Advisory guidelines for the environmental impact statement on the southern part of the (Dutch) National Motorway 73, from Venlo to St. Joost

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CONTENTS

SUMMARY OF THE ADVICE

This advice of the Commission for EIA contains recommendations for the content of the environmental impact statement (EIS) for the southern part of national motorway 73.

Definition of problems and objectives
The objective of the project is threefold: improvement of the living conditions in residences and of the accessibility and the maintenance of the economic potentials. The EIS should contain a definition of the problems for these aspects. Therefore, the bottlenecks and the developments must be described. Prognoses will be needed to show the origins of the initiative. Special attention must be paid to qualitative and quantitative prognoses for traffic and transport. In these, a distinction must be made between cargo transport, passengers travel and public transport. The prognoses should to be made for two situations: with and without the construction of the southern part of national motorway 73. Furthermore, in the issue of accessibility the role of the current connections must be described on various levels: internationally, nationally, regionally and locally.

The objectives of the project must be formulated as concretely and operationally as possible. An indication to what extent the proposed activity would solve the bottlenecks would be useful.

Alternatives and variants
The Commission suggests developing the alternatives starting from environmental aspects. These can be picked so that largely they correspond with the issues mentioned under the heading *current state of the environment*; this enhances the interaction between the various elements of the EIS.
All alternatives and variants must be discussed equally.
The Commission recommends considering following alternatives (increasing in magnitude of the operation):

- *Zero alternative (A)*
  This is the development that would occur without any extra measures being taken; only operations that cannot be reversed anymore, are involved in this alternative.
- *Zero plus alternative (B)*
  The Commission recommends elaboration of three variants of a zero plus alternative:
  - Bypasses alternative (B1)
    This implies road diversions to enhance the living conditions in the villages and towns.
  - Public transport alternative (B2)
    The EIS should show the perspectives for improving and enlarging passengers transport per train and bus.
  - Combination alternative (B3) of B1 and B2.
- *Motorway alternative (C)*
  Whether this is by reconstruction of the roads N271 and N273, this is to create one or two motorways, avoiding the towns and villages. In this alternative the junctions will be built as flyovers if possible (see also B1).

- *Expressway alternatives (D)*
  These are the three main routes mentioned in the notification of intent: a route on the eastern bank of the river Maas, and both routes on the western bank of the river Maas: the Lateral routing and the Napoleon routing (D1 through D3). For each alternative the EIS should also indicate which supplementary measures are to be taken at the other river bank.
- *Execution*
  The variants for the execution of the road must be described and differentiated into infrastructural measures and measures to control mobility and improve the quality of life.
- *Alternative most favourable to the environment*
  It is advised to develop the alternative most favourable to the environment from two issues:
  · residential conditions and quality of life;
  · natural environment.
  For the development of this alternative the Commission suggests considering combinations of the elements of alternatives A through D with the execution variants. In seeking solutions for the traffic problems a starting point could be to focus on local or regional problems.
  The EIS should show to what extent both ways of creating this alternative will lead to overlap and therefore to what extend they are combinable or exclusive.

Current state of the environment, autonomous development, environmental impacts
The current state of the environment and its expected (autonomous) developments must be described. For brevity, see sections 5.2 through 5.8 of this advice for the environmental impacts that deserve attention anyway.

Comparison of alternatives
The EIS should contain a matrix of the environmental impacts caused by the alternatives compared with each other and with the autonomous development of the environment.

Gaps in knowledge, programme for evaluation
The EIS must pay attention to remaining gaps in knowledge and to uncertainties and the consequences for the decision-making process.
The EIS can already contain a draft for an evaluation programme; this should be related with the gaps in knowledge as mentioned.

1. INTRODUCTION

The Department of Public Works intends to link National Motorway 67 near Venlo and National Motorway 2 near Maasbracht; this connection would be the southern part of National Motorway 73. The EIA obligation is linked with the routing decision by the Minister of Transport, Public Works and Water Management.
In writing this advice, the Commission has considered the written public comments, received through the competent authority.

2. PROBLEM DEFINITION AND OBJECTIVES

Environmental Protection Act, section 7.10, subsection 1, sub a:
An EIS shall contain at least: *" a description of the purpose of the proposed activity".*

2.1 Introduction

For a precise definition of the initiative and of the various objectives and their priorities, the backgrounds of the proposed activity must be described clearly and concretely. After a further analysis of the definition of the problems the main goal of the proposed activity must be clarified in the EIS.

The problem definition needs to contain a description of the present and future bottlenecks and (among others planning) development. These baseline data are necessary to show to what extent the proposed activity could solve the problems.
For founding the assumed need for the proposed activity the main policy items of the National Government and the province of Limburg are to be used (see also chapter 3).

The problem definition in the EIS can pay attention to the two main policy issues from the national policy for traffic and transport, which are accessibility and quality of life. This corresponds with the notification of intent, which says that improvement of the quality of life and of the accessibility are the main objectives of the project. In addition, it mentions the maintenance of the economic potentials of Northern and Central Limburg (and with that of the whole of Limburg) as a goal of the proposed activity.
The next sections contain further points of interest for the problem definition as for these three objectives. Section 2.3 provides guidelines for quantifying several aspects of the problem definition; it is not necessary for the EIS to have the same arrangement of sections.

With each data presentation the EIS should clearly indicate whether these are facts or assumptions; the reliability and accuracy of the input data – and thus of the output information – must be defined. This is very important for a good interpretation of the EIS.

2.2 Problem definition

Definition of the life quality problems
The problem definition in the EIS must be elaborated for the present situation (bottlenecks: see above) and the objectives regarding:

- air pollution,
- odour hindrance,
- noise,
- traffic risks (with special attention for transport of hazardous materials),
- social barrier impact,
- fragmentation, damage to nature and landscape.

Definition of the accessibility problems
The EIS should describe the accessibility of the area as a whole, and of places within the area, vehicle intensities, road capacities and congestion risks; illustrations with the help of maps might provide more insight in these data. A survey must be given in the EIS of the regional infrastructure (and its role) as it is and is it is expected to develop in the short term. The EIS must indicate where and to what extent the current connections are not or will not be satisfactory and where problems occur in truck traffic, passengers travel and public transport; it must also go into the (intended) quality of the connections.
The accessibility (and the accessibility bottlenecks) must be considered on various levels:

- internationally: The EIS must contain a proper description of the relevant parts of the road network and of the railroad networks in Germany, Belgium and the Netherlands. Which roads and railroads in Germany and Belgium are important to the study area and what role do they have? As far as the roads are concerned, at least the National Motorway 74 / A61, the road Roermond – Heerlen across German territory, the connections between Germany and Belgium through Venlo and the other important regional Belgian roads are to be considered. What role can the proposed activity fulfil for these roads?
- nationally: The notification of intent implies that the southern part of National Motorway 73 is important as a national north-south connection; how does this relate to for instance National Motorway 2 and other north-south connections (under construction) between the cities of Arnhem and Nijmegen and Maastricht?
- regionally and locally: This concerns roads that connect the various centres with each other.

Definition of economic development problems
The current and expected future economic developments must be described in the best possible way.
One may suppose that both (inter)national and regional/local interest are at stake. The EIS must therefore explain which interests are served in particular and to what extent the accomplishment of these objectives depends on the construction of the southern part of National Motorway 73. The Venlo distribution centre requires special attention.

2.3 Prognoses of baseline data

The EIS must describe both the qualitative and the quantitative regional traffic and transport problems with proper models (as baseline data). These calculations must be executed for truck traffic, car traffic and public transport. The most recent views on the expected environmental and economic developments in the region must be used and the most recent national policy must be considered. Possible deviations from this policy must be accounted for.
The construction of the southern part of National Motorway 73 will have its impact on the prognoses. Therefore, the calculations must consider both situations: without and with construction of the road (or an alternative). The latter calculation concerns a prediction of the traffic impacts of the initiative.
The prognoses should address the following aspects:

- origin, destination and size (now and in future) of the various transport flows (subdivided into freight and passengers traffic and public transport). Considering of the problems in the quality of life (noise, odour) a reliable prognosis of the truck traffic as part of the transport flows needs special attention. These data must be quantified as properly as possible for the period until 2010. The calculations should be use 24-hours-averages (subdivided into daytime and nighttime) and highest 1-hour-averages (per driving direction) for the various days of the week. The EIS should mention the recent development of the traffic intensities from about 1980 onwards.
- the expected extent of capacity problems and the places where these will occur;
- if a prognosis is possible: the periods of driving time gained for several typical relations;
- the changes that will occur in the distribution of traffic and transport ('modal split');
- the desirability of an entirely new expressway as part of the road infrastructure has to be shown by comparing this situation with an improvement of the public transport network and of the facilities for bicyclists and pedestrians in the entire region. This may include an improvement of the quality of public transport, of park and rail facilities, the levelling down of the rush hour intensities in commuter traffic, the construction of bus lanes and carpool facilities, home working, group transportation and stimulation of bicycle traffic or a (further) improvement of the existing road infrastructure. This element will also be found in section 4.3, alternatives B2 and B3. Scenarios must be developed for passenger traffic and freight transport by public transport, over the road, per ship and pipeline;
- indicate whether the construction of the southern part of National Motorway 73 will require any other new roads to be constructed;
- the EIS must show to what extent the construction of the southern part of National Motorway 73 will decrease the intensities on the existing national motorways (N271 and N273) and on other motorways or expressways in the Southeast of the Netherlands. Equally important are the relevant environmental impacts of such changes. It must also be stated whether - and if so, to what extent and where - the construction of the road will create additional car traffic (shifting of bottlenecks). In relation to this question the EIS must indicate to what extent the southern part of National Motorway 73 will reinforce the need for housing and for industrial and other activities.

For these calculations and prognoses the basic data must explicitly be mentioned in the EIS. This concerns:

- the basic parameters for the traffic prognoses and their assumed development in time;
- basic criteria for capacities, acceptable intensities and congestion levels of city roads and state motorways. In these criteria attention should be paid to the parameters that influence either the capacity or the acceptable intensity respectively on lanes and junctions;
- the extent in which possibilities have been considered to push back the mobility by car and the increase of car use and the concrete measures to be taken for this;
- traffic safety (number of dead and injured people).

2.4 Goal of the proposed activity

The objectives of the project must be derived from the problem definition in the EIS as considered before. The definition of the goal sets the framework for the alternatives (reasonable measures to be taken for reaching the goal stated). Hence a clear description of the goal will be necessary, if possible as terms of reference.

The EIS may not define the objectives in such a limited way that they would exclude alternatives, which are technically or economically less attractive but favourable to the environment. This implies not only the maximum avoidance or restriction of nuisance and damage to the landscape, but also the development of existing environmental qualities of the environment within the scope of this project.
From the defined objectives the EIS must derive concrete assessment criteria for checking the alternatives and variants that will be elaborated in the EIS. Environmental standards and target values are among these criteria.

It would be useful in the list of goals and assessment criteria to suggest which goals have the highest priority, and which are more secondary or derived.

3. DECISION-MAKING PROCESS

Environmental Protection Act, section 7.10, subsection 1, sub c:
An EIS shall contain at least: *"an indication of the decisions in the preparation of which the environmental impact statement is to be drawn up, and a review of the decisions previously taken by government bodies relating to the proposed activity and the alternatives described".*

The EIS must mention for which decision it has been compiled and by which authority this decision will be taken (here: the routing decision by the Minister of Traffic, Public Works and Water Management).
The objectives of the proposed activity must be verified against new developments in policy and regulations. This verification should include national, provincial and municipal policies with respect to traffic and environment.

The EIS must indicate in what manner these developments influence the decision-making process. To what extent can the proponent and the competent authority influence truck traffic over the road, if necessary in combination with rail transportation?

4. PROPOSED ACTIVITY AND ALTERNATIVES

Environmental Protection Act, section 7.10, subsection 1, sub b:
An EIS shall contain at least: *"a description of the proposed activity and the manner in which it will be carried out, and of the alternatives which should reasonably be taken into consideration".*

Environmental Protection Act, section 7.10, subsection 3:
"The alternatives to be described in accordance with subsection one, under b, shall in any case include the alternative which makes use of the best means available for protecting the environment".

4.1 Introduction

This chapter deals about developing alternatives. Generally at least a zero alternative (reference situation) and an alternative most favourable to the environment must be described. In this case, at least the following alternatives must be described or discussed:

- routing alternatives,
- execution alternatives,
- zero plus alternative.

The description of the alternatives and variants must clearly show what they mean, on which points they mutually differ, and which measures they include to protect the environment. Every alternative must be described in the same way. The descriptions must be as accurate as possible. However, a level of detail as used for contract drawings is not necessary. For each alternative or variant the preference of the proponent must be indicated.

The description of variants should consider the possibilities of gradual solution of bottlenecks, and show to what extent application of certain measures will limit the possibilities later to choose options that differ from the preferred alternative. It must be clear if these data are facts or assumptions.

Both for developing routing or capacity alternatives (two or four lanes) and for their description in the EIS the Commission advises to start by considering environmental aspects. If this development technique would show that design or execution aspects (concerning the construction and the use of the road) would have repercussions for the routing choice, the design and execution aspects must be addressed in the proper way (see section 4.6).

To improve the internal consistency of the EIS the aspects mentioned in chapter 5 (important to the impact prediction) should be taken as a basis choosing environmental aspects. These aspects might be clustered.

Apart from using these environmental aspects in the development of alternatives, at every moment in the development process the (rudimentary) alternatives have to be checked against the objectives defined according to the guidelines in chapter 2.
A partial overlap of the project objectives and the environmental aspects might occur, in particular in the field of quality of life.

The possibilities for routing are also determined by (technical) preconditions that depend on the nature and the proportion of the traffic and transport prognoses (see chapter 2). The prognoses for the intensity of private cars on the one hand and hand trucks on the other and their corresponding driving speed determine the number of necessary lanes, curves and other preconditions for the routing.

The EIS must pay explicit attention to the possible occurrence of so-called consequential activities (see also section 5.8); these are activities stimulated by of the proposed activity (or one of the alternatives), without being part of these (see also chapter 2). They can include building activities (industrial sites, housing), with the traffic and transport these new activities would generate. Vice versa, it must be indicated to what extent the routing choice will be determined by other large-scale projects, such as the Betuwe-route (a planned railroad from Rotterdam to Germany) or the northern part of national motorway 73 and the Waalsprong[1]].

Sections 4.2 up to 4.6 contain guidelines for the description of some of the alternatives. These sections are ordered along the extent to which the existing situation must be changed: zero alternative, zero-plus alternative, motorway alternative and then the three expressway alternatives mentioned in the notification of intent (East Bank, and two West Bank routes). Section 4.6 deals with the variants for the execution. The chapter finishes with guidelines for the development of the alternative most favourable to the environment.

4.2 No execution of the proposed activity ('zero alternative', A)

The 'zero alternative' is the development that will occur without any measures being taken to improve the transport situation and the bottlenecks between National Motorway 67 and National Motorway 2 (except the measures already decided upon). This description should be based on the development of the traffic and transport intensities as intended in the national policy for traffic and transport; the index of 139[2]] is important for the southern part of the Netherlands, although it should be noted that the index specifically for the region of Limburg may deviate[3]].

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1 The leap over the river Waal: a housing project in the province of Gelderland.

2 This index is the index for the automobility between the years 1986 and 2010.

3 In 1990 the Dutch government decided to change the national policy on traffic and transport. The goal of the new policy is to create a sustainable development. Predictions showed that without a new policy the automobility would grow, and the in the year 2010 this growth would be 70% (1986 being the baseline year). This growth would lead to many environmental and economical problems. Besides, accessibility problems would occur, be-
(continued...)

As stated, any additional measures do not belong to this alternative. The zero alternative does include measures completed, measures to be completed soon and measures that will start soon (after being decided upon), as they determine the so-called autonomous development of the environment. This includes for instance construction of road connections and detours, expansion of industrial or residential buildings, changes in groundwater catchment, land development, foresting and developments promoting tourism.

Based on the definition of the problems and the objectives the EIS must argue whether the 'zero alternative' can be considered an alternative feasible for elaboration and decision-making. If the 'zero alternative' is not feasible, it should still be described, but then only as a reference for the other alternatives and as basis for a prediction of the 'autonomous development of the environment'.

4.3 Zero plus alternative (B)

The EIS must pay attention to the possibility or impossibility to solve (part of) the bottlenecks as mentioned without the construction of National Motorway 73.

This alternative is to offer a solution for the most urgent bottlenecks with relatively modest additional measures. These measures go beyond those that have already been decided upon (for the latter will be part of the zero alternative). In the view of the Commission this alternative could be developed from three angles:

1. *Bypass alternative (B1)*
   One of the largest problems is the quality of life in the residential centres. This could be solved by means of detours. These must be described in the EIS. In combination with the detour other measures, such as a traffic guidance system might be developed.
2. *Public transport alternative (B2)*
   An alternative must be developed and described in which both the towns will be relieved and the existing damage to the environment will be decreased by improving the facilities for passenger transport per train and bus. This alternative may include freight transport over water, rail and pipeline.
3. *Combination alternative*
   Both alternatives mentioned (B1 and B2) can be combined into one alternative. They are not incompatible in advance.

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3 (...continued)
cause the Dutch towns and cities are not built to accommodate so many cars. Therefore, the increase of automobility has to be limited, according to the new policy. Instead of a 70% growth the new policy sets aim for only 35% increase in the years between 1986 and 2010. This is the so-called 'traffic-index' of 135.

4.4 Motorway alternative (C)

The Commission advises to develop an alternative that consists of the construction of one or two motorways (two lanes, maximum speed 100 kilometres per hour), either with or without reconstruction of N271 and/or N273, avoiding the towns. As many as possible intersections and connections must be executed as flyover junctions. The connecting road between Tegelen en Reuver on the East Bank of the river Maas may serve as an example for this type of solution. (Obviously in this case the connection to the Zuiderbrug [= South Bridge] should be guaranteed).
Advantages of such a solution could be that the quality of life in the towns would improve and that the environment outside the towns would probably suffer less than with the construction of an expressway.

4.5 Expressway alternatives (D)

The notification of intent suggests that in principle three main routing options (the Eastern Maas Bank route and on the Western Maas Bank the Lateral Route and the Napoleon Route, D1 through D3 respectively) will be considered. These three have been the final alternatives in the 1985 routing decision, including some local variants. The EIS must give a concise overview of the other routes considered in earlier stages of this 1985 decision-making process and of the reasons why these have been dropped. It should also mention what role environmental considerations have played at this selection.

According to the notification of intent, even if the road will be constructed on one of the two banks, measures will be required on the other bank to relieve the towns. These measures need extensive discussion in the EIS.

4.6 Execution

It is important to indicate for all execution variants to what extent they determine the routing choices.
In the description of alternatives a distinction can be made in physical changes for infrastructural activities and traffic patterns and measures; the former will be caused by the construction, the latter by the use and management of the infrastructure. Apart from these, mobility control measures and measures to improve the quality of life can be distinguished.
The description of the variants must also show how the expected environmental impacts can be counteracted. In this section, attention must also be paid to mitigating temporary environmental impacts and to the effectiveness of the proposed measures. It is important to see, that such measures will not just move the problems from one part of the environment to another, or that combinations of environmental measures will eventually lead to negative results.

4.7 Alternative most favourable to the environment

The Commission suggests developing the alternative most favourable to the environment by using creative engineering and to present it as a full alternative; a real and implementable alternative most favourable to the environment must be the ultimate goal.

The routing is the main element in the development of this alternative. In addition, the following elements are important to this alternative (in combination with the routing):

- the execution (implementation, layout) and the protecting and compensating measures for the benefit of the residential environment, the quality of life and the natural and rural environment;
- a use of the infrastructure that would be favourable to the environment.

It is possible that there will be problems in identifying the alternative most favourable to the environment, as not all environmental aspects will benefit by the same package of physical activities and measures. The major criteria for identifying the alternative are:

- the quality of the residential environment in the towns and villages;
- the natural environment.

Physical activities and measures beneficial for the residential environment in villages and towns may harm the natural environment and vice versa. To solve these problems, the Commission suggests elaborating two different versions of the alternative most favourable to the environment:

Elaboration direction 1

Here there is a focus on the residential environment and the quality of life. Improving the quality of life was one of the basic issues for the provisional choice of routes. The solution most favourable to the residential environment and quality of life must be identified.

It is emphasised that, in addition to the separate alternatives, the EIS should also consider the possibilities to combine alternatives. Concrete measures (on an execution level) to limit noise, odour, air pollution, etc., need to be part of the description.

Elaboration direction 2

Various data show the presence of very important nature values in the study area. Because of their character and size, the study area must be considered very sensitive to a further disturbance and fragmentation; these may lead to extra barriers between areas with ecological coherence. Therefore, with nature conservation as the basic view in this elaboration direction, the choice of routes and the options to implement or execute the infrastructure must be directed towards causing minimal harm to these interests. Taking the ecological conditions as a start in the development of this alternative means considering the ecological structures and relations as well as the scenic and cultural and historical values.

Here too, it will be important to consider possible combinations between the alternatives A through D. Attention should also be paid to the implementation alternatives favourable to the environment, with special attention for mitigating

measures (badger tunnels, etc.).
Considering the focus on nature values, another basic assumption for this alternative might be that in solving the traffic problems, only the local or regional problems are predominant and not the problems on a more national level. Thus a condition could be that the road to be newly constructed may not attract any extra traffic from outside the region. This would limit any extra burden for nature.

Finally, it must be shown to what extent both elaboration directions correspond and can therefore be combined or exclude each other.

5. CURRENT STATE OF THE ENVIRONMENT, AUTONOMOUS DEVELOPMENTS AND ENVIRONMENTAL IMPACTS

Environmental Protection Act, section 7.10, subsection 1, sub d:
An EIS shall contain at least: *"a description of the current state of the environment in so far as the proposed activity or the described alternatives may affect it, and the expected developments in the said environment in the event that neither the said activity nor the alternatives are undertaken".*

Environmental Protection Act, section 7.10, subsection 1, sub e:
An EIS shall contain at least: *"a description of the effects which the proposed activity or the described alternatives may have on the environment, and an explanation of the manner in which the said effects have been determined and described".*

5.1 General

5.1.1 Current state and autonomous development

Those aspects of the current state of the environment and its autonomous development must be described, that are significant for predicting the impacts on the environment of the proposed activity and alternatives. Autonomous developments are changes that will occur in the environment without the proposed activity or any of the alternatives being executed (i.e. the environmental consequences of the no-go-alternative).
Any uncertainties in the environmental data must be clearly indicated. Literature and field descriptions will provide the baseline data for the description of the current state. If needed, supplementary data must be found by new inventory research.
The notification of intent makes a difference between the 'planning area' (i.e. the infrastructural study area) of the road and the 'environmental study area'. These areas can differ in size. For determining the size of the environmental study area it is important to know how far the influences of the proposed activity and alternatives will reach. The size of the area of environmental influence will be different for each environmental aspect (water, soil, air, flora, fauna, sound, etc.). Areas that have important hydrological, ecological, landscape or transport relations with the direct area of influence must be considered part of the study area.

Impacts on the environment
The impacts must be described for the construction and the use of the road as well as for the extra measures necessary to implement the objectives (such as measures on the bank where the road is not built).
For the description of the impacts following general guidelines can be observed:

- The manners in which the environmental impacts are determined and described, must be explained. This particularly concerns the reliability and accuracy of both the baseline data and the methods used to predict environmental impacts. For every data the EIS must indicate whether it concerns facts or assumptions.
- Special attention must be paid to those environmental impacts that differ per location or per alternative.
- Not just negative impacts, but also counterbalancing positive possible developments or positive impacts can be shown (by words or illustrations).
- The EIS must indicate to what extent environmental impacts occur, because beyond the current project other activities (will) occur in the region. In this part of the EIS impacts of activities directly or indirectly caused by the construction of the southern part of National Motorway 73 (or from one of the alternatives) should be taken into consideration; such as new industrial establishments or housing.
- Beyond the description per environmental aspect, separate attention must be paid to the connection between the environmental impacts of the road and the overall influence on (parts of) the study area, and to the accumulation of these environmental changes.
- The impacts must be described both for the construction of the road and for its use.

The next sections indicate the minimum of environmental aspects that have to be considered in the EIS. For brevity's sake the main points for both the current state of the environment and the environmental changes have been integrated in these sections. Each section contains the guidelines first for the current state and the autonomous development and then for the impacts. To be accurate, section 5.2, *'Abiotic aspects'*, only deals with geomorphology, soil, groundwater and surface water are discussed. Other aspects that are in fact also abiotic such as air and sound are discussed separately in sections 5.5 et seq.

5.2 Abiotic aspects

Current state and autonomous developments
The description of the current state and autonomous developments should consider:

- the geomorphology and soil conditions of the study area (geology, current differences in altitude, types of soil, geologically valuable elements, such as terraces, ancient stream beds etc.);
- the geohydrological conditions and the groundwater systems including the autonomous development.

Special attention must be paid to hydrological systems within subareas of the study area where impacts may or might be expected on plant communities dependent on moisture, seepage and groundwater or indicator groups (for in-

stance plant communities along brooks and rivers, seepage communities, (oligotrophic) water communities, pool communities etc.). The current draining situation must be considered on the routes themselves and in the areas that surround these.

Data about the geohydrological building of the subsoil, division in aquifers and confining or semiconfining layers, groundwater flows, groundwater levels, isohypse patterns, seepage and infiltration areas, groundwater quality in seepage and infiltration areas (in seepage areas in relation to the infiltration area, in infiltration areas related to land and water use), relations between deep groundwater and shallow groundwater, extraction of groundwater by government organizations or private companies and the surface water system must be used in the description.

Impacts
Preparatory activities along the route or routes may include clearance, sand supplementations to raise the land, levelling of differences in altitude, digging in soil layers, temporary drainage by well points or water level decrease, permanent decrease. The geomorphological and hydrological effects of these activities have to be considered, in particular in connection with excessive drainage and quality change in seepage and infiltration areas and possible need for external water supply. If relevant, the expected changes in the hydrological conditions (groundwater level in Spring, seepage intensity, trophic level and composition of surface water and groundwater) for the habitats of valuable natural vegetation types must be considered. In view of the nature of the relations in the area it is recommended that in case of impact predictions geohydrological models are used. The impact predictions must also cover the consequences of the hydrological action for land clearance and for preparatory measures before the road construction, on the dispersal of current pollution and on the introduction of new pollution by future use. For these predictions the interactions between the soil, the groundwater and the surface water must be explored.
An overall indication must be given of possible sand dredging for the project.

5.3 Vegetation and fauna

Current state and autonomous developments
The description of the biotic situation and impacts in the study area will be more valuable, if the biotic aspects to be discussed ('communities and indicator groups') are properly chosen and this choice is justified in relation to the characteristics of the area. A functional description of the study area showing the various actual and potential ecological relations is important. The relation with the Main Ecological Structure (as laid down in the national policy) must also be indicated. One of the considerations in the choice of indicator groups must be that they reflect the characteristic environmental circumstances in the study area. For the entire study area and for each indicator group the appearance, geographical dispersion, ecological requirements and relations between biotopes have to be described. This information might include:

- plant and animal species and their regional, rural (and international) significance,
- sites of characteristic plant communities and plant species in the landscape, and their relation to landscape-ecological factors, such as trophic level, groundwater regime and groundwater flow (qualitatively and quantitatively), ecological infrastructure and the like,
- sites of suitable habitats for valuable animal species, if relevant.

The EIS should not be limited to the actual presence of these biotic elements, but should also mention the suitable habitats where the species have not been found. Moreover, it should indicate the zones, that would be necessary for dispersion between the subareas, either established or hypothesized. Attention must at least be paid to mammals (e.g. hamsters and badgers) summer birds, reptiles, amphibians and butterflies:

- description of the location of and environmental interaction between functional areas (resting, moulting, forage and hibernation areas);
- description of the development potencies of vegetation, flora and fauna.

Finally, an overview must be given of the present nature reserves in the study area, including a mention from which (special) natural values their status has been derived.

Impacts

In the analysis of the impacts of the construction and the presence of the road the following types of impact must be distinguished per route:

- land occupation, which will diminish surfaces of valuable nature reserves and will decrease or fragment habitats of valuable species (see also: barrier effect);
- noise of adjacent areas: the quality as habitat is decreased, which can species make disappear or decline in numbers;
- change of relations in surface waters and groundwaters and its physical impact on nature reserves. This can both be quantitative (for instance access of drainage) and qualitative (for instance accumulation of nutrients by stagnation of their removal);
- barrier effect for necessary (from a point of view of survival) migration between local populations that constitute a network population. This concerns mainly populations of animal species that move on the ground. Intersection of connecting relations can lead to local or even regional extinction;
- barrier working in commuting movements between functional areas, such as breeding pools and summer residences of amphibians or forage trips in large habitats (home ranges).

For each of these impacts the EIS must show where they will occur in considerable measure and lead to a loss of natural values. Pay attention to parts of central areas in the main ecological structure and to types of nature reserves and species that have been labelled as important in nature policy (to be expressed in surface loss, transformation towards less valuable ecosystem types and decline, local or regional extinction of valuable species).

The following nature reserves deserve special attention: the valley of the river Roer and surroundings, the valley of the Swalm and surroundings, the valley of the Neerbeek and surroundings and the Beegderheide (heathland).

Separate attention must also be paid to the effectiveness of proposed mitigating and compensating measures.
Finally, attention must be paid to impacts on nature reserves that might be developed in the future and on losing these possibilities.

5.4 Landscape and cultural heritage

5.4.1 Landscape and quality of the physical landscape composition

Current state and autonomous developments
The EIS must describe the current landscape composition and in particular its special coherence and its main structure.
The visual environmental components of the landscape must be typified in terms of openness, transparency, relief, scale and the like.

Impacts
An overview must be given of the changes occurring in the landscape caused by the construction of the road, both in terms of direct losses through occupation of land and in terms of recognizability of the remaining fragments and changes in the visual environmental characteristics of the these areas.
Apart from negative aspects attention must also be paid to positive impacts (for instance by landscaping).

5.4.2 National heritage and archaeology

Current state and autonomous developments
The existing cultural-historical elements in the region (patterns of parcelling, roads and planting, dikes and quays, estates, archaeological values and types of landscape that might be characterised as characteristic or rare within a Dutch or in a European framework. This description must include their degree of perfection.

Impacts
Indicate,
- whether the routing alternatives will affect historical-geographical and archaeological elements and structures or
- make them disappear or
- whether these elements can be fit in without any damage and
- how these elements could contribute to the layout of the infrastructure.

For this vulnerability analysis historical-geographic research on relicts by means of map comparison will be necessary; for this, not only the oldest available topographical maps must be consulted, but also more recent maps (of various representative stages), so that also later stages in the development of the landscape can be considered. Relicts are not only punctual and lineair ele-

ments but also superficial elements (river forelands and the like); also ensembles (such as villages with accompanying fields and meadows) must be described. The impact description must not be limited to the elements as such, but also consider the relations with phenomena pertaining to the soil and geomorphology.

5.5 Noise and vibrations

Current state and autonomous developments
It is desired that the EIS provides quantitative information concerning the L_{eq} values in the area of study during the day, the evening and the night, as well as the 24-hours-values based on these data. The sources to be considered are:

- the road traffic
- the other sound sources (railroad traffic or industrial noise), separately and in accumulation.

If the various days of the week would clearly show different data, an explanation of these differences will be necessary.

Each calculation should contain a feedback towards the traffic data and their uncertainty margins.

It is recommended to determine the noise data for such a number of characteristic points that on this basis also sound contours can be drawn. Inside the borders of the contours the approximate number of persons hindered and seriously hindered by road noise can then be calculated.

Areas that are sensitive to noise must be mentioned, such as residential areas, silence areas, nature reserves and pasture bird areas. If there are any silence areas in the region it will be necessary to attune to the information available at the offices of the Province of Limburg. In the acousticly sensitive areas the surroundings sound levels must be established on a number of representative points.

A study is recommended to what extent (level and reach) vibrations of road traffic and/or other vibration sources cause hindrance or damage to be experienced.

Impacts
For the planned road acoustic research will be inevitable. This research must be performed in conformity with the prescriptions and directions. The EIS should not be restricted to how the requirements of Noise Act must be met, but it must also show what significant changes of the sound level will occur in (potential) silence areas. The latter means that the study area for noise will be larger than the actual reach of the noise zone.

It is recommended to show the areas of influence in maps, for instance with the help of sound contour lines. If possible, these contour lines must be used to calculate if and to what extent the numbers of acousticly hindered or seriously hindered people in the study area increase of decrease. Average values for the

number of inhabitants per house and the percentage of hindered people as a function of the sound exposure can be used in this calculation, assuming that the number of houses inside the various contours will be known. These numbers are important to compare the alternatives.
During the prediction of the noise levels an estimation of the uncertainty margins is necessary, both as a result of uncertainties in the input data (for instance the share of truck traffic) and in the method of calculation. Attention should be paid to the possibility of cumulation of sound impacts by simultaneous influence of other sources, such as industry and aviation traffic.
The temporarily noise hindrance on supply and work roads during the construction must also be considered.
Will vibration hindrance occur as a significant impact? Are there any houses or vibration sensitive buildings within a zone of 50 meters along the road?

5.6 Air

Current state and autonomous developments
With respect to the air pollution quantitative information must be given about:
- the emission of air polluting compounds in the study area from motorised road traffic and other relevant sources,
- the concentrations of air polluting compounds a result of the motorised road traffic and other relevant sources in relation to the current background concentrations. In considering the background concentrations, attention can be paid to the German Ruhr Region.

Impacts
The EIS must show which specific contribution the alternatives deliver to the decrease or increase of air pollution in the study area.

In the predictions of the contributions of the proposed activity and the alternatives to the air pollution in the study area the following input data should be used: traffic intensities, average driving speed, truck shares per stretch of road, the emission factors for the various vehicle categories (passengers cars and trucks) and kinds of fuel (petrol, LPG and diesel) and the environmental characteristics surrounding the routes.
The predictions must also consider the expected developments with respect to the exhaust gas emissions of vehicles and the background concentrations of the compounds mentioned.

For variants that include the construction of a tunnel special attention must be paid to the air quality in the tunnel, the air quality near the ends of the tunnel and the dispersion of the air pollution around the possible ventilation points.

The following impacts must be investigated in the view of the Commission:
- ***Acidification and photochemical air pollution***
  For each alternative the emission must be established of compounds contributing to acidification or photochemical air pollution. Nitrogen oxydes, volatile organic matters and carbonmonoxyde (as long term precursor in the formation of ozone) can be considered representative for this theme.

- ***Dispersion***
  For each alternative the immission concentrations must be established of chemicals that burden the environment such as nitrogen dioxyde, benzene, benzo(a)pyrene (as representative of the polycyclic aromatic hydrocarbons), fine dust and black smoke.
  After these predictions, the contribution of the road traffic should be added to contribution of other sources and the background concentration. The result of this will facilitate an evaluation based on the current environmental standards.
- ***Climatic change, energy use***
  For each alternative CO_2 emissions in the study area must be established. The results can be compared with the emission limits for CO_2 as worded in the national policy.

5.7 Safety and residential quality

Current state and autonomous developments
A overview must be given of the environmental living conditions and safety, such as the sources of hindrance and danger (including hazardous materials transports). Part of this information has been specified in previous chapters in this advice.

Impacts
The impacts include the major part of the information that has also been specified in previous parts of this advice, in the section on health and quality of life.

For each part of the alternative routes the EIS must show the consequences of a catastrophic but not inconceivable traffic accident for the road itself and its surroundings. These may include the release of volatile and/or liquid and water solvent toxic or other dangerous matters.

The general traffic safety must also be discussed in the EIS (influence of routing, intersections, etcetera).

5.8 Indirect impacts

In dealing with indirect impacts the following aspects must be discussed:
- the impacts of the proposed changes in destination (in the physical plans) and in accessibility on the functioning (including liveability) of the area (in particular the facility centres and local hamlets) and the (remaining) agricultural area,
- to what extent will agricultural land and industrial buildings be lost at the construction of the various alternatives? What are the impacts for the regional agricultural structure? Have provisions been made for the relocation of agricultural businesses and what is the environmental impact of these relocations, in particular if it concerns intensive agriculture?

6. COMPARISON OF ALTERNATIVES

Environmental Protection Act, section 7.10, subsection 1, sub f:
An EIS shall contain at least: *"a comparison of the expected developments in the environment, as described under d, with the described effects of the proposed activity on the environment and with the described effects on the environment of each of the alternatives considered".*

The environmental impacts of the alternatives and variants must be compared with the current state of the environment and its autonomous development. This can happen by clustering the environmental information into groups of aspects and note them in a comparative matrix, including a list of the standards and the (interim) restrictive, directive and objective values of the environmental policy.

It is particularly important to show the extent in which the objectives regarding conditions for living quality in residences and accessibility at each of the alternatives can be realized, as well as a consideration of the positive and negative impact on the environment of every alternative.
A preferential sequence of the alternatives per group environmental aspects can furthermore be presented (at which a consideration of unlike environmental aspects must be avoided).

7. GAPS IN INFORMATION

Environmental Protection Act, section 7.10, subsection 1, sub g:
An EIS shall contain at least: *"a review of the omissions in the description referred to under d and e, due to lack of the necessary information".*

The EIS must say which information required by the guidelines cannot be given and why. The consequences of these gaps for the decision-making process must be shown.

8. POST PROJECT EVALUATION

Environmental Protection Act, section 7.39:
"The competent authority that has taken a decision, in the preparation of which an environmental impact statement was drawn up, shall investigate the effects of the activity concerned on the environment, either during or after its completion".

The competent authority should draw up an evaluation programme to compare the predicted impacts with the actual impacts. In the first place the programme must check whether the actual environmental impacts are more positive or more serious than the predictions, and whether extra measures must be taken. Secondly, it must be investigated whether the gaps in knowledge and information mentioned in the EIS can be filled in.
A draft of a post project evaluation programme can be part of the EIS.

9. EIS STYLE AND PRESENTATION

Environmental Protection Act, section 7.10, subsection 1, sub h:
An EIS shall contain at least: *"a summary providing sufficient information for the general public to be able to evaluate the environmental impact statement and the effects on the environment of the proposed activity and of the alternatives described therein".*

The EIS must contain a summary that is separately readable. It must be comprehensible for the public at large and be a correct reflection of the contents of the EIS. Special attention must be paid to the presentation (in a map) of the initiative and the major alternatives, and to the comparison of the alternatives.

Furthermore it is recommended:

- to keep the EIS concise;
- to give the maps a well readable topographical basis and to provide them with clear legends and topographical names;
- to clearly justify the choices relevant in the writing of the EIS;
- to account for possible deviations from the guidelines;
- to record background data (as the baseline for conclusions, predictions and choices) not in the EIS itself, but in appendices;
- to include in the EIS an explanatory list of terms, a list of abbreviations used and a literature list.

ANNEX

Outline of the EIA procedure on the southern part of the (Dutch) National Motorway 73, form Venlo to St. Joost

Outline of the EIA procedure on the southern part of the (Dutch) National Motorway 73, from Venlo to St. Joost

Introduction

The provincial branch of the Ministry of Transport, Public Works and Water Management in the province of Limburg intends to construct a motorway connection between the towns of Venlo and Saint-Joost, either on the western or on the eastern side of the river Maas. This connection will be called the southern part of National Motorway 73.
This project has a long history. The Minister of Transport, Public Works and Water Management did already choose the routing in 1985 – after long research – and without EIA being applied. This routing decision (on the eastern side of the river Maas) was cancelled in 1992; it was decided then, that through the direct mandate of the European Commission (EC) Directive on EIA the routing decision had to be submitted to an EIA.

The existing road infrastructure in the area cannot cope with the growing (motor) traffic. At both sides of the river Maas there are several villages and small towns. These villages and towns are connected by regional roads (1× 2 lanes and a speed limit of 80 km/h), that lead right through their centres. These roads are frequently used by lorries, often plying between Germany and Belgium.
The natural and scenic values in the area (landscape ecological values in the valley of the Maas) are affected adversely, because various new activities cause fragmentation.
These developments have led to major problems in the area affecting environmental quality, accessibility and economic potentials. The initiative aims at solving these problems.

Advice for specific guidelines

To solve these bottlenecks many solutions are conceivable. The advice for specific guidelines therefore selected a wide approach. The competent authority has adopted this approach in the specific guidelines. This approach accentuates a gradual method of developing alternatives, as discussed below.
The gradual method defines alternatives ranging from no new action to a new national expressway. By checking the environmental and transport impacts of the alternatives against the initiative's objectives a view on the possible solutions will be possible. In this way the Minister can select the routing. The guidelines mention the following degrees of 'solutions':

- the no-go alternative (= zero alternative): no extra measures will be taken (apart from the ones that have already been decided upon);
- the zero-plus alternatives. There are three possible subalternatives:
  - the bypasses alternative: road bypasses will be constructed around the villages and towns;
  - public transport alternative: a strong impulse is given to stimulate public transport;

- combination alternative: the elements of both previous alternatives are combined.

- motorway alternative: construction of a new motorway on either side of both river banks, or the upgrading of one or both of the existing roads to a motorway. This is because measures at one side of the river will inevitably have consequences for the other bank;
- expressway alternatives: construction of an expressway on one river bank (including the measures to be taken on the other bank);
- the alternative most favourable to the environment: in this context the Commission suggested elaborating two of these alternatives: one with regard to the interest of the population centres and one favouring natural and ecological values.

EIS

The EIS followed the guidelines closely. Eventually 13 alternatives were elaborated. The EIS proved unmistakably that new traffic infrastructure on the west bank was best for the environment, and that alternatives on the east bank were best from a point of view of economy and traffic.
Both elaborated alternatives favourable to the environment appeared to be real options. These alternatives concerned upgrading of an existing road or construction of a motorway on the west bank.

Review advice

The Commission expressed in its review advice its appreciation for the EIS, as it describes very well the method of developing the many alternatives. A very positive remark was made about the popular summary made especially for the public.
The description of impacts from fragmentation received negative comments. Fragmentation is a major impact with this kind of projects, especially for this area. The Commission stated that a more quantitative approach would have been appropriate. Therefore, the Commission stressed the necessity of elaborating mitigating and compensating measures relative to the fragmentation impacts in the evaluation programme (post-project analysis).

Decision

The minister decided to speed up the decision-making process for completion before the national elections. The choice was clear between 'economy' and 'ecology': new infrastructure on the west bank is better for the environment, whereas the regional economy will benefit more from the development on infrastructure on the east bank. The various advisory bodies and pressure groups put forward remarkably different views and recommendations. The minister decided in favour of a motorway on the east bank. Certainly, this decision will be challenged in court by environmental pressure groups.