



Analysis of Measures in accordance with the Four-stage Principle

- a general approach to
analyses of measures for
the road transport system

1 Demand for transport
and modes of transport

2 More efficient utilisation
of the road network

3 Improvements and
minor rebuilding

4 New investment and
major rebuilding

Analysis of measures in accordance with the four-stage principle

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Analysis of Measures in Accordance with the Four-Stage Principle – a general approach to analyses of measures for the road transport system.

Main contents

A description of the general approach "The Four-Stage Principle", for use in analyses of measures for the road transport system.

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1 Introduction

Society's measures with respect to the road transport system shall be based on a total view, and be intended to secure the provision of socio-economic, efficient and long-term sustainable transport support for citizens and the business community throughout the country.

The intention of the report is to give a direction to planning work which guarantees a broad approach, in which the best measures shall be found for solving a deficiency. The report gives a general description of the four-stage principle and its application within the SNRA, and gives an example of how analyses of measures can be carried out.

We have chosen to call the report "Analysis of measures in Accordance with the Four-Stage Principle", as it is about analysis of measures in general, and is not limited to planning of measures in work with road transport plans.

The report, Analysis of Measures in Accordance with the Four-Stage Principle, has been produced by the Department for Road Design and Traffic, having been ordered by the Unit for Government Road Management, and the Unit for Planning of the Road Transport System, whose network has functioned as a reference group. Work has been ongoing during the period December 2000 until September 2001.

At a late stage of the work, the designation used previously of four-stage model was replaced with four-stage principle, in order to further emphasise that it is about an "approach" and not a strict model.

Work Group

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2 Description of the Four-stage Principle

2.1 What is the Four-stage Principle?

The four-stage principle should be seen as *a general approach to analyses of measures for the road transport system* and not as a strict model that should be applied at some specific planning stage. It was originally launched in order to manage investment funds, but has been developed to a general planning principle for management of resources and reduction of the road transport system's negative effects. The four steps involve measures being analysed in the following order:

Step 1. Measures which affect the demand for transport and the choice of modes of transport

Covers planning, control, regulation, effect and information bearing on both the transport system and society at large, in order to reduce the demand for transport or transfer transport to less space-requiring, safer or more environmentally friendly means of conveyance.

Step 2. Measures that give more efficient utilisation of the existing road network

Covers input within control, regulation, effect and information directed towards the various components of the road transport system, in order to use the existing road network more efficiently, more safely and in a more environmentally friendly way.

Step 3. Road improvement measures

Covers improvement measures and rebuilding of existing segments, for example, traffic safety measures or load-bearing capacity measures.

Step 4. New investment and major rebuilding measures

Covers rebuilding and new building measures, which often demand new land, for example, new segments of road.

The principle is constructed on a general transport-type approach, but primarily deals with deficiencies and problems within the road transport system. A basic consideration is that measures outside the road transport system can reduce the demand for road transport, and thus the requirement for measures within the road transport system. As a first step therefore, measures outside the road transport system should be tried. After that, the principle is, to a very large extent, concerned with analyses of measures within the road transport system.

2.2 Background

In connection with the formulation of the present traffic policy, see Government Bill "Transport Policy for Sustainable Development" 1997/98:56), the requirement was expressed that, to an increased extent, solutions should be chosen that utilise existing roads in a more efficient way. In this context, it was recommended that before new building and rebuilding of the road infrastructure be proposed, one should be able to show that alternative solutions had been analysed and considered.

The Government Bill also stated that the planning system should be designed to permit co-ordination of and weighing up between different types of measure within the transport sector. Against the background of this emphasis on the holistic view of the transport system, proposals for suitable solutions to identified problems should be discussed and tried in a more unbiased way than previously. This can, for example, be done through more efficient utilisation of the existing road network, or as alternative measures to infrastructure measures, such as controls or intelligent transport system measures.

In the SNRA's guidance to the regions and to the units at the head office, prior to planning of measures 1998 – 2007¹, it was stated that the four-stage model (as it was earlier called) could be used in the following way in order to carry out examination of various proposed solutions:

- First, those measures that can affect the demand for transport and the choice of mode of transport should be considered and tested.
- In a second stage, measures should be tried which give more efficient utilisation of the road network. These can be measures such as controls, regulation, information, intelligent transport systems and charging systems.
- In the third stage, improvement measures can be tried. These can be widening, rebuilding of intersections and other limited building measures in combination with intelligent transport systems.
- Only in the fourth and last stage should new investment be considered.

¹ Guidance for the Regions and Units at Head Office. Basis of the National Plan for the Road Transport System and for the Regional Transport Plans, (13-03-1997), Appendix 8, Page 3.

2.3 Application

Basis

The four-stage principle describes an approach in the analyses of measures for solving identified problems and deficiencies. It therefore presupposes that an analysis of deficiencies has been carried out, in which the existing situation is compared with the transport-policy goals.

Goal

The paramount goal of transport policy is "to ensure socio-economic, efficient and long-term sustainable transport support for citizens and the business community throughout the country". By "long-term sustainable" is meant both ecologically, economically, socially and culturally sustainable.

The general goal is given precision in five subsidiary goals for the transport system:

- An accessible transport system
- High transport quality
- Positive regional development
- Safe traffic
- Good environment

Yet another subsidiary goal – equality of opportunity – has been formulated in the Government Bill 2001/02:20 Infrastructure for a Long-term Sustainable Transport System². The stage goals and other measures need to be developed for this subsidiary goal. It is therefore not dealt with in this document.

Other relevant goals to deal with in connection with the analysis of measures, are the general environmental quality goals for society, and the architectural-political goals.

The subsidiary goals for the transport system should be given precision as far as possible for each particular planning case.

Analysis of conditions and deficiencies

A survey of conditions in the road network and its surroundings is given in the analysis of conditions. After that, the analysis of deficiencies is made, with reference to relevant types of traffic and groups of road users, by means of a systematic run-through of the transport-policy goals and goals for individual planning cases. Analyses of conditions and deficiencies are not developed further in this report.

² Adopted by the Riksdag without change, 14-12-2001.

Requirements of Measures

It is often not possible to attain all goals, on account of goal conflicts and/or limited resources. When deficiencies and problems in relation to goals and other formulated requirements are identified, some form of adjustment and prioritisation is therefore required between the goals. Even if the starting point for the analysis of measures should be to solve the problems, measures which only partially solve the problems must also be tried.

Work Methods

In application of the four-stage principle in analyses of measures, the method of working should be characterised primarily by an *unbiased approach* and a *step-by-step consideration* of measures. All work, including earlier analyses, shall be *documented* in a relevant manner.

Unbiased approach

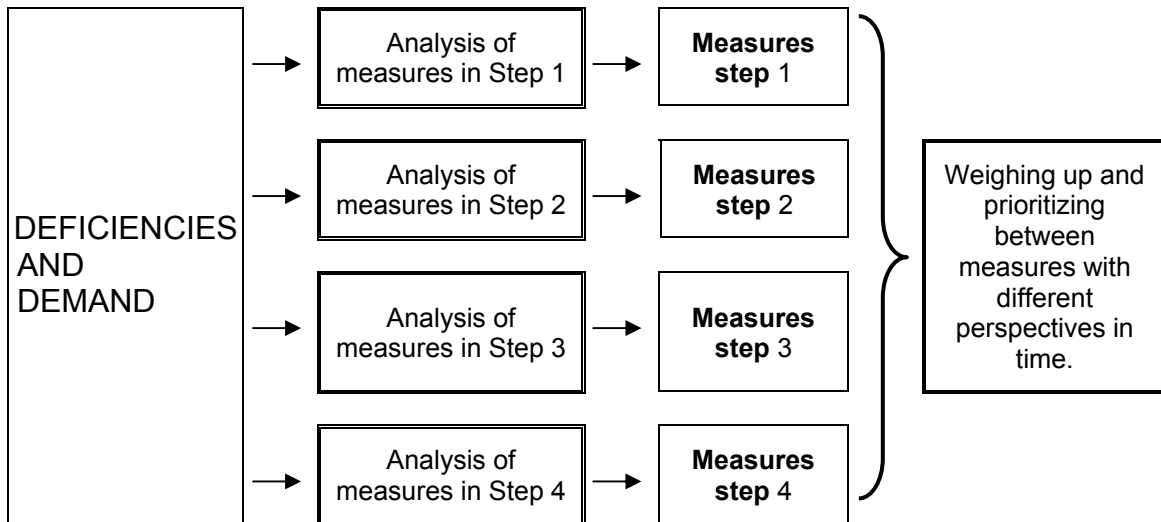
Irrespective of when and where the analysis of measures is carried out, both measures within the road transport system, and measures outside the road transport system and all their components (users, vehicles, infrastructure and regulatory system) must be considered. In discussions concerning which conceivable measures shall be analysed, it is therefore important to have an *unbiased approach*. Consequently, representatives for various interests should participate, so that all conceivable measures emerge, and the questions at issue are correctly elucidated.

Step-by-step consideration of measures

The four-stage principle involves first considering whether one can fully or partly attain one or more of the goals with the measures in *step one*. After that, measures in *step two* are considered, etc. When all the steps have been gone through, a weighing up and prioritisation of measures with various time perspectives is made, taking into account cost-effectiveness and long-term sustainability.

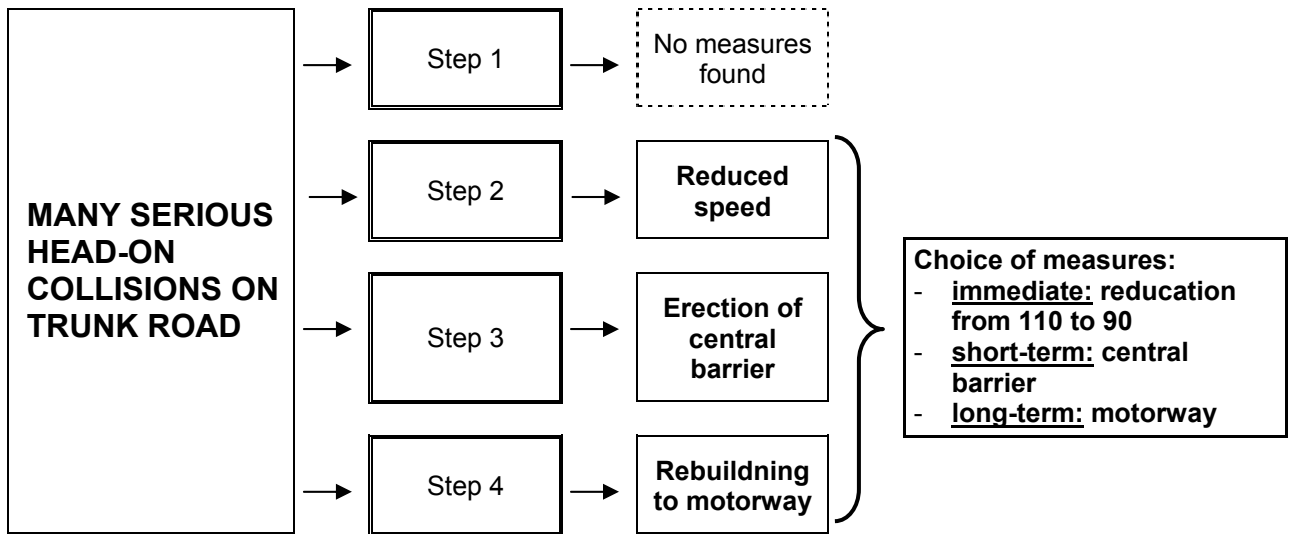
Even if a measure is found which partly fulfils the goals, there may be measures at a later stage that solve all problems or which are more cost-effective, and therefore are better in total. All steps should consequently be gone through if it is not obvious that the goals are attained in a cost-efficient and long-term sustainable way. Measures in the various steps should not be seen as alternatives, but can complement one another. The result can therefore be seen as a combination of measures from the different steps. The method of working can be illustrated by the figure on the next side.

Analysis of measures in accordance with the four-stage principle



Consideration of measures according to the four-stage principle, step by step

An example of how consideration can be carried out in steps can be shown by the following analysis of measures for Road E4 past Ljungby.



Analysis of measures for Road E4 past Ljungby

3 The Four-stage Principle within the SNRA

3.1 The SNRA's Tasks

The tasks of the SNRA have been widened during the 1990s. The SNRA has been given the collective responsibility (sector responsibility) for the entire road transport system, with the following tasks:

- **Sector tasks**
co-operating with and co-ordinating input to push on development of the road transport system
- **Exercise of authority**
producing and applying rules for vehicles, drivers' licences, traffic environment, etc.
- **Government road management**
developing and administering the Government road network

In addition, there are profit centres in the SNRA, with the task of carrying out production within project planning, building, operations and maintenance, and also training.

The sector responsibility of the SNRA involves responsibility for results for the entire road transport system. This responsibility is in addition to the operational responsibility the SNRA has for measures within the sector tasks, Government road management and exercise of authority. Within responsibility for results is included responsibility for influencing other participants to undertake measures which contribute to fulfilling the transport-policy goals.

The role of the SNRA is not only to satisfy demand for transport, but also to influence both the demand for transport and the way in which transport is carried out. One approach can therefore be to attempt to prevent the transport situation becoming a problem at all. Transport can often be forecast, even during urban and regional planning, and certain operational locations give transport that is longer and creates more disturbance than others. The SNRA affects locations and society's planning by participating in urban and regional planning. Demand for transport and modes of transport are thus also affected in processes outside traditional planning of measures.

Often a combination of regulation, physical measures and influencing measures give greater effect than any one of these methods alone. Some measures have a national effect, for example, legislation and taxation, while others have regional effects, for example, pricing and regional public transport, or local effects, for example road charging, parking fees and commuter parking. It is therefore important in analyses of measures to identify what effect different types of measure give from a system perspective, and not

only relate the measures to a specific planning problem or particular feasibility study.

3.2 Analysis of Measures in the Planning Work of the SNRA

Analysis of Measures at different levels

In order to demarcate analyses of measures for the road transport sector, some form of general transport type analyses of conditions and deficiencies in combination with other participants are required. The purpose of these is to indicate general deficiencies in the transport system, and deficiencies in the actual road transport system.

The purpose of analyses of measures for the road transport system then is to find the "best" measures, irrespective of:

- whether the measures are undertaken within or outside the road transport system
- the SNRA, or some other body, has the responsibility for carrying them out

Measures handled within the SNRA are structured differently in different contexts, for example, in accordance with purposes/goals of such things as general measures for passability, safety and environment. Or in accordance with how responsibility for planning and execution are allocated (for example, operational measures, investment measures or public transport measures). The search tool in *Effektsamband 2000 (Effect Connections 2000)* is an aid for being able to look both for appropriate measures to fulfil a certain goal, and describing various effects of a particular measure.

In the four-stage principle, measures are mainly structured on the basis of what part of the transport system they are directed towards. Step 1 deals with measures outside the road transport system, and measures directed at road users, vehicles and regulatory systems. Step 2 deals with controls, etc., within the road transport system. Steps 3 and 4 consist of measures directed towards the infrastructure. The structure is therefore independent of what purpose the measure has, or how the responsibility for the measures is divided up. The measures within each step do, however, differ depending on the planning situation. This is exemplified under each respective step below.

3.3 Long-term Planning

In the SNRA, analyses of measures are made at general level, in order to create a basis for long-term planning at national and regional level. The plans are dominated by road management measures, but also deal with the basis of the SNRA's other tasks

(see Chapter 3.1). The planning thus covers all the measures for which the SNRA has operational responsibility, i.e., apart from Government road management, also being sector tasks and exercise of authority. In the road transport plans for 1998-2007, this applies to the national plan, while the regional plans only cover parts of the national road management.

Between planning batches there is also a need for general analysis of measures resulting from decisions on special investment (for example, central safety barriers), or, as required, measures after unforeseen events such as new developments, serious accidents or natural catastrophes. There is no established method of approach for such analysis of measures. Actually, it is no different from the analyses of measures which are made as a basis for the long-term plans. They are like general analyses of measures, in that they are based on an analysis of conditions and deficiencies.

Directional Planning

Directional planning can be seen as a “programme stage”, which results in decisions on such things as total average allocation, division between types of transport and goal directions. In directional planning, the general transport-type analysis of conditions and deficiencies are made that indicate deficiencies in the road transport system, and general deficiencies in the transport system for which measures within the road transport system are conceivable.

Those surveys of conditions and deficiencies, and descriptions of effects which are made in directional planning, constitute the basis for the so-called directional decision, and should not be seen as proposals for choices of measures and prioritisations of objects, except in certain indicated exceptional cases. Work with proposing measures and prioritisations should normally therefore “start again” in an unprejudiced way in planning of measures.

In directional planning, measures are considered, which are of a general nature, and which often apply for the whole country. At this stage, solutions for solving deficiencies on longer links can also be considered, for example, the “right line” and the Road E6 from Uddevalla to the Norwegian border. Measures in accordance with step 1 for such a system must often be drawn up at this strategic level.

Examples of measures with directional planning

Examples of measures in accordance with step 1

- Reduction of vehicle traffic through higher charges
- General concentration on public transport
- General concentration on alternative types of transport, such as railway, aircraft or ship

Examples of measures in accordance with step 2

- General speed reductions
- Improved driver training
- Increased use of cycle helmets
- General emphasis on intelligent transport systems

Examples of measures in accordance with step 3

- General concentration on road improvements for increased accessibility, safety, environment, regional development and good transport quality
- General concentration on operational and maintenance measures

Examples of measures in accordance with step 4

- General concentration on new building for increased accessibility, safety, environment, regional development and good transport quality

Planning of Measures

Planning of measures is the stage that results finally in the long-term plans of the SNRA and the county. Planning of measures can be divided into three constituent parts: deficiency analysis, analysis of measures and prioritisation. The proposals for measures that emerge are often preliminary. Formulation of measures can change during later planning stages.

Conditions and deficiency analysis

An action-neutral and goal-oriented condition and deficiency analysis shall be carried out as a basis for selection and prioritisation of measures. It should be based on the present and expected condition of the transport system being compared with the goals, with respect to types of traffic and groups of road users. The analysis results in an assessment of deficiencies in relation to the goals. The deficiencies can be assessed for the entire transport system or the road transport system, demarcated road networks or geographical areas, single roads or segments, etc.

Analysis of measures

When the deficiencies are identified, all conceivable measures and combinations of measures are studied. Solutions in the form of information and influence measures, and directed traffic safety and environment measures, as well as object-based measures are studied and considered in accordance with the four-stage principle.

Often a measure cannot conclusively solve all problems. Therefore, a combination of measures is often necessary. In addition, limitations of resources and goal conflicts cause adjustments between different goals and allocation of measures over time.

Analysis of measures in accordance with the four-stage principle

The analysis of measures results in “gross lists”, with proposals for various types of measures

Prioritisation

When establishing plans, a prioritisation is made between different measures, and a grading of measures over time.

Examples of measures and planning of measures

Examples of measures in accordance with step 1

- Arrangement of school transport
- Improvement of public transport in a certain area, in consultation with the principal for public transport
- Location of new activities, in consultation with municipalities, so that the need for transport is reduced
- Road pricing in urban areas

Examples of measures in accordance with step 2

- Speed limits in certain sections
- Intelligent transport systems
- Control of traffic with dangerous goods
- Information and influence

Examples of measures in accordance with step 3

- Road improvements on certain segments, for example, the erection of median separation, improvement of side areas, load-bearing capacity improvements, improvements of worn road environments
- Improved operational and maintenance measures in the section of road

Examples of measures in accordance with step 4

- New building or rebuilding of the section of road, most often fully or partly as a new segment, for example, a new by-pass, new motor traffic route with separated carriageways, new motorway, new bridge with greater load bearing capacity.

3.4 Operational Planning

Operational planning results in operational plans which look ahead 1 – 3 years. These contain financial planning for measures which the SNRA has the responsibility of carrying out. For measures outside the road transport system, and for those measures within the road transport system for which others are responsible, the role of the SNRA is to influence the participants who are involved, for example, representatives of other types of transport, other road management bodies or vehicle manufacturers. As regards further investigation and design of such measures, the main responsibility lies with the participants involved. The SNRA also has an interest in

following both continued planning and the effects of such measures, for such reasons as to be able to co-ordinate them with its own measures, and in order to obtain experience for the development of the connections between measures and effects.

Planning of measures uses knowledge obtained earlier, and initiates continued work on the basis of existing proposals for measures. As to what process in the SNRA (by whom and where in the organisation), and how the analysis is undertaken, is determined by the type of measure proposed, for example, investment measure, sector measure or execution of authority. Thus, it is not decided by the type of deficiency involved. However, in the work, feedback to the deficiency has to be made to be able to make an unbiased assessment of the preliminary proposal for measures on the basis of in-depth knowledge.

3.5 Planning at Object Level

For those measures which the SNRA has the responsibility of carrying out, the analysis of measures is intensified in continued work towards a final choice of measures and design. In principle, this is carried out in parallel with planning, in accordance with 3.3 and 3.4, and is both initiated by and creates planning information. Analyses of measures at object level all have in common the fact that they are based on some form of preliminary proposal for measures. This imposes the requirement that assessments of conditions, deficiencies and proposals for measures carried out earlier must be gone through in order to clarify that this work is carried out in an acceptable way in the spirit of the four-stage principle, and that the decision-making information has been sufficient and is still valid.

How the work is then continued in order to produce the various final decision-making information for choice of measures and design differs depending on the proposed measure, as earlier. The best-assessed work procedures are those for traditional road-building measures. For this reason, the assessment below exemplifies the in-depth analysis. Equivalent investigation work is also made to produce final decision-making information for other types of measures.

Brief description of how continued investigation work is carried out for physical measures

Physical Road Planning

For road-building measures, which cover all measures involving some change in the physical design of the road or its surroundings that affect the traffic or the environment (this means that small measures such as erection of safety barriers, surfacing of gravel roads and cleaning side areas should also be considered to be road-building measures), an established, partly legislated, process with initial study, feasibility study, design plan and construction documents are applied. In this, analyses of measures are included, both in the initial study and the feasibility study.

Initial studies

Initial studies shall assess the problems, and propose conceivable measures, and shall be a basis for how it is assessed that significant environmental effects can arise, and shall give proposals as to how work is pursued. Continued work is dependent on what measures are assessed to become appropriate.

In the initial study, it is assessed whether the alternatives for measures have been considered in accordance with the four-stage principle at earlier planning stages. If earlier consideration showed that road-building measures can be appropriate, and the decision-making basis is still relevant, no further consideration in accordance with the four-stage principle is required. However, one should be aware that in-depth analyses in the initial study work can give reason for reconsideration.

It is also necessary to clarify whether measures, in accordance with steps 1 and 2 can contribute to removing defects within selected main solutions (road measures) and reduce the requirement for, or postpone, road-building measures.

For examples of measures, see "Examples of Measures, Planning of Measures"

Feasibility studies

A feasibility study shall constitute the basis for selection of measures for continued planning in the design plan and construction documents. In the feasibility study it is checked whether the alternative for measures has been considered in accordance with the four-stage principle at earlier planning stages. If earlier consideration showed that road-building measures can be appropriate, and the basis for decision making is still relevant, no further consideration is required in accordance with the four-stage principle. One should, however, be aware that in-depth analysis in work with the feasibility study can give cause for reconsideration.

One must also clarify whether measures in accordance with steps 1 and 2 can contribute to remedy deficiencies within the selected main solution (road measures) and reduce the requirement for, or postpone road building measures.

Step 3 measures (often called the 0+-alternative) shall, of course, also be assessed in the feasibility study. There shall, moreover, be assessment of the future situation if no measures are taken, (the so-called 0-alternative).

For examples of measures, see "Examples of Measures, Planning of Measures"

4 Example

4.1 Purpose

In order to show how measures can be considered in accordance with the four-stage principle in various planning situations, an example is shown as an appendix. The example does not refer to any specific stage, but the degree of detail is selected with a view to it being suitable for an initial study or a feasibility study.

The example shows how an analysis of measures in stages, according to the four-stage principle, can be undertaken for problems in the transport system, but it is not an example of how the actual report should be compiled. The purpose is both to show how deficiencies and problems can be identified/assessed through a progressive survey of the transport-policy goals, and also as to how the actual analysis of measures can be carried out.

The example is primarily intended to show the actual structure, but the formulation, conclusions, etc., are somewhat simplified; reasons for this include the fact that the conditions are partly invented.

4.2 Example in Principle

General Assessment

It can be appropriate to divide the general assessment into three subheadings, namely:

- Collecting information on the problem
- The condition of the transport system in the section in question
- The design of the existing road and previous measures

A brief description of the case in question is given under each of these headings.

Deficiency Analysis

In this section, a description is given regarding the five transport-policy goals, and with respect to the actual type of traffic (for example, cars, public transport, pedestrians and cyclists), and groups of road users (for example, motorists, children and the functionally disabled).

- An accessible transport system
- High transport quality
- Positive regional development
- Safe traffic
- A good environment

Under each of these headings, there is then a division, as appropriate, into the following subheadings:

- Present situations

Analysis of measures in accordance with the four-stage principle

- Goals (here, both the general goals and those goals which are appropriate in the case in question shall be given)
- Deficiencies in conditions compared with the goals.

After an analysis under these headings, it is appropriate to compile a

- Summary

Analysis of measures

The analysis of measures is carried out in accordance with the four-stage principle, i.e., in the following four stages:

- Reduced demand for transport and choice of alternative modes of transport (Step 1)
- More efficient utilisation of the existing road network (Step 2).
Can be appropriately divided into control and regulation, and intelligent transport systems
- Improvement measures (Step 3)
- Rebuilding or new building (Step 4)

For each step, a division should be made as follows:

- Conceivable measures
- Effects

The analysis of measures shall be carried out step by step, irrespective of what stage the process is at. If at previous stages one has rejected measures in previous stages, in accordance with the four-stage principle, it is only necessary to give an account of these if the basis for the decision is relevant and still appropriate. However, it should always be investigated as to whether the problem in question can be solved through a combination of presented proposals for measures.

Evaluation

State which measure or measures should be undertaken to solve the problem in question.

Here it is also appropriate to elucidate the question as to whether short-term measures are possible before carrying out the end solution.

4.3 Example Shown

The following example is shown in Appendix 1

- European highway through larger urban area

5 Identified Requirements for Continued Development

In the course of the work, it has been established that the requirement for joint bases in analyses of conditions and deficiencies is a prerequisite for being able to apply the four-stage principle in a relevant way, and one which is more or less equal in merit over the whole country.

Example

European Highway through Larger Urban area

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1 General Description

1.1 Introduction to the problem

At present, transport on the Road E4 through the central part of X-town is largely of the character of through traffic. This situation involves deficiencies in road safety, disturbance for those living in the area and for those unprotected road users who cross the European highway or travel along it. In addition to this, there is impaired passability for through traffic.

1.2 The function of the transport system

The transport system is of crucial importance for the business community, and of decisive importance for access to places of work, service and culture and leisure facilities. The transport system is thus of decisive importance for the development of the region and for the quality of life of its inhabitants.

1.3 The present design of the road and earlier measures

The design of the road as a two-lane road, centrally located through the city, has required measures to be undertaken in order to attempt to improve the situation in different ways. Thus:

- crossings have been rebuilt
- speed limits have been reduced on certain segments
- traffic control has been carried out in order to improve the environment
- traffic control has been carried out to improve passability for unprotected road users
- buses have been given priority at traffic lights
- attempts have been made to develop public transport.

Despite measures that have been undertaken, a considerable problem remains in the form of a high accident rate with resulting serious injuries, high traffic load and interruptions in passability.

2 Analysis of Defects

2.1 An accessible transport system

The existing situation

The existing traffic load on the Road E4 through the city is approximately 20,000 vehicles per 24-hours period on weekdays. The transport of timber through the city is from logging north of the river and north of the city. Most of the destinations are located south of the city. Of regional travel, at present 51% is by car and 5% by bus. There is at present, considerable pedestrian and cyclist traffic, unprotected, along the European highway and without level-separated crossings.

Goals

In general/As regards transport policy

”The transport system shall be designed so that the basic demand for transport by citizens and the business community can be satisfied”

Case in question

Both for those who live in the city and for the through traffic, it is of great importance that the traffic should either be removed from the city or, at least, that measures should be undertaken to improve the situation for the unprotected road users. As regards the environment, measures must also be taken to improve the situation for residents.

Problems

Because the timber terminals are located south of the city, conflicts of various types arise when such transport goes through the central parts of the city. The problems can be summarised as follows:

- passability is impaired because different types of traffic are mixed together
- traffic safety for unprotected road users is inferior
- the situation for those living in the vicinity is not satisfactory as regards noise and exhaust gases
- difficulties in developing public transport satisfactorily.

2.2 High transport quality

The present situation

The load bearing capacity of the road is unsatisfactory throughout the year. The evenness of the road and the road surface are also unsatisfactory. Passability through the central parts of the city is not satisfactory. The unprotected road user experiences great uncertainty. Public transport has difficulty in functioning in the required way.

Goals

In general/As regards transport policy

”The design and function of the transport system shall permit a high degree of transport quality for the business community”

The case in question

The road should have satisfactory bearing capacity, evenness, and be fully passable throughout the year. For people using public transport, the situation should be secure as regards keeping to timetables, and also adapted for functionally disabled people. As regards pedestrians and cyclists, there should be separate paths along the European highway, safe as regards traffic, and crossings of the European highway should either be on different levels or controlled by traffic signals.

Problems

In order that heavy transport may function throughout the year, the load-bearing capacity of the road must be improved. This also applies to the evenness of the road and the road surface throughout the year. With respect to the requirement that transport should arrive on time, passability through the central parts of the city must be improved. This latter is also of great importance for improved public transport. The situation for unprotected road users must also be improved.

2.3 Positive regional development

The present situation

The forest industry is the branch of industry which is of greatest importance for the development of the region.

Goals

General/From the transport-policy point of view

”The transport system shall promote positive regional development by both evening out the differences in the ability of different parts of the country to develop, and in counteracting disadvantages of long transport distances”

The case in question

Transport shall be undertaken in such a way that industry knows that it will arrive on time, and safely. The possibilities of getting to work quickly and safely must be improved.

Problems

The problem is to be able to transport timber from the felling regions to the processing locations, quickly and safely. It is additionally important that the unsatisfactory public transport connections for conveying people from their homes to their places of work should be improved.

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2.4 Safe traffic

The present situation

The segment of the European highway through the city involves clear road safety risks, both for vehicles and for unprotected road users. Despite crossings having been rebuilt, speed restrictions imposed and traffic regulation having been carried out, the road safety aspect is still unsatisfactory.

Goals

General/From the transport-policy point of view

”The long-term goal for road safety is that no-one shall be killed or seriously injured as the result of road accidents. The design and function of the transport system shall be adapted to the requirements resulting from this”

Actual cases

As long as the European highway goes through the city, the measures presented above must be intensified. In addition, further investment must be made in both summer and winter road management, as regards pedestrian and cycle paths.

Problems

An investigation must be carried out concerning measures which must be taken. Which measures can be taken in the short-term, which shall be seen in a longer perspective, and which can wait until final rebuilding.

2.5 Good environment

The present situation

The through traffic causes significant environmental problems in the city, especially for those living nearby. The big problems are primarily air pollution and noise. Transport of dangerous goods through the city is also a problem of great importance.

Goals

General/From the transport-policy point of view

”The paramount goal of environment policy is to hand on society to the next generation (in about 20-25 years) in which the big environmental problems have been solved, the so-called generation goal”

Actual case

The goal is to undertake measures in the transport system and in the city, so that the environmental problems described above can be reduced and finally surmounted.

Problems

An investigation must be carried out in order to clarify whether the noise problem can be solved fully or partly by erection of noise barriers or by replacing window glass. It would appear to be difficult to solve the exhaust gas problem. The routes to which transport of dangerous goods should be directed must also be investigated.

2.6 Summary

The analysis of deficiencies should be neutral as regards measures, not action-directed, meaning that the analysis should cover the requirements of all groups.

Expected future circumstances should also be assessed, in order to take into consideration changes in society regarding vehicles and road users, for example, new locations or general measures.

This means that it is important to study whether deficiencies can be rectified in a short-term and long-term perspective.

The analysis of deficiencies shall be carried out for the five subsidiary goals in the transport-policy prerequisites. Furthermore, it also means that after the analysis has been carried out, prioritising what measures are the most important ones to carry through. This work should constitute the basis of the following analysis of measures.

3 Analysis of Measures

3.1 Reduced demand for transport and choice of alternative modes of transport (Step 1)

Conceivable measures

It does not appear to be possible to reduce demand for the transport of forest products, as long as the forest industry is a main employer for the area, and as long there is a market for such products. To reduce demand for other transport is not possible either, with consideration to the requirements of the community.

Measures which should be discussed are the expansion of the railway, which requires the building of a new bridge over the river, improvement in public transport for conveying people, and improved conditions for pedestrians and cyclists.

Effects

As the transfer of transport to rail discussed in the area does not involve changing the locations of goods terminals and commuter stations, the local transport will retain traffic volume at the existing level. This leads, in total, to the planned and conceivable public transport and transport solutions only fulfilling established goals to a marginal extent.

3.2 More efficient utilisation of the existing road network (Step 2)

Control and regulation

Conceivable measures

Locally, it is possible to re-route traffic through the city streets, for example, when there is interruption (an accident) in the traffic. In a larger perspective, it is possible to re-route traffic over an adjacent river bridge, which is located 20km upstream. This would give a 48km longer travel distance. This bridge also has limited load-bearing capacity.

Effects

Re-routing traffic along city streets creates considerable new problems, but is one conceivable possibility. Re-routing the traffic via a 48km longer road increases the total environmental effect, but solves the problem of passability in the central parts of the city by the near absence of through traffic. This redistribution does, however, involve certain requirements for rebuilding work along the road to be utilised.

Intelligent transport systems

Conceivable measures

The SNRA and the municipality have been working actively for several years to benefit from the possibilities from intelligent transport systems. Use of intelligent transport systems for control of the choice of roads is effective in raising the capacity of a road network. It does, however, need flexible and durable possibilities of road choice available, which is, however, not the case in the urban areas.

Effects

Intelligent transport systems are an alternative which can solve problems in the cases of such things as an accident. Investigation of it should be continued.

The environment and passability problem will, however, not be improved through these measures

3.3 Limited building measures (Step 3)

Conceivable measures

Adjacent to the city and through it, the European highway has been worked on on several occasions during the past few years. Examples of such measures are roundabouts, pedestrian and cycle paths and crossings on separate levels for pedestrians and cyclists.

The measures mentioned above have brought positive effects in several ways, but have not, however, been sufficient by any means. Apart from the limiting measures, which have been carried out earlier, there are possibilities of further improving the situation along the arterial road through the city. However, such measures can probably not produce a satisfactory standard for the European highway through the city. The possibilities of attending to the air environment problem are probably also limited.

Effects

These measures fulfil the pedestrian and cyclist goals regarding passability and traffic safety, but the environmental problem remains, as does the passability problem for through traffic.

Despite the above measures, the environmental, safety and passability problems through the urban area will remain, and may intensify.

3.4 Rebuilding and new building measures (Step 4)

Conceivable measures

The possibility of building a completely new diversion past the urban area. Several different alternatives are possible to carry out, and should be investigated more closely. An alternative to limited rebuilding is to

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build a new bridge over the river at a position which would fit a future diversion. Another alternative would be to leave the European highway where it is, through the urban area, but at a sunken level.

Effects

A diversion or a new bridge would constitute land encroachment, but would solve the passability goal, and would solve the road safety goal to a great extent. An alternative sunken road solves the passability goal to a great extent, and the road safety goals, but not the environmental goals.

4 Evaluation

Solving the problem with the Road E4 through the city, solely with effects on the demand for transport and choice of transport, together with more efficient utilisation of the existing road network, would not appear to be economically defensible. These measures should be combined with "limited development measures" as described above. An investigation should also be carried out to see whether it is possible to solve parts of the through traffic problem with other measures.

With reference to the important function that the European highway has, and with reference to the considerable problems along the road through the city, investment in a new diversion must be considered in continued planning work.

With reference both to the high investment cost of development of a diversion, and to the limited funds available, a debate should be started as to whether the problem can be solved in a short-term perspective and a long-term perspective. In such case, an investigation must be carried out to establish whether the cost of development in a short-term perspective can be written off before the final development takes place.

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