rogaland County Roads Office

Green spaces

Green spaces are the remnants of open country, playgrounds, paths, patches of undeveloped land, parks and other open spaces forming a network in urban and other built-up areas.



Green spaces allow us to enjoy Nature in an urban environment and form an important transport network. They are vital for the majority of animal and plant species in urban environments.

Green spaces are the "laughter lines" in the urban landscape. These parks, stretches of river, undeveloped areas, small remnants of open country, paths, hills and knolls, bring us daily into contact with Nature, and make it possible to enjoy outdoor pursuits in an urban environment. They make our journeys to and from school, work and home more interesting and varied. For children and the elderly, whose action radius is limited, they are often their only chance for contact with Nature in their daily lives. Together with pedestrian and cycle lanes, they offer an opportunity for resource-friendly transport. They break up the urban landscape and shield us from the effects of wind and bad weather. The vegetation cleanses pollution in the water and the air, and helps raise the quality of our surroundings. Parks and pathways, together with city streets and squares, are also important social spaces in an urban environment.

Some parts of the green spaces may be remnants of former agricultural land, grazing or old fortifications. Thus, the landscape can portray the history of the area.

Green spaces may consist of:
- parks
- playgrounds and sports fields
- pedestrian and cycle lanes, and paths
- open country
- ridges and narrow valleys
- small remnants of agricultural land
- former industrial and railway areas.

Green spaces may be:
- recreational areas
- a communication system
- playgrounds
- pieces of scenery
- habitats for plants and animals
- reducers of pollution
- a way of portraying our history

What must be taken into account?

To safeguard the green spaces it is important to take into consideration their

- continuity
- shape
- content.

Continuity
A continuous network of green spaces is vital as a communication- system for people, animals and plants. For people, the green spaces, including pedestrian and cycle lanes, need to be:

- continuous
- in contact with important facilities
- of a reasonable standard and level of safety
- attractive and of good quality.

For many people, the flora and fauna are considered to be their most important qualities. Plant and animal life is in various ways also dependent on a continuous network of green spaces if it is to survive in an urban setting. Plants and animals depend upon interaction with other areas and species. A continuous network of green spaces allows for greater variations within the individual area, thus giving the system greater tolerance and ability to withstand outside pressures. Contact with areas beyond the urban fringe such as extensive tracts of open country, agricultural land and shores is particularly important. Green wedges from the

Green spaces are often the best and most exciting places for children to play in. Until the age of eight, a childs action radius in terms of distance from its home is only 200 m (Kolbeinstvedt & Strand 1978). This emphasises the need for green play areas near housing estates.
Photo: Mari-Lise Sjong

When the Mesnadal arm from the E 6 into the centre of Lillehammer was being planned and built, efforts were made to maintain a continuous green strip along the River Mesna. This starts at the T-marked paths on Stampesletta and ends at the bathing beach at Mosodden on Lake Mjøsa. The construction of a tunnel saved this beach from being destroyed by the E 6. Sources: Oppland Road Works Office and Knut Selberg Arkitektkontor

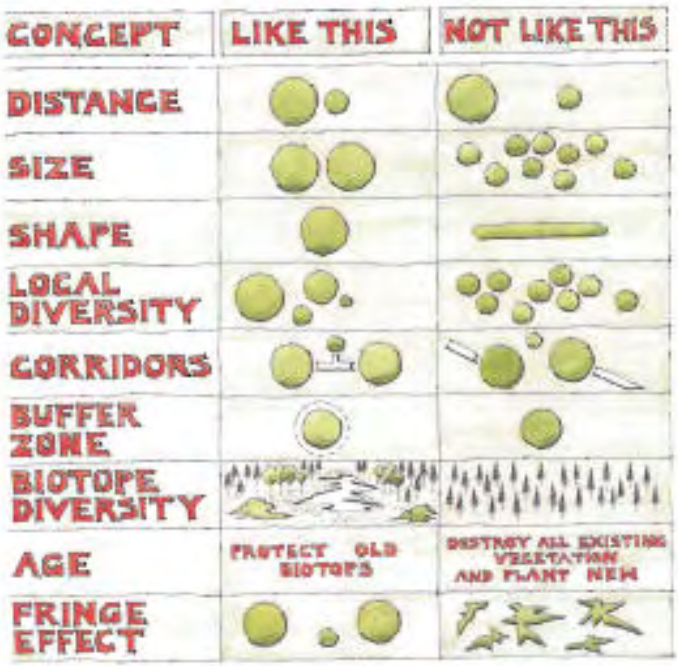
As part of the Mesnadal project in Lillehammer, footbridges, underpasses and well-planned paths were constructed to the continuous system of green spaces as intact as possible. Photo: Kari Øvrelid

areas into the urban centres enable animals to enter towns and cities and people to get out into the country on foot. If the green spaces are to function as a network, the distance between them should be as short as possible. Corridors linking them may be paths, residential areas, streams and railway lines. A corridor should be about 60 m wide to provide cover for migrating animals and ensure habitats for plants.

Shape

The shape of green spaces is also significant for which species of plants and animals will live there. A long, narrow area gives less protection than a compact one with the same surface area. Plants and animals have specific requirements regarding breeding, access to food and dispersion which vary from species to species. Thus, it is important to remember that:
-bigger areas give greater opportunities for more species of plants and animals

-compact areas create opportunities for species living in the transition zones between different kinds of countryside as well as those preferring protected core areas.



Geometrical principles for the shape of the green spaces to enable them to meet the needs of as many plants and animals as possible. These general principles do not guarantee good conditions for all animals and plants, but, properly applied, they can safeguard the majority .
Illustration: Tom Dyring
Source: Signe Nyhuus

Content

The content and quality of green spaces is important for the degree to which people, animals and plants will thrive. Varied areas create the best opportunities for plants and animals to survive in an urban setting. They are also the kind people enjoy most.

What problems can roads create?

Green spaces are often exposed to pressure from development. Road-building reduces their continuity, dimensions and quality in the following ways:

-the areas are punctured, severed and developed, links and corridors are destroyed, contact with open spaces and the nearby countryside are cut; they lose their original flora and fauna and their ability to function as a transport system

-their size is reduced causing them to function less well as a habitat and a migration route for plants and animals; they become less enjoyable for people

-the immediate surroundings of the road are changed in such a way that opportunities for biodiversity are reduced.

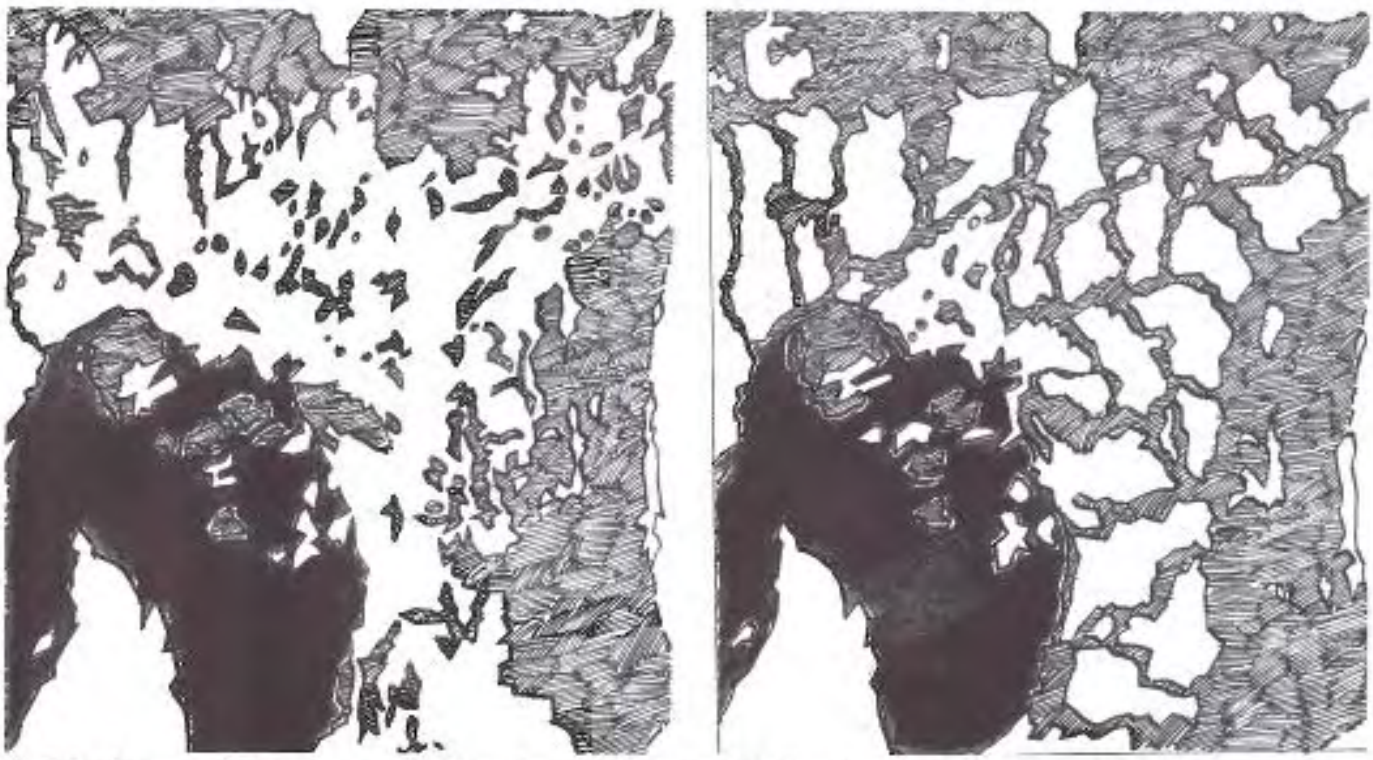
Pressure from development plans

Proximity of green spaces to built-up areas exposes these areas to pressure from development plans. This often leads to gradual reductions in the sizes of green spaces. Investigations in Stavanger, Hønefoss and Hommelvik show that the area each inhabitant has available for recreational activities near his or her home was reduced by 20-30 per cent between 1955 and 1985 (Ringaar & Skjøstad 1986). The trend since 1985 has doubtless increased rather than reduced the pressure on leisure areas near homes.

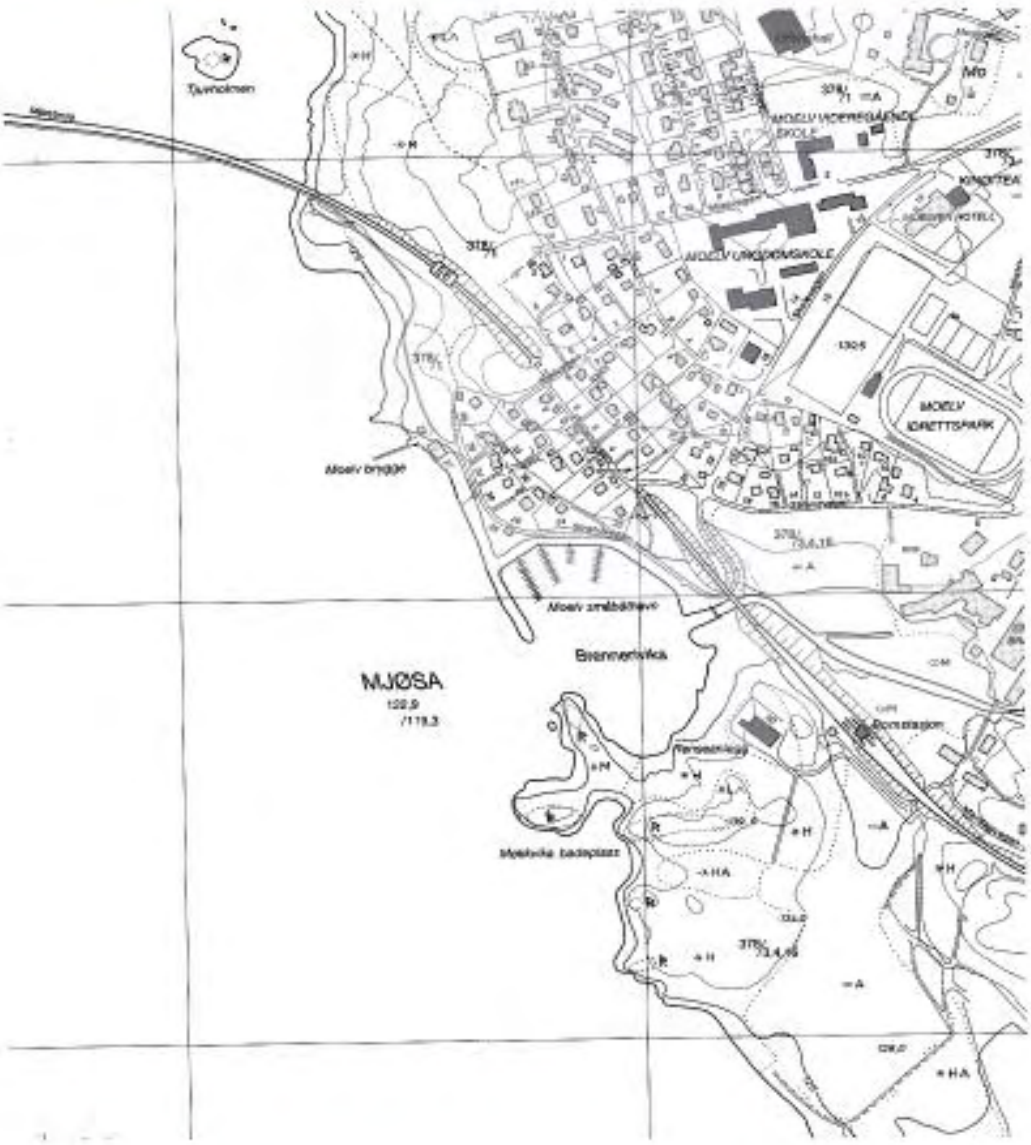
How far green spaces are incorporated into existing development plans varies widely from municipality to municipality and county to county. Some have prepared a green plan, or defined the status of such areas within other types of plan.

How can the road be accommodated to the green spaces?

By taking the continuity, shape and content of the green spaces into account, road construction can help to protect their size and qualities. The system of pedestrian and cycle lanes, as well as the road and street network, can also ensure contact with important facilities.



In Oslo, the network of green spaces has been fragmented and "nibbled" at the edges from 1949 to 1989. Illustration: Tom Dyring



The original plan was to place the new E 6 approach road to the bridge across Lake Mjøsa at Moelv along the lake shore, thus putting a built-up area in the vicinity in danger of losing green spaces. However, this was avoided in 1984 by routing the road through a tunnel under the houses. All the plants and trees in the path of the road were moved to a local nursery. When the tunnel was finished and the soil that had been removed was replaced, the vegetation was put back. "Wild" bushes and trees outside the properties were also replaced. Map: Land-use map reproduced by permission of the Norwegian Mapping Authority. Photo: Kari Øvrelid

Six good pieces of advice for planning roads that favour green spaces

1.Obtain information from the municipality, the county council and the Department for Environmental Affairs in the office of the respective County Governor about the green spaces and existing plans for green spaces.

2.Co-ordinate the system of pedestrian and cycle lanes with the existing, and any future, transport network involving the green spaces.

3.Safeguard and strengthen links within the network of green spaces. Put priority on links that are lacking.

4.Ensure that the green spaces retain their contact with important objectives, such as schools, shops, recreational areas, open country and public transport.

5.Let the individual elements in the green spaces maintain (or be given) a size, a shape and qualities which make them useful for people, animals and plants. Avoid changes whenever possible. Take advice from experts .

6.Fit the standard and design of pedestrian and cycle lanes to the qualities to be found in the neighbouring natural and cultural environments.

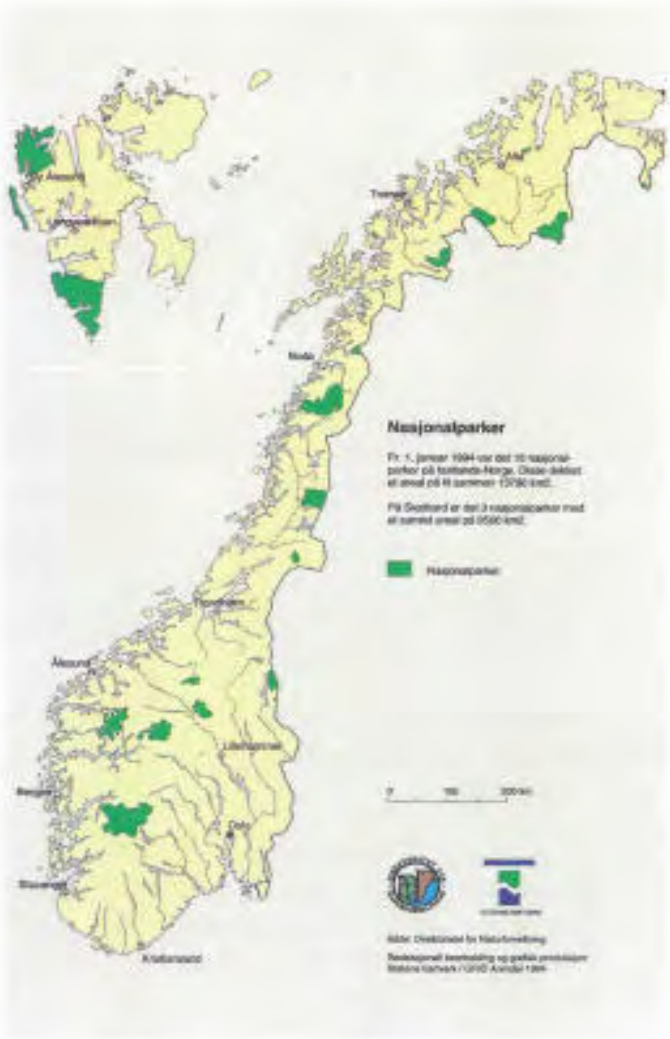
Nature conservation

Conserving areas of countryside in Norway must be seen as part of an international effort to protect species, ecosystems and landscapes. Areas that are given protected status are often the most valuable parts of large tracts of countryside. Road construction must not take place in areas protected under the terms of the Nature Conservation Act.

Several forms of Nature in Norway are unique or rare internationally. We have species of plants and animals which are only found in this country, or which have their main distribution range here.

Conservation of special areas of countryside and individual occurrences of species is called classic nature conservation. From the beginnings of formal nature conservation up to the 1970's, practical nature conservation work was mostly concerned with protecting individual occurrences or specimens, and these were seldom considered in an overall context. A new Nature Conservation Act in 1970, together with the establishment of the Ministry of the Environment in 1972 helped to change this. To obtain a better and more effective handling of matters, nature conservation work since the mid-1970's has been concentrated around county conservation plans.

In 1972, 1.1 per cent of Norways land mass was protected under the terms of the Nature Conservation Act. By 1993, this had increased to 6.3 per cent. It is assumed that the total area which it is possible to protect in the long run will not exceed 10-15 per cent of Norways land mass. In this respect, it is important to emphasise that classic nature conservation forms only a small part of a total management of Nature. Understanding the assets which lie in the areas of countryside which are not protected and giving attention to these in connection with all types of encroachment and activities are prerequisites for protecting Norwegian nature.



National parks in Norway, as of 1 January 1994
Source: Directorate for Nature Management

International conventions

Because of the threats posed to the world`s biodiversity, ever-increasing priority has been given to work concerned with protecting the biological resources as a basis for sustainable development. There have been several important international agreements (conventions) concerned with this, which Norway has endorsed. These require us to conserve wild plant and animal species and the countryside. In particular, we have a responsibility to conserve those species and forms of nature which are only found in Norway, or which have their main concentration in this country. The most important conventions which Norway has ratified are:

-The Convention on Biodiversity (the Rio Convention) in 1993
Protection and sustainable use of the biodiversity along with a fair distribution of the profits from utilising genetic resources.

-The Bern Convention in 1982
International agreement with the objective of protecting European species of wild animals and plants and their natural habitats.

-The Bonn Convention in 1983
International agreement on conservation of endangered and vulnerable animal species which swim, fly or migrate over national borders.

-The Ramsar Convention in 1975
International agreement on protection of wetland areas, with particular respect to aquatic birds.

-Convention in 1977 concerning the world`s natural and cultural heritages, which seeks to conserve natural and cultural heritages of outstanding universal value from a historical, cultural, scientific or aesthetic point of view.

Conservation under the terms of the Nature Conservation Act

Conservation of specific areas of countryside or natural occurrences is first and foremost put into effect under the terms of the Nature Conservation Act. This Act authorises the establishment of several different categories of conservation:

- national parks
- landscape conservation areas
- nature reserves
- natural monuments
- animal, plant and bird sanctuaries
- conservation of species.

In areas protected in accordance with the Nature Conservation Act, nothing is allowed to be done which will substantially influence or alter the countryside. This includes road building.

Encroachment of Nature can destroy the conservation value of a proposed nature conservation area in a very short time. Road construction, tree felling and drainage work are examples of such encroachments. To avoid this, the Act has a clause which makes it possible to implement temporary conservation measures to prevent the loss of conservation assets while the matter is under consideration. Temporary conservation can be brought in with immediate effect without prior hearings or clarifications in regard to other interests.

National parks

National parks make up the greater part of the protected areas. The 18 national parks on the Norwegian mainland cover approximately 4.25 per cent of Norway`s landmass (1993).

In addition to scientific and aesthetic considerations, one of the motives of conservation is to ensure general access to recreation and outdoor pursuits in unspoilt countryside.

Landscape conservation areas

As of 1993, there were 76 landscape conservation areas (areas of outstanding beauty), comprising 1.4 per cent of Norway`s landmass.

Landscape conservation is the least stringent form of conservation under the terms of the Nature Conservation Act. It contains a general embargo on intervention which will significantly alter the character or nature of the landscape. However, normal agricultural practices which are already in use at the time the conservation resolution is adopted will usually be allowed to continue.

Landscape conservation has been used to link together areas protected by other forms of conservation.

Nature reserves

In 1993, there were 1,175 nature reserves in Norway. Conservation of these areas is the strictest form of conservation under the terms of the Nature Conservation Act.

Nature reserves are chiefly set up for scientific reasons. The areas must be undisturbed, or almost undisturbed and constitute a type of nature which is of special scientific or educational interest.

Natural monuments

Individual occurrences of interest in the context of natural history are potential candidates for protection as natural monuments.

There are 86 geological natural monuments in Norway (1993). They are mostly very limited in size and together comprise an area of 2 km^2. In addition, 190 trees or groups of trees are protected as botanical monuments.

The terms of this form of conservation are similar to those of nature reserves.

Conservation of species

Plant and animal species can be protected against being picked or collected within a defined area or over the whole country. This form of protection does not concern encroachment into the habitats of the species, such as road construction, tree felling, etc. Conservation of species can also be applied within a landscape conservation area.

Animal, bird and plant sanctuaries

Conservation of species can be combined with conservation of biotopes so that the habitats of the species are protected against encroachment. Such conservation can be enforced as strongly as conservation for nature reserves.

Conservation plans

From 1976 onwards, work throughout the country has centred around county conservation plans. Four of the most vulnerable types of habitat and forms of life have been given priority and occurrences of

- wetlands
- broad-leaved deciduous woodlands
- swamps, bogs and marshes
- seabirds

that are considered worthy of protection began to be registered in the various counties.

Work is also under way with a view to protecting

- Quaternary geological features
- fossils
- mineral occurrences.

According to the Government White Paper no. 68 (1980-81) concerning the Conservation of Norwegian Nature, conservation plans will also be prepared for
- coastal heaths
- seashores and lakes
- rare and endangered plant species
- coniferous forests
- yews and holly
- characteristic marine environments.

Conservation plans for wetlands, broad-leaved deciduous woodlands, marshes, seabirds and coniferous forests have priority and will be completed during 1996.

Area conservation under the terms of other Acts

In addition to the Nature Conservation Act and Acts dealing with the polar regions, the Planning and Building Act, the Wildlife Act, the Cultural Heritage Act and the Act relating to Salmonids and Fresh-Water Fish are also important for area conservation:

-the Planning and Building Act
Municipalities may designate areas as special conservation areas and, using powers embodied in municipal development plans, can expropriate areas for nature conservation purposes or to protect them under the terms of other Acts.

-the Wildlife Act
This enables the authorities to protect biotopes that are of particular importance for wildlife. This opportunity has not yet been utilised.

- the Cultural Heritage Act
This gives powers to protect areas surrounding

archaeological and cultural monuments, i.e. the cultural environment.

- the Act relating to Salmonids and Fresh-Water Fish
This Act can protect biotopes in a similar way to the Wildlife Act, but to protect the habitats of fish.

Limitations providing for nature conservation are also authorised by other legislation, but these are not dealt with here.

Administrative conservation

On state-owned land, there are a number of administratively protected areas which can be compared with those protected under the terms of the Nature Conservation Act. Such conservation is undertaken for individual occurrences and areas in state or municipal forests.

Protected rivers

Conservation plans for river systems are implemented through resolutions adopted by Parliament and not according to law. Rivers may also be given conservation status according to legislation where they occur in established conservation areas. As of 1993, no conservation plans existed which chiefly related to rivers. (See the chapter on "Shore zones" for further details.)

Outdoor recreation areas acquired by public funds

These are not protected areas, but areas acquired by the State through purchase or servitude agreements to secure them for use by the general public because of their importance for outdoor pursuits. As of 1 January 1993, 1,220 areas, or 0.1 per cent of Norway, were secured in this way.

Administration of conservation areas

The overall responsibility for co-ordinating administration lies with the Directorate for Nature Management. County Governors, through their Department for Environmental Affairs, have the formal administrative responsibility. In many places, much of the practical work has been put in the hands of the management offices of the Directorate for State Forests and Land. The areas are managed in accordance with regulations laid down in the Nature Conservation Act.

Conflicts in relation to roads

Roads are normally totally forbidden in all conservation areas. Existing or planned roads are discussed in the listing process. This gives a relatively clear guideline for planning public roads in, or in contact with, conservation areas.

Problems occur when roads are placed along the borders of conservation areas. The puncturing effect means that the road influences conditions in the conservation area so that the conservation value is reduced.

Legislation

The Planning and Building Act

Date: 14 June 1985. No. 77
Authorities responsible: Ministry of the Environment, county councils, County Governors and municipalities.
The Act aimes to ensure that planning of public works shall be co-ordinated and create a basis for resolutions concerning the development, use and conservation of resources, and for development, so that land-use and development take place to the benefit of both the individual and society.

The Public Roads Act

Date: 21 June 1963. No. 23
Authorities responsible: Ministry of Transport and Communications, Directorate of Public Roads, County Roads Offices.
Defines the different types of road and who is responsible for them. All road planning, construction and budgeting must be co-ordinated with the interests of the local society and the Planning and Building Act.

The Road Traffic Act

Date: 18 June 1965. No. 4
Authorities responsible: Ministry of Transport and Communications, Directorate of Public Roads, County Roads Offices.
Concerns all traffic with motor vehicles. Deals with traffic regulations, vehicle specifications, driving tuition and responsibilities of drivers.

The Nature Conservation Act

Date: 18 June 1970. No. 63
Authorities responsible: Ministry of the Environment, Directorate for Nature Management, Department for Environmental Affairs in the respective County Governors' offices.
This Act covers conservation of outstanding areas of nature, natural occurrences, scenery and the natural environment, and protection of flora and fauna, through establishment and management of, for example, national parks, nature reserves, landscape conservation areas and natural monuments.

The Pollution Control Act

Date: 13 March 1981. No. 6
Authorities responsible: Ministry of the Environment, State Pollution Control Authority, Department for Environmental Affairs in the respective County Governors' offices, municipalities.
The Act aimes to protect the environment from pollution and reduce pollution; also to ensure the quality of the environment so that Natures ability to produce and renew itself is not impaired.

The Outdoor Recreation Act

Date: 28 June 1957. No. 16
Authorities responsible: Ministry of the Environment, Directorate for Nature Management, Department for Environmental Affairs in the respective County Governors' offices.
Protection and regulation of the common right of access to both cultivated land and unfenced areas. Common law allows everyone to wander freely in the countryside and to harvest the fruits of Nature.

The Land Act

Date: 18 March 1955. No. 2
Authorities responsible: Ministry of Agriculture, Department for Agriculture in the respective County Governors' offices, municipalities.
Conservation of the land, supporting agriculture as an industry and ensuring that the land is used in the most beneficial way for society.

The Land Reallocation Act

Date: 21 December 1979. No. 77
Authorities responsible: Ministry of Agriculture, Department for Agriculture in the respective County Governors' offices, Land Reallocation Service.
Where property boundaries and rights of use are inappropriate, and a voluntary agreement cannot be reached, the property can be placed under land reallocation under the terms of the Land Reallocation Act. Land reallocation is a means of controlling the use of land in agriculture. In connection with road construction, it can be used to promote conservation or other general aspects and to reduce the negative impact on agriculture.

The Concession Act

Date: 31 May 1974. No. 19
Authorities responsible: Ministry of Agriculture, Department for Agriculture in the respective County Governors' offices.
Regulates and controls the sale of properties to protect the interests of society, including agriculture, nature and open-air recreation.

The Cultural Heritage Act

Date: 9 June 1978. No. 50
Authorities responsible: Ministry of the Environment, Directorate for Cultural Heritage, county councils.
The aim of this Act is to protect prehistoric and historic monuments and cultural environments with their distinctive qualities and diversity as part of our cultural heritage and identity, and as part of the overall management of the environment and resources. Prehistoric and historic monuments and cultural environments that are of value for cultural history or architecture are to be protected under the terms of this Act.

Act relating to Salmonids and Fresh-Water Fish

Date: 15 May 1992. No. 47
Authorities responsible: Ministry of the Environment, Directorate for Nature Management, Department for Environmental Affairs in the respective County Governors' offices.
Aims to ensure that natural stocks of anadromous salmonids, freshwater fish and their habitats, together with other freshwater organisms are managed in such a way that the diversity and productivity of Nature is preserved. Within this framework, the Act provides for the development of stocks with the aim of increasing yields, for the benefit of anglers and those with fishing rights.

Act relating to Motorised Traffic on Marginal Land and Watercourses

Date: 10 June 1977. No. 82
Authorities responsible: Ministry of the Environment, Directorate for Nature Management, Department for Environmental Affairs in the respective County Governors' offices, municipalities.
The aim of this Act is, for the benefit of society as a whole, to regulate motorised traffic in unfenced areas and on rivers and lakes in order to protect the natural environment and promote peoples enjoyment of it.

Act relating to Forestry and Forest Conservation

Date: 21 May 1965, No. ??
Authorities responsible: Ministry of Agriculture, County Agricultural Committees, municipalities.
Aims to encourage timber production, establishment of forests and conservation of forests. Emphasis is placed on the significance of forests for recreational purposes, as an important element in the landscape and as habitats for plants and animals.

Act relating to Watercourses

Date: 15 March 1940. No. 1
Authorities responsible: Ministry of Industry and Energy, Norwegian Water Resources and Energy Administration, Department for Environmental Affairs in the respective County Governors' offices.
This Act provides the general legislation concerning rivers and lakes, laying down the framework for handling various forms of encroachment relating to them. It also stipulates limits for activities on rivers and lakes.

Wildlife Act

Date: 29 May 1981. No. 38
Authorities responsible: Ministry of the Environment, Directorate for Nature Management, Department for Environmental Affairs in the respective County Governors' offices.
The objective of this Act is to manage wildlife and the areas in which it lives in such a way that the productivity of Nature and its wealth of species are preserved. Within this framework, wildlife production can be harvested for the benefit of the agricultural industry and outdoor recreation.

Information on Nature

Information and co-operation are vital. Information on Nature that has relevance for road projects can be obtained from a number of sources. The most important are described here.

Environmentally-friendly planning requires co-operation across the board. Both the Planning and Building Act and the Public Roads Act lay down requirements concerning information, participation and co-operation from and between a number of interested parties. This is to ensure that every significant aspect of the matter concerned comes out during the decision-making process. Paragraph 16 in the Planning and Building Act stipulates that:

"The planning authorities shall provide relevant information about plans at an early stage.

Individuals and groups that are affected shall be given the chance to participate actively in the planning process."

The onus is consequently on the developers to inform affected parties about plans as early as possible in the planning process and to take the initiative for co-operation with them.

Who can contribute scientific knowledge?

The environmental management authorities at national and local levels, together with other scientific groups and organisations, have a particular responsibility for ensuring the proper management of Nature. This includes a responsibility to provide information to other sectors which include nature-related interests in their activities. The most important co-operative partners for the highways departments in this context are the respective Department for Environmental Affairs in the County Governors' offices and relevant departments in the county and borough councils.

It is the intention that the Department for Environmental Affairs in the County Governors' offices will make environmental goals known, state the minimum requirements with respect to environmental considerations, make available existing knowledge and give advice. The county councils should strive to ensure that co-ordinated planning takes place in accordance with the Planning and Building Act and that the planning processes include co-ordination, adequate reports and the integration of basic environmental considerations.

Good information and co-operative routines contribute to an enhanced level of knowledge about environmental assets in the county and form the basis for collaboration on the project in hand. It is the responsibility of the developer to ensure that every significant aspect associated with the overall landscape, the flora and fauna, the cultural landscape and outdoor recreation is investigated as a basis for the planning work.

The following administrative structure is responsible for nature management:

- Ministry of the Environment
formulates environmental policies and instruments in line with premises laid down by the Government and Parliament; it has administrative authority within its own area and is responsible for ensuring active environmental policies in all areas of society.

- Directorate for Nature Management
is the Ministry's specialist body on questions of nature conservation, landscape conservation, control of wildlife, fish, plants and development of outdoor recreation.

- State Pollution Control Authority
is the Ministrys specialist body for matters relating to pollution.

- Directorate for Cultural Heritage

is responsible to the Ministry of the Environment for scientific and management matters concerned with the protection of all prehistoric and historic monuments, including buildings and constructions, cultural landscapes, ancient monuments,

maritime historic monuments, Sami (Lappish) cultural monuments, boats and vessels and the SEFRAK registration (concerned with old, listed buildings).

The Directorates give specialist advice and are the responsible authorities within their fields. They have management responsibilities in areas where the county does not.

- The Department for Environmental Affairs in the offices of the County Governors and the chief county officers for cultural affairs in the county council offices represent the Ministry of the Environment at county level.

They are responsible for:

- making national environmental goals widely known
- contributing knowledge about the environment
- calling attention to discrepancies between concrete plans and national environmental goals
- calling attention to the need for investigations and information.

Other sources of knowledge about the environment, resources and nature are:

- the municipalities:

Engineering department, departments concerned with the environment, pollution, parks, outdoor recreation, agriculture, forestry, health, etc. wildlife board, freshwater fish board.

- county council
Departments for culture, outdoor recreation, planning, etc.

- Others:
County offices of the Norwegian Mapping Authority
Department for Agriculture in the offices of the County Governor
Regional offices of the Norwegian Water Resources and Energy Administration
Directorate for State Forests and Land
Regional offices of the Directorate for State Forests and Land
Organisations concerned with outdoor pursuits and nature conservation
Society for the Preservation of Norwegian Ancient Monuments
Regional councils for outdoor pursuits
Other developers in the same area

Universities, colleges, natural history museums, research groups, experts in the fields of landscape, form, biology or other sciences can also contribute valuable information for the planning work. Examples of these are:

DNMI	Norwegian Meteorological Institute
JORDFORSK	Centre for Soil Science Research
NGI	Norwegian Geotechnical Institute
NGU	Geological Survey of Norway
NIBR	Norwegian Institute of Urban and Regional Research
NILU	Norwegian Institute for Air Research
NIJOS	Norwegian Institute of Land Inventory
NINA	Norwegian Institute for Nature Research
NIVA	Norwegian Institute for Water Research
NLH	Agricultural University of Norway Research Park, Ås
NTH	Norwegian Institute of Technology
SINTEF	Foundation for Scientific and Industrial Research at NTH
NVE	Norwegian Water Resources and Energy Administration

Numerous data bases and registers concerned with nature

The majority of departments and institutions mentioned in this chapter have various registers containing information on the environment that will be useful for road planners. For a complete overview of this, see the publication "Environmental information in central environmental institutions in Norway" (in Norwegian). Norwegian Mapping Authority, Misam publication 1991-1.

NATURBASEN

NATURBASEN is a data base system for information on nature conservation, outdoor recreation areas and wildlife in use in every Department for Environmental Affairs in the County Governors' offices. Information from this should be part of the

basic information when evaluating and planning road construction that encroaches upon areas containing potentially valuable natural environments. NATURBASEN is a decision-support system for planning and wildlife protection measures. It is a continuation and integration of the following registers:

EDNA	Data register of environmentally valuable areas Contains information on 5,000 - 10,000 areas which are either pro tected or registered as being of special interest in a nature conser vation context.
FRIDA	Data register of outdoor recreation areas Contains information on 5,000 - 10,000 outdoor recreation areas.
VILTREG	Data register of areas with notable wildlife Contains information on 50,000 areas.

VILTOBS
Contains wildlife observations fixed on a grid system, and information which is not openly accessible concerning vulnerable, rare or endangered species of animals and birds.

The main difference between the old and the new system is that it is geographical location and not the type of area which determines the division into areas. An area may contain special information from all the old registers and still be a single area. In this way, it is possible to acquire all the information available concerning one geographical area from a single data base.

The Directorate for Nature Management is responsible for developing and updating the data base system. The Department for Environmental Affairs in the respective County Governors' offices is responsible for entering and updating data in the data base. The use of the registers varies from county to county. Some counties have reached an advanced stage in the process of linking the registers up to digital maps.

What information can be obtained from NATURBASEN?

The following gives an overview of the information on an area available from NATURBASEN:

- the intrinsic value, conservation merit and utility value of the area
- whether approved area development plans exist
- specific seasons that are important for activities in the area
- type of natural environment
- status of plans
- ownership
- management
- location on a map
- size
- length of shore line
- 100 m zone along a lake or river
- operational area
- information on conservation status
- areas reserved for outdoor pursuits
- appropriate use
- information about wildlife
- types of access

A temporary data base covering cultural landscape registrations was added to NATURBASEN in 1994.

What can NATURBASEN be used for?

Information from NATURBASEN can be used as a foundation in the planning process. Important areas of natural environment are registered here, sometimes inadequately. All these areas are interacting ecologically and visually with their surroundings, and it is often the surroundings themselves that enable these special areas to be located just where they are.

NATURBASEN provides information on which areas are inadequately coverered by the registrations. The respective Department for Environmental Affairs is among those responsible for drawing attention to such areas. When road works are being planned, the developer is obliged to obtain information that is lacking for a thorough evaluation of the area.

Glossary

Administrative conservation
Areas protected by the landowner using administrative procedures, e.g. through operational plans for the property. Covers most alpine birch forests and coniferous forests, also known as virgin forest. The majority are essentially totally protected forest reserves. They may be on state-owned or other publicly-owned land. They lack a statutory basis in the Nature Conservation Act.

Aesthetics
Value from a beauty viewpoint.

AOO areas
Different categories of areas used in municipal development plans, as authorised by paragraph 20 section 4 of the Planning and Building Act; abbreviation for agricultural, open countryside and outdoor recreation areas.

Areas acquired for outdoor recreation using national funding
Areas which public authorities obtain the right for the general public to use through land acquisition or permanent right-of-use agreements (servitude agreements).

Areas where flora and fauna are protected
This category of conservation protects the botanical and/or zoological conditions in an area, but the habitats of the species are not correspondingly protected. Authorised under the Nature Conservation Act or the Wildlife Act.

Automatic protection of prehistoric and historic monuments
Applies to all cultural remains from before 1537. These are automatically protected, or listed, under the terms of the Cultural Heritage Act. All Sami (Lappish) cultural monuments that are more than 100 years old are also protected in accordance with the same Act. A 5 m wide buffer zone around the monument is also automatically protected. The Act makes the developer responsible for having the area investigated.

Bern Convention (1982)
International agreement aimed at preserving European species of wild animals and plants and their habitats.

Biological diversity
Also called biodiversity. The diversity of plant and animal species, their ecological functions and their genetic variations.

Biotope
The area where a specific animal or plant species finds its life-sustaining requirements, cover, food and water, satisfied.

Bonn Convention (1983)
International agreement on conservation of endangered and vulnerable animal species which swim, fly or migrate across national borders.

Conservation of plant and animal life, including protection of biotopes
Strict form of conservation which protects the botanical and/or zoological conditions in an area, as well as the habitats of the species. Used mostly for plant or bird sanctuaries. Authorised under the Nature Conservation Act.

Conservation of rivers and lakes
Rivers and lakes have been protected against development by the power industry by parliamentary resolutions based on four conservation plans up to 1994. They can also be protected under the terms of the Nature Conservation Act as part of a protected area.

Conservation of species
This form of conservation covers specific species of flora or fauna which are protected throughout the country or in parts of it. Authorised under the terms of the Nature Conservation Act and the Wildlife Act.

Convention
International agreement.

Convention on Biodiversity (1993)
The Rio Convention
Conservation and sustainable use of the biodiversity, together with fair distribution of the fruits of the utilisation of genetic resources.

Cultural environment
Areas where prehistoric and historic monuments comprise part of a greater entity or continuity, such as farms, groups of buildings, centres of vil-

lages or other areas with a functional connection.

Cultural landscape
All landscape which has been influenced by the activities of Man.

Cultural monument protected by resolution
Historic monuments and cultural environments from 1537 to the present are protected under the terms of the Cultural Heritage Act.

Cultural monuments
All traces of human activity in our physical environment, including locations of historic events and places with historical, religious or folklore associations.

Designated areas
A category covered by the area section of the municipal development plan under the terms of paragraph 20 section 4 of the Planning and Building Act. Such areas can be designated as recreational areas for four years, with an option of two year`s extension, but must then be regulated.

Diversity
Richness of variation. When it is exposed to changed stresses, a system that consists of many different components and processes has more alternative solutions and processes to choose from than a uniform system.

Ecology
The study of the relationships between living organisms and their environment. Production, habitats and opportunities for dispersal for flora and fauna, climatic effects, influence on water management, etc.

Ecosystem
Interrelationships between all plant and animal species and their organic and inorganic environment (soil, water, minerals, etc.) within a limited area.

EDNA
Data register in the Department for Environmental Affairs in the respective County Governors' offices covering particularly interesting natural environments. Contains information on 5,000 - 10,000 areas, both protected ones and those which are of interest in a nature conservation context. Forms part of NATURBASEN.

Encroachment
Encroachment into Nature. Human activities which lead to physical changes in the natural environment.

Fragmentation
Dividing up of areas.

FRIDA
Data register in the Department for Environmental Affairs in the respective County Governors' offices covering outdoor recreation areas and containing information on 5,000 - 10,000 areas. Forms part of NATURBASEN.

Fringe effect
Where two or more ecological systems meet, a separate ecological system will develop which is richer than the sum of the two separate systems.

Genetic resources
The total amount of genetic material in all plants, animals and micro-organisms.

Landscape
The total complex of physical elements in a given area.

Landscape conservation area
Areas where characteristic or beautiful natural or cultural landscapes should be preserved. Measures which alter the character of the landscape cannot be carried out. The mildest form of conservation. Authorised under the Nature Conservation Act.

Margin vegetation
Trees and plants which grow in a transition zone between two biotopes, e.g. between woodland and agricultural land.

Monoculture
Continuous growing of one type of crop, e.g. wheat over a large area or pure spruce production.

National guidelines
National guidelines are a means for the Government to communicate national policies to counties and municipalities. Authorised under the Planning and Building Act.

National park
Natural environment where landscape, flora and fauna, natural and cultural monuments are protected against development, pollution and other encroachments. The largest conservation areas with

almost undisturbed, characteristic or outstandingly beautiful nature; mostly on state-owned land. Authorised under the Nature Conservation Act.

Natural area
An area of countryside; may contain different types of nature.

Natural environment
Our physical surroundings, with emphasis on those bestowed by nature. These include the topography, climate, soil and the flora and fauna in water and on land. The natural environment has been formed by geological and ecological processes operating over thousands of years. The human factors affected these processes at a late stage, but have become increasingly stronger and more critical for the quality of the natural environment, not least for the wealth of species.

Natural landscape
Landscape which has only been slightly affected by human activities.

Natural monument
A strictly protected, characteristic or scientifically important natural site, object or occurrence. The majority of objects are trees or groups of trees where the area itself is not protected. Authorised under the Nature Conservation Act.

Natural resource
Something occurring naturally which Man can utilise commercially. Divided into renewable and non-renewable resources.

NATURBASEN
Computer register operated by the Department for Environmental Affairs in the offices of the respective County Governors. It is a co-ordinated and expanded compilation of the three registers EDNA, FRIDA and VILTREG, and was established in 1992.

Nature conservation
Nature is a national asset which must be protected. Nature conservation involves managing the resources while having regard for the close interdependence between Man and Nature and the need to protect the qualities of Nature for the future. Nature Conservation Act, 1970.

Nature reserve
The strictest form of conservation. Total conservation of undisturbed or almost undisturbed nature. The conservation regulations can also be applied to special forms of nature. In addition to non-specified nature reserves, there are reserves specifically for broad-leaved deciduous woodland, coniferous forest, mire, wetland, seabirds and geology. Authorised under the Nature Conservation Act.

Natures toleration level
The limit in the amount of pollution and encroachment that Nature is able to withstand without damage occurring to sensitive or major parts of the ecosystem (including safety margins). Toleration levels vary for different geographical areas.

Principle of «look before you leap»
The ministerial declaration from the environment conference in Bergen in 1990 states that to achieve sustainable development, politics and strategies must be based on the principle of «look before you leap». Environment-related ventures must anticipate, prevent and attack the causes of deterioration of the environment. Where there is danger of irreversible damage, the lack of full scientific information should not be used as an excuse to postpone measures aimed at avoiding deterioration of the environment.

Puncturing effect
If an area is to continue to be thought of as unspoilt, a certain distance is required from man-made structures, such as buildings and roads, the sight of these and noise carried from them. The size of the unspoilt area is important for outdoor pursuits, flora and fauna. A road or construction built within or alongside such an area will reduce the degree to which the area remains unspoilt. In a broad belt along the road (depending on the road standard, its alignment, the types of nature and the landscape forms) the previously unspoilt area will be reduced to an altered area. The road "punctures" the unspoilt character of the area.

Ramsar Convention (1975)
International agreement on conservation of wetlands, with particular respect to aquatic birds.

Species
Common term for individual examples of plants or animals which can produce fertile offspring.

Sphere of influence
When construction takes place in the natural environment, it influences an area that is much greater than the actual construction itself. Factors and aspects that are affected may include noise, dirt, shocks, enjoyment of landscape, cultural history, views (in and out), migration and dispersion routes for animals and plants, groundwater, etc. The total area which is affected or altered by the construction process is called the sphere of influence or the area of influence.

Stock
Total number of individuals of a species within a defined area.

Sustainable development
A political concept for economic and social development. The United Nations World Commission defines the concept as "a development which satisfies present-day requirements without destroying the opportunities of future generations to have their needs met."

Type of nature
A limited, uniform area of countryside with a characteristic composition of species of plants and animals. Mire, coniferous forest and hayfield are examples of different types of nature.

UNEP
United Nations Environment Programme.

VILTOBS
Computer register operated by the Department for Environmental Affairs in the offices of the respective County Governors containing information on vulnerable, rare and endangered species of animals and birds. Classified information.

VILTREG
Computer register operated by the Department for Environmental Affairs in the offices of the respective County Governors containing information about some 50,000 wildlife areas. Incorporated into NATURBASEN in 1992.

Virgin forest
Forest which shows no trace of human influence.

Washington Convention (1975)
International agreement which regulates the international trade in plants and animals threatened with extinction.

Wetland
Areas which contain permanent surface water, or very wet land.

Check List

A check list to help road planners look after the interests of nature during the planning process

Project:

Basic information	**YES**	**NO**
Have you contacted the Department for Environmental Affairs intheCountyGovernor'soffice and the municipal environment officer as early as possible in the process?		
Have you looked into other available sources of information on natural and cultural assets in the area?		
Have you taken steps to acquire information on the natural and cultural environments, the landscape and outdoor recreation areas that is not available in the Department for Environmental Affairs or other offices?		
Have you taken contact with specialists to have specific matters investigated?		
Co-operation Have you followed the requirements of the Planning and Building Act and the Public Administration Act as regards giving information, co-operation and participation?		
Have you co-operated with the Department for Environmental Affairs, the county council and the borough councils to obtain the best possible outcome for natural and cultural assets in the sphere of influence of the road?		
Has there been co-operation and assistance above and beyond that required by law?		
Planning in areas of countryside in general Have you limited the sphere of influence of the road in co-operation with the Department for Environmental Affairs?		
Have you evaluated the consequences for the natural and cultural environments, the landscape and outdoor recreation in the sphere of influence of the road?		
Have you, as far as possible, avoided disturbing or fragmenting valuable areas of countryside?		
Have you, as far as possible, safeguarded the migration routes of animals, the opportunities for fish to swim unhindered and the links between areas of countryside?		
Have you, as far as possible, accommodated the road to suit the natural and cultural environments, the landscape and outdoor pursuits at every level from choice of alignment to design of details?		
Has the route of the road, its alignment and all the constructions been subjected to specialist aesthetic evaluation?		
Have you evaluated and presented proper alternatives which will reduce the consequences for the natural and cultural environments, the landscape and outdoor pursuits?		

Have you, in the planning proposal, put forward suggestions for measures to alleviate impacts?

Have you, in the planning documents, explained the consequences of the road for the natural and cultural environments, the landscape and outdoor pursuits?

Planning in extensive, uninterrupted areas of open countryside
Have you, as far as possible, taken into account the size of the area?

Have you, as far as possible, taken into account the core areas?

Have you, in co-operation with the borough councils and the county council, considered measures to hinder other developments in the wake of the road?

Planning in shore zones
Have you, as far as possible, taken into account the width of the shore zone?

Have you, as far as possible, taken into account the continuity of the shore zone?

Have you, as far as possible, taken into account the vegetation in the shore zone?

Planning in agricultural landscapes
Have you, as far as possible, taken into account the continuity and important links in the landscape?

Have you, as far as possible, taken into account the natural and cultural environments, and prehistoric and historic monuments?

Planning in outdoor recreation areas near urban environments
Have you, as far as possible, taken into account the size of the areas?

Have you, as far as possible, taken into account the qualities of the areas?

Have you, as far as possible, taken into account access for pedestrian and cycle traffic, and links with the green area?

Planning in the green spaces of built-up areas
Have you, as far as possible, taken into account the continuity of the green area?

Have you, as far as possible, taken into account the form of the green area?

Have you, as far as possible, taken into account the content of the green area?

Conclusions
Is the plan good enough in relation to the consideration that should be given to the natural and cultural environments, the landscape and outdoor pursuits?

Notes:			
Date:	Signed:		

And to conclude.....
Have you reconsidered old plans which did not meet the requirements of the natural and cultural environments, the landscape and outdoor pursuits?

Construction and Maintenance

Building plans are not dealt with in this handbook. However, it is emphasised that the way the road is built can also have an immense effect on the natural assets. It is important that the precautions advised in this handbook are also applied during the construction and maintenance of the road.

Removing rock and earth, Hordaland.
Photo: Erling Grønsdal

Site where superfluous stone and earth is dumped and equipment and stores are kept, Sannanger, Hordaland.

Clearing snow on Sognefjellet in winter.
Photo: K. Skagen

Rest area in Måbødalen.
Photo: Erling Grønsdal

Stone-lined embankment in Drivdalen, Sør-Trøndelag.
Photo: Tor Landløpet

The initial report concludes that the surface water from the bridge should be drained via a drainage and collection basin which can store pollutants which would otherwise run directly into Hallevannet, for example if a tanker overturned on the bridge or the adjoining road.

Handling potential accidents. Source: Norwegian Public Roads Administration, Vestfold.

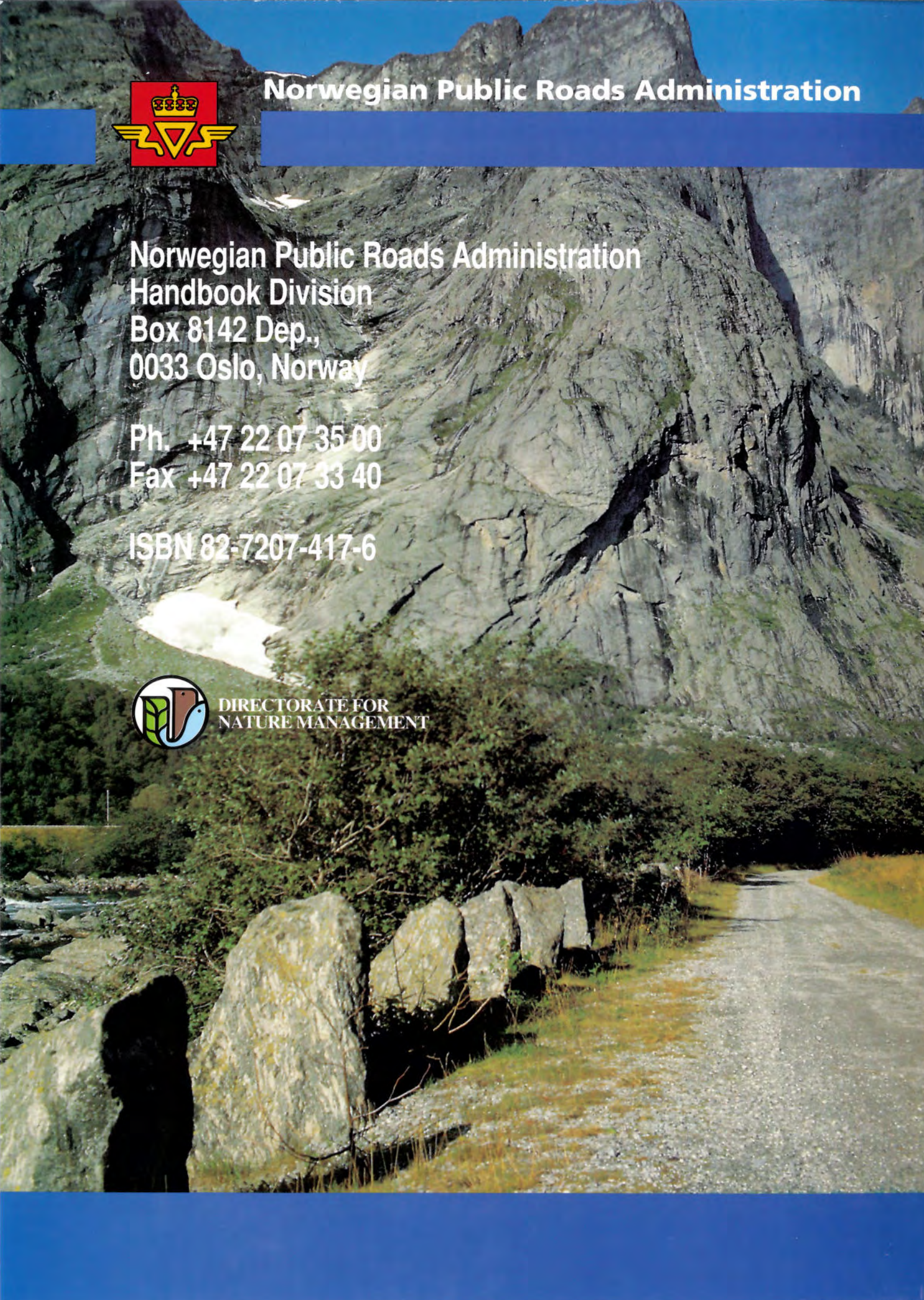
Site where equipment and stores are kept, Salhus bridge in Hordaland.
Photo: Erling Grønsdal

Blasting technique. Askøybroen in Hordaland.
Photo: Erling Grønsdal

Draining and runoff at Dale near Voss in Hordaland.
Photo: Erling Grønsdal.

Cutting back the trees
Photo: Ivar Eggen

Road under construction at Dale near Voss in Hordaland.
Photo: Erling Grønsdal



Norwegian Public Roads Administration
Handbook Division
Box 8142 Dep.,
0033 Oslo, Norway

Ph. +47 22 07 35 00
Fax +47 22 07 33 40

ISBN 82-7207-417-6

DIRECTORATE FOR
NATURE MANAGEMENT