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Cuperus, R.

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Chapter 7

Improving ecological input in Dutch road planning

Ruud Cuperus
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Improving ecological input in Dutch road planning

Abstract
In the Netherlands planning and decision-making on national road schemes is a staggered process in which successive stages are characterised by growing detail. In principle, there is a need for ecological data input at each phase. In practice, problems arise: the Reconnaissance Study requires more information than is then available, for example, and the Routing EIA (Environmental Impact Assessment) Study draws in a mass of detailed information not necessarily required at that particular stage. Although there is a major need for ecological data in the next phase, the Preliminary Routing Decision, in practice there is little extra input because of the deadline in force for this stage. This article reviews the main bottlenecks in the current procedure and suggests several improvements.

1. Introduction

Major road-building schemes generally have a substantial impact on nature and wildlife, and it is therefore essential that ecological considerations be adequately incorporated throughout the planning and decision-making process. In the Netherlands this has indeed been the wish of the public and legislators for many years now; witness the Environmental Protection Act (Official Gazette (1979) and Routing Act (Official Gazette 1994). At present, ecological input to the process is in the form of a description, first, of the (protected) plant and animal species occurring on and around the site of the proposed scheme and, second, of the implications of the scheme for survival of those species.

The Routing Act sets out the decision-making process to be followed for large transport infrastructure projects, including construction and widening of trunk roads and motorways, or 'national' roads as they are known in the Netherlands. In the course of the various phases of this process, all relevant information and descriptions of potential impacts are fed in, from rough-and-ready information in the Reconnaissance Study to detailed in the final decision on project implementation (cf. Table 1). This progression in detail holds essentially for ecological and non-ecological information alike.

The fact that the phases of this process are staggered allows 'go / no-go' decisions on the project to be taken at virtually any time, reducing project risks while avoiding excessive, possibly unnecessary work in each of the phases. The staggered approach means that each phase requires its own level of detail in terms of ecological data input, i.e. general information and descriptions of impacts. In practice, though, this information is not always properly matched to what is needed in the phase in question. This can lead to undesirable project delays, whether in the planning stage (due to public inquiries and appeals, for example) or during implementation (if construction permit data are inadequate, for example). There is public and political pressure to speed up the decision-making process, moreover, putting high demands on planning the work to be done in each phase and the time available to do it.

The question that is often asked but that has as yet scarcely been answered, then, is how data input on species presence and estimated ecological impact can best be matched to the respective phases of the decision-making process in force for national road schemes. It is this question that is addressed in the present article.

2. Phases of decision-making on Dutch national roads

In the Netherlands a multi-stage decision-making procedure is in force for national road-building schemes (Table 1), an area in which competence is borne jointly by the Minister of Transport, Public Works and Water Management and the Minister of Housing, Spatial Planning and Environment. The following stages can be distinguished.

The *Multi-Year Program Infrastructure and Transport (MIT)*, published annually, reports on the bottlenecks in the Dutch road grid requiring most urgent review (e.g., MTPW 2002a). These are road sections no longer meeting the requirements of the Second National Transport Structure Plan (MTPW 1990) and the National Traffic and Transport Plan (MTPW 2001) in terms of accessibility (excessively long journey times due to congestion), safety (too many accidents) or quality of life (too much air pollution or noise nuisance).

For each road section identified in the MIT there follows a so-called *Reconnaissance Study*, to establish the approximate nature and magnitude of the

Table 1: Decision-making on national road schemes in the Netherlands.

Phase of planning process	Aim	Scale level	Question to be answered
MIT*	To identify bottlenecks in the national road grid	1:>100,000	Where and why is action required? (political agenda)
Reconnaissance Study	To improve insight into a specific bottleneck and identify policy options for addressing it	1:50-100,000	Where and why must action be taken? (initial elaboration)
Commencing Document	To inform the regional population about the problem and available policy options	1:50-100,000	What are the alternatives?
Routing EIA	To assess and compare the alternatives	1:10-50,000	Where can the problem be solved?
(Preliminary) Routing Decision	To establish the location and elaborate the route in detail	1:2,500	How can the problem be solved?

* Multi-Year Program Infrastructure and Transport

problem and possible strategies for remedial action, in terms, say, of public transport versus new infrastructure, road-widening versus road-building, or bridge versus tunnel (MTPW 2002b). The study also states whether additional study is required and the aims of any such study.

The start of the Routing Act procedure proper is marked by publication of an *Commencing Document*, designed to inform the local or regional population of the problem and the basic strategies available to address it. It describes any alternative routing options and the kind of (environmental) studies to be conducted in the course of the ensuing process. This phase concludes with legal advice to the government and a first round of public consultation.
In the *Routing EIA Study* the various routing options (and variants) are described (the question 'Where?') and provisionally evaluated, with their likely consequences being compared, including ecological impact. This phase also

concludes with legal advice to the government and public consultation.
A political decision is then taken to adopt one or other alternative: the 'preferred option'. This is laid down in the official Position of the Minister of Transport, Public Works and Water Management, which is subsequently worked up into a *Preliminary Routing Decision*. This (sub-)phase again concludes with legal advice [dito]and public consultation. After possible revisions on specific details, this draft document is finalised in the form of an formal *Routing Decision*, which, after the hearing of any appeals, then becomes irrevocable. The aim of this final part of the procedure is to optimise the design of the preferred option, including any conservation measures (the question 'How?'). Following the Routing Decision, preparations for actual project implementation can then be started.

3. Review of ecological methods

There are a variety of methods in use for assessing the ecological impact of road schemes and similar large-scale development projects. These can be broadly categorised as follows.

3.1 Fragmentation of protected areas

The first type of assessment, at the relatively coarse scale level of the landscape, is rough-and-ready and focuses on the spatial unity of areas enjoying official 'protected' status (Udo de Haes 1975). The goal here is to estimate how fragmentation of the landscape due to road presence and disturbance by traffic affect the overall ecological and physical continuity of the protected area. In today's policy framework, this approach can be adopted for areas forming part of the (national) Ecological Main Structure and areas protected under the (European) Bird Directive (79/409/EC) and Habitat Directive (92/43/EC). The number of segments into which the area is fragmented as well as the total area affected, both visually and through noise nuisance, are then taken as indicators for overall (landscape) ecological impact.

This approach has been adopted for landscape and road planning in the United States (cf. Forman & Hersperger 1996) and Germany, too. The US approach has been elaborated a little further, taking 'road density', i.e. total road length per unit area (km/km^2), as a yardstick for fragmentation. Although there is no

quantitative relationship with ecological integrity as such, it has proved feasible to establish a threshold road density at which populations of wolves and other species are not threatened in their survival.

3.2 Specific impacts

The next set of methods, at a more detailed level of analysis, seek to describe the likely ecological impacts of a given road scheme. Three types of impact are usually distinguished: habitat loss, habitat disturbance or degradation (particularly by noise, but also by pollutants and changes in groundwater levels) and barrier effects. Today we know a fair amount about the impact of traffic noise on breeding bird populations (Reijnen *et al.* 1996), but very little about the barrier effects of roads and associated infrastructure. All such impacts are presently described using rough rules of thumb only. Thus, based on breeding bird studies, a 35% reduction in total breeding bird numbers is assumed in the disturbance zone, i.e. the zone parallel to the road up to the line where impacts are no longer discernable.

3.3 Population models

Population models are being used more and more in the context of impact studies. Their proceed from the observation that most species are generally found in subpopulations between which there is a certain amount of gene flow. Landscape fragmentation gives rise to smaller patches of habitat spaced further apart and survival of a given population therefore depends on the dynamic equilibrium between extinction and recolonisation by subpopulations (Opdam *et al.* 1994). Most roads are above-ground, creating barriers difficult for terrestrial species to cross, so that recolonisation is often hampered. Population models require solid data on species characteristics, habitats and environmental factors (Verboom 1996).

4. Ecological data input to decision-making

Overall ecological input to the decision-making process is currently organised as follows (cf. Table 2).

Table 2: Current input of ecological data in the various stages of decision-making.

Phase of planning process	Aim	Nature of ecological input
MIT	To identify bottlenecks in the national road grid	n.a.
Reconnaissance Study	To improve insight into a specific bottleneck and identify policy options for addressing it	Areas forming part of the Ecological Main Structure
Commencing Document	To inform the regional population about the problem and available abatement options	General ecological aspects
Routing EIA	To assess and compare the alternatives	Usually specific impacts; sometimes population models
(Preliminary) Routing Decision	To establish the location and elaborate the route in detail	Always specific impacts; never population models

Multi-Year (MIT) Programme. In this initial stage of planning there is scarcely any ecological data input at present, bottlenecks in the road network being identified mainly in terms of other issues, viz. accessibility, safety and quality of life.

Reconnaissance Study. It is during assessment of the options available for addressing a specific bottleneck that ecological impacts are first reviewed. In this phase the principal data input is a description of affected areas that are part of the Ecological Main Structure (MANF & MHPE 1993).

Commencing Document. In this document relevant information from the Reconnaissance Study is simply recycled. In addition, though, the alternative options are described as well as the scope and content of the ecological studies to be conducted in the next phase.

Routing EIA. During this initial evaluation and comparison of the impacts of the various alternatives, three types of impact are examined: habitat loss, disturbance and fragmentation. Occasionally, population models are employed.

(Preliminary) Routing Decision. This document describes what conservation measures (number, nature, magnitude and exact location) are to be incorporated in the engineering design of the preferred option. Ecological impacts and conservation measures are now described in more detail than in the previous phase. In practice, these measures are keyed to the individual kinds of impact. In this phase population models are never used.

5. The problems

From the ecological perspective this procedure brings with it a number of recurrent problems, which for the respective phases of decision-making can be specified as follows (Table 3).

Mulit-Year (MIT) Programme. Under the (European) Habitat and Bird Directives certain areas have been designated as 'protected', or are being considered for such status. The ecological safeguards set for these areas thus constitute a new (legislative) criterion for assessing the road grid bottlenecks first identified in the MIT.

Reconnaissance Study / Commencing Document. At the Ministry of Transport all work on infrastructure projects is subject to the proviso that investment data be attached throughout the planning. At this stage, though, data on the conservation measures required for a specific project are still often lacking, whether these be in the form of integration (e.g. sunken roadways), mitigation (e.g. ecoducts) or compensation (e.g. land purchase). This makes it all the more necessary that data on such measures be collected and ecological impacts described at an earlier stage than at present, i.e. before the moving onto the next, Routing EIA phase.

Routing EIA. Overall, this phase has become steadily more detailed over the years, in part due to the growing complexity of the policy and legislative framework. This has led to ever greater demands on technical road design, environmental studies, consultation and formal public enquiries. In this phase it

Table 3: Mismatches between ecological data input and phases of decision-making.

Phase of planning process	Aim	Mismatches in ecological input
MIT	To identify bottlenecks in the national road grid	Implications of European Habitat and Bird Directives are a new issue
Reconnaissance Study	To improve insight into a specific bottleneck and identify policy options for addressing it	Implications of European Habitat and Bird Directives are a new issue
Commencing Document	To inform the regional population about the problem and available policy options	n.a.
Routing EIA	To assess and compare the alternatives	Intrinsic problem of disparate levels of ecological detail required for Ministerial Position and Routing Decision; as this phase has no deadline, it acts as magnet for additional work
(Preliminary) Routing Decision	To establish the location and elaborate the route in detail	Major need for detailed input on ecological impacts and conservation measures, despite this phase having a tight deadline

becomes clear that the Routing EIA is in fact a springboard for two separate official decisions, viz. the Ministerial Position and the Routing Decision, requiring ecological data input at different scale levels. This is an intrinsic and recurrent problem. Because there is no mandatory deadline for completing this phase, moreover, it tends to draw in far more work than is strictly necessary.

(Preliminary) Routing Decision. With road design now optimised in detailed engineering plans, likely ecological impacts can be specified with greater precision than in the previous phase and mitigating and compensatory measures better elaborated in terms of both design and location. As mentioned, though, despite the greater need for ecological input here, in practice such input is sorely

Table 4: Improved match between ecological data input and phases of decision-making.

Phase of planning process	Aim	Matching of ecological data
MIT	To identify bottlenecks in the national road grid	Assessment of safeguards for European Habitat and Bird Directive areas
Reconnaissance Study	To improve insight into a specific bottleneck and identify policy options for addressing it	Bisection of protected areas, species presence; rough-and-ready assessment of ecological impacts in study area
Commencing Document	To inform the regional population about the problem and available policy options	General ecological aspects, ecological considerations via-à-vis prevention of impacts, potential conflicts with conservation legislation and policy
Routing EIA	To assess and compare the alternatives	Approximate assessment and comparison of ecological impacts, combined with shorter deadline
(Preliminary) Routing Decision	To establish the location and elaborate the route in detail	Extension of this phase, making it a 'phase 2 Routing EIA' in which population models can be more effectively used

lacking, mainly because of the relatively tight deadline for this final phase of decision-making.

6. Matching ecological input

Ecological data input information must be better matched to the respective phases of the decision-making process, as follows (cf. Table 4).

Multi-Year (MIT) Programme. As the presence and use of (new) transport infrastructure may jeopardise the ecological safeguards in force for areas protected under the European Habitat and Bird Directives, some form of

preliminary assessment of such risks, i.e. likely impacts, is required at the MIT stage. In this phase, then, it is essential that there be more input of (area-wide) ecological information than is presently the case.

Reconnaissance Study. It is in the Reconnaissance Study, though, that more detailed ecological data and specification of likely impacts first become really indispensable. The specific focus should now be on areas protected under the cited EU Directives and on inventorying protected species in these and other parts of the study area. To avoid any false sense of security this area-wide impact assessment should be fairly rough-and-ready, rather than striving to be quantitative. At the same time, though, it should be firmly rooted in key statistics like the length of road bisecting the area, the amount of land required for the associated infrastructure, the total acreage of protected area affected and so on. In designing impact abatement strategies, the guiding principle should always be: avoid impact whenever possible, moving on to minimise the area affected only if this proves unfeasible. Based on the Reconnaissance Study, the competent authority can then decide whether or not to give the go-ahead despite, or because of, any project risks arising at a later stage of planning (due to public pressure, for example, or conservation measures being too costly). Another motive for improving ecological input at the Reconnaissance Study stage is the ministerial requirement that investment levels already be specified at the earliest planning stages. The problem remains, though, that the relevant ecological information is often not available at this stage or has not yet been properly pulled together.

Commencing Document. Building on this new platform of information, the Commencing Document should specify the kind of research that needs to be undertaken to ensure the safeguards in force for the European Directives are duly respected. These directives oblige principals to adopt the option causing least ecological damage and, more so than in the past, efforts will therefore have to be made to demonstrate the extent to which the physical design of the preferred option has been influenced by ecological considerations and whether or not the alternatives under review conflict with standing conservation legislation and policy, particularly at the European level.

Routing EIA. Even at this stage all that is needed is a fairly rough assessment and comparison of impacts, and population models should therefore be used only

sparingly, for two basic reasons. First, such models require a substantial body of primary and derived ecological data over a relatively large geographical area, viz. the entire study area of the project. Second, until such time as the need for the project and its potential benefits have been formally established, overly complex impact studies should be avoided. By extending the period available for researching and reviewing impacts and measures to include the following, Preliminary Routing Decision (PRD) phase, the quality of that research can be improved and the 'intrinsic problem' cited substantially alleviated. This would also make it easier to meet the procedural deadline for presenting the PRD.

One way to improve matters would be to reconceive the PRD phase as a 'phase 2 Routing EIA', much the same as the current EIA procedure for new housing developments and industrial estates, where basic proposals are currently elaborated in a number of physical variants. This would allow the Routing EIA phase to be kept shorter, for at that stage all that is needed is a 'first-pass' comparison of alternatives. This would mean a stricter and more logical division between the two basic questions of 'Where?' – i.e. which physical option is to be adopted? – and 'How?' – i.e. actual engineering of the preferred option in the (D)RD phase. What is more, the time gained by shortening the Routing EIA phase could be used to improve the analysis of likely ecological impacts and recommended conservation measures in the following PRD phase, or 'phase 2 EIA'.

Unfortunately, it seems that legislators would rather maintain the (time) constraints on the PRD phase (MTPW 2002c), which does not omen well for the suggested changes in the decision-making procedure. However, this would mean a missed opportunity for enhancing the quality of that procedure – in this case specifically from an ecological angle – and leave unaddressed the intrinsic problem of the disparate levels of detail required in the Routing EIA phase.

(Preliminary) Routing Decision. If the PRD phase were indeed extended as proposed, population models could then be usefully applied to help establish the required number, nature, size and location of conservation measures. Given the statutory time constraints on this phase, this is an impossible task at present. During finalisation of the Routing Decision ecological data input can in principle remain unchanged.

7. Conclusions and recommendations

(a) The general public as well as legislators would like to see improved input of ecological data in the early stages of decision-making on national road schemes, particularly in view of the commitments arising under the European Bird and Habitat Directives and the need to identify potential problems arising within that framework. To ensure these safeguards are duly respected, it is essential that proper information on protected areas and species occurrence within the project area is available at an early stage of the decision process. As an added benefit this would also contribute to society's general desire to speed up decision-making.

(b) The departmental requirement that investment sums be attached to (aspects of) road-building schemes at an early stage of planning means that, with detailed ecological information still lacking, all-purpose indicators will have to be used if ecological uncertainty is to be avoided at this stage. A standard list of conservation measures should therefore be drawn up, specified in terms of geographical factors and protected status of areas and species, for mandatory inclusion in the basic engineering of road schemes. In the case of new roads this would mean an obligation for the principal to incorporate X ecoducts for every 10,000 ha of Habitat Directive area bisected, say, or install Y fauna tunnels per km of the Ecological Main Structure bisected, or fund Z ha of 'habitat reconstruction' in compensation for every km of road. This would allow solid indicators to be derived with which to arrive at proper cost estimates for the measures in question.

(c) What is needed at the Reconnaissance Study stage is a rough-and-ready overall assessment of the project area from the physical planning and ecological perspectives, for use by the competent authority – the Minister of Transport, Public Works and Water Management – to arrive at an early decision on any further research that may be required. The simpler type of assessment proposed here requires only a modest research effort and avoids work being started on projects that are simply unrealistic or unfeasible within the framework of the cited European Directives.

(d) Extending the deadline for the Preliminary Routing Decision phase combined with limiting the Routing EIA to a rough assessment and comparison of the basic alternatives would enhance ecological input to the decision-making process enormously, It would do greater justice to the approximate character of the Routing EIA and allow for incorporation of better-reasoned ecological impact descriptions and conservation measures in the PRD stage. This would mean (more logical) separation of the 'Where?' and 'How?' questions (cf. Table 1).

(e) In principle, the three sets of methods available for estimating the ecological impacts of road schemes dovetail well with the various scale levels encountered in the decision-making process: first, overall assessment of the study area in the MIT and Reconnaissance Study; then assessment of specific impacts in the Routing EIA phase; and, finally, studies using population models in the (Preliminary) Routing Decision phase. In the second phase ecological models should be used sparingly if at all, as they distract from the basic benefits-and-need discussion on the scheme in question. In a PRD stage as reconceived under d, population models could be used to far greater effect.

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