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Chapter 6

**Compensating for ecological impacts of road
development: seven years' experience with
highway A50 (*Eindhoven - Oss, Netherlands*)**



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Compensating for ecological impacts of road development: seven years' experience with highway A50 (*Eindhoven - Oss, Netherlands*)

Abstract

This article reviews the implementational aspects of the ecological compensation plan for Highway 50 (Eindhoven-Oss), the first of its kind to be executed in the Netherlands as part of a structural nature conservation policy. Such compensation plans are explicitly designed to ensure that large-scale development projects do not lead to any net-loss of important ecological values, with an obligation that any impacted values be redeveloped elsewhere. The review concludes that after full implementation of the Highway 50 compensation plan as scheduled, the acquisition target will have been fully or largely achieved, but that this will not be case the case for design, ecological management and transfer of the compensation sites. From this point of view, it will take yet several years until the 'no-net-loss' criterion will be satisfied. It is also concluded that ecological compensation is not in fact amenable to a programmatic approach of this kind. For more effective implementation of the compensation principle, it is recommended that a clearer administrative framework be developed at the national level, as well as some form of policy guidelines on farm-based conservation. Future compensation plans should also specify more precisely what deviations in implementation are acceptable under the terms of no-net-loss.

1. Introduction

One of the key planks of Dutch conservation policy (MANF & MHPE 1993) is the provision that large-scale development projects such as road construction may not impact on important ecological values unless there are deemed to be other, more important interests at stake, in which case the ensuing damage must be fully compensated ('no-net-loss'). Other countries already have a fair degree of experience with compensation as a conservation tool, viz. the United States (since 1986; NEPA 1970), Canada (since 1992; Rubec 1994) and Europe, particularly Germany (since 1976; Meier 1987). Although the compensation principle had

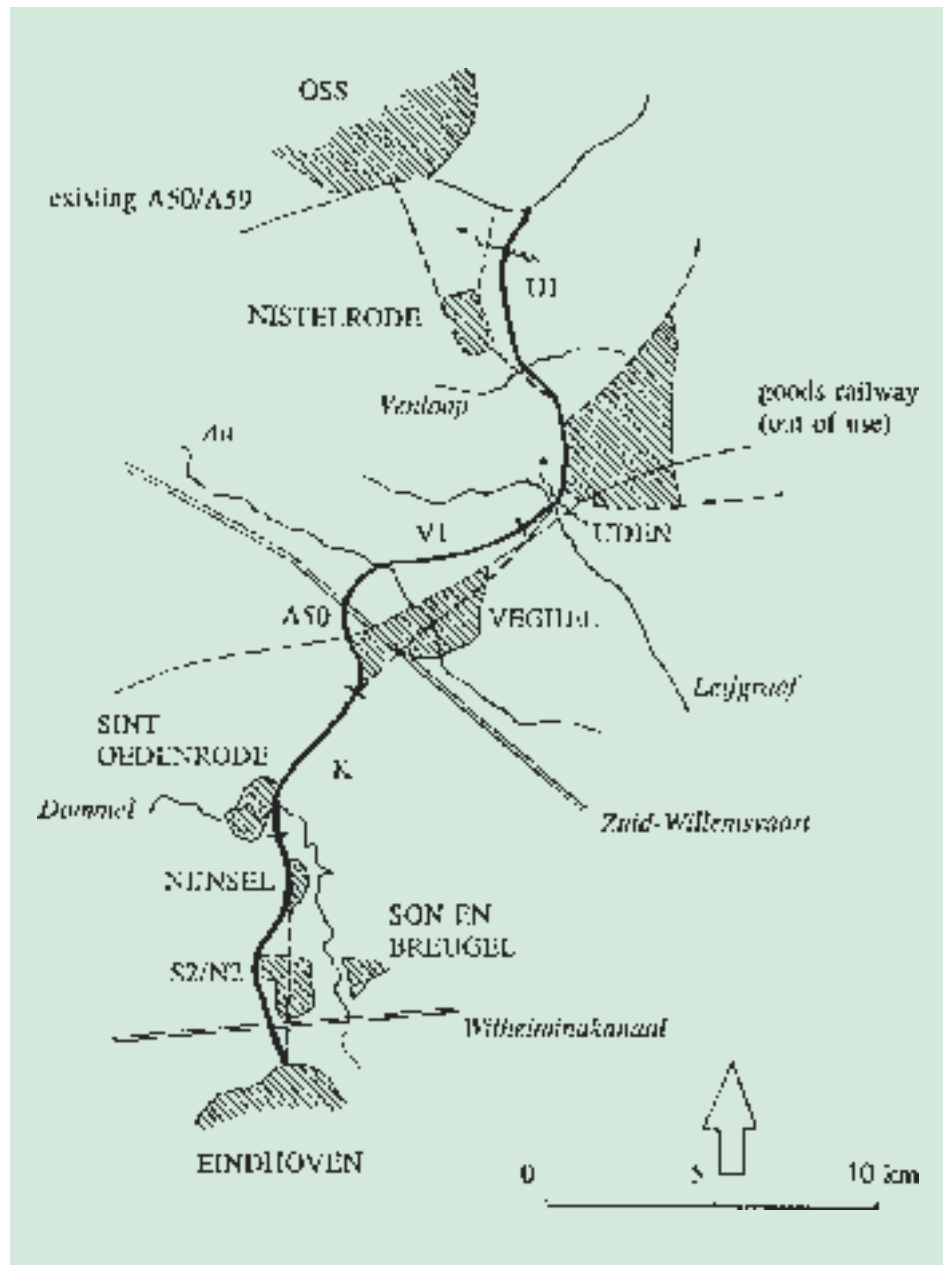


Figure 1: Study area and highway route.

been applied on occasion in the Netherlands, it was not until 1993 that formal policy guidelines were introduced under the terms of the national Structure Plan for the Rural Areas. This document lays down five basic criteria for ecological compensation: (a) the initiator is responsible for implementation; (b) project legitimacy must be established before compensation measures are considered; (c) impacts must be avoided, wherever possible, and otherwise mitigated or, in the last resort, compensated for; (d) impacts on habitats should be compensated for in terms of the same or, where this is unfeasible, equivalent quality; (e) if physical compensation is unfeasible, financial compensation is required.

Responsibility for physical implementation of the compensation principle in Dutch highway development lies with the Directorate-General of Public Works and Water Management (*Rijkswaterstaat*, RWS). Because of the lengthy administrative procedure involved, however, ecological compensation has been applied in only a handful of development projects to date. The first compensation plan (CP) to be elaborated under the new legislation was for the new A50 highway link between Eindhoven and Oss, although the compensation issue had in fact played no part in decisions on the project, as the Routing Decision (MTPW 1993) was finalised at approximately the same time the Structure Plan for the Rural Areas came into force. The Routing Decision provided for a CP nonetheless, and two years later this had been duly elaborated by the regional, Noord-Brabant Directorate of RWS. In principle the CP has been implemented parallel with highway construction, the timetable for both being about 10 years. Under the Structure Plan the obligation for compensation applies only to the core areas of the National Ecological Network (MANF 1990). The A50 roadworks caused no damage to ecological values covered by the European Habitat and Bird Directive.

The methodological and planning aspects of ecological compensation have been discussed elsewhere (Cuperus *et al.* 1996, 1999, 2001). This article addresses implementational aspects, with special reference to the A50 CP, which serves as a model project for RWS. It seeks to assess whether the plan fulfils the conditions laid down in the Structure Plan, in particular the 'no-net-loss' criterion, and whether the compensatory measures are indeed being implemented according to plan.

A brief description of the A50 and the associated ecological compensation plan are first presented. The practical issues that came up during implementation of the plan by the regional Directorate of Noord-Brabant are then discussed in some detail. Finally, several conclusions and recommendations are presented.

2. Towards ecological compensation on Highway A50

2.1 The route

The government Routing Decision for the A50 road link joining the towns of Eindhoven and Oss (MTPW 1993) provides for construction of 30 km of road infrastructure, part dual carriageway and part motorway. The route passes around the villages of Son en Breugel, Nijnsel, Sint-Oedenrode, Veghel, Uden and Nistelrode and links up with operational motorways at Eindhoven and Oss (Fig. 1). Most of the route runs through or along agricultural area which alternates with slightly elevated heathland, woodland or peat moor on poor, dry, sandy soils. Several streams (Dommel, Aa, Leijgraaf, Venloop) and canals (Zuid-Willemsvaart, Wilhelminakanaal) are also traversed.

2.2 Deriving appropriate measures

The A50 ecological compensation plan (CP) outlines a series of measures to address the ecological damage caused by road construction and associated engineering work. These measures fall into two categories: mitigation and compensation. The former comprises material provisions along the route to reduce the direct risk to animal life, such as wire fencing for larger animals (i.e. game) and fauna underpasses for smaller mammals and amphibians. Although the need for such measures had already been outlined in the Routing Decision, as recommended in the Environmental Impact Statement (MTPW 1991), they still remained to be detailed in actual engineering plans (Table 1).

It was at this stage that the scientific, methodological underpinning of ecological compensation was taken to hand. The method adopted, described elsewhere (Cuperus & Canters 1994, Cuperus *et al.* 1996), assesses the ecological consequences of habitat destruction and disturbance (Fig. 2), after due steps towards mitigation, on the basis of the estimated decline in the populations of indicator species of breeding bird. Development of replacement habitat, in the

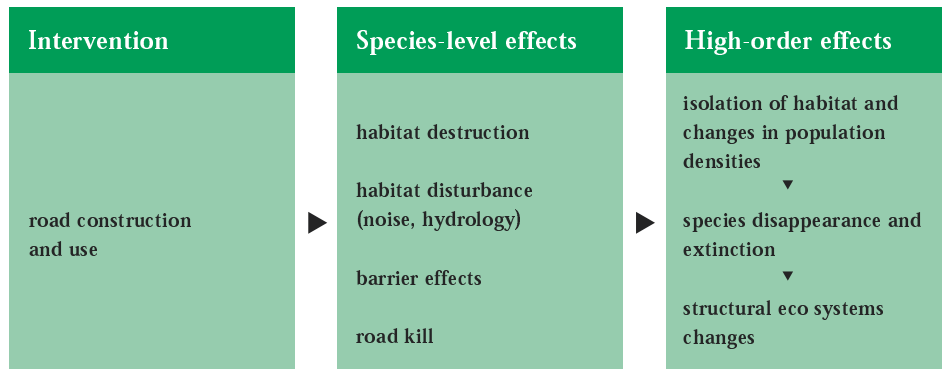


Figure 2: Ecological values affected by highway construction.

Table 1: Mitigating measures: targets and performance (MTPW 1995b, Graat 2002). ‘Quiet’ open-graded asphalt concrete and noise barriers are standard practice on Highway A50.

Mitigating measure	Target (15-06-1995)	Revised target	Implementation (01-01-2002)
wire fencing (fauna)	27,700 m	(none)	partly erected, length unknown
extended bridge span / continuous stream banks	6x	(none)	3 complete, 1 in progress, 2 planning stage
tunnel for small animals (ø50 cm)	23x	1 extra tunnel	12 complete, 12 planning stage
tunnel for large mammals (2.5x1.75 m)	2	1 ecoduct with cycleway, 1 modified viaduct ^a	planning stage, design stage
tunnel for animals / hikers	1x	(none)	1 planning stage
bentonite screens	2	1 ^b	1 complete

^a An additional, unpaved 3.5 m verge.

^b See main text.

Table 2: Compensatory measures: targets and performance (MTPW 1995b, Graat 2002).

Compensatory measure	Target (15-06-1995)	Acquired (01-01-2002)	Implemented (01-01-2002)
woodland	168 ha		40 ha
fine-structured dry habitats	25 ha		11 ha
wet grassland	48 ha		6 ha
marshland	16 ha		11 ha
'small landscape features'	^a 24 ha		7 ha
total	281 ha	226 ha	^b 75 ha

^a To be implemented - through land acquisition - on about 600 ha of farmland.

^b 55 ha already implemented; remainder scheduled in the short term (plans finalised).

Table 3: Costs of mitigating and compensatory measures, actual and estimated, in € mln. (MTPW 1995b, Thoolen 2001, Graat 2002).

	Original estimate 15-05-1995	Revised estimate 31-12-2000	Implementation 01-01-2002
mitigation	4.5	4.5	0.3
compensation	10.7	13.5	5.7
total	15.2	18.0	6.0

form of one or more equivalent 'compensation sites', is then specified for all species that would be lost from the area in question. No additional area is prescribed to compensate for impacts other than habitat destruction or disturbance, nor for impacts on other species (viz. mammals, amphibians and reptiles affected by habitat intersection as well as physical collision, i.e. 'road kill'), it being argued that suitably designed and managed compensation sites will provide an environment for these other species too.

In all, some 280 hectares of replacement habitat are provided for in the A50 CP, in several categories (woodland, marshland, etc.; see Table 2). No specific quality criteria were set for these various types of habitat; these were to be established in consultation with the agencies that would be managing the sites in question.

The CP identifies, on a scale 1:50,000, a number of areas within which compensation sites were to be sought. The overall area of compensation sites was several dozen times greater than the compensation target. As one of the aims of the CP is to integrate compensation sites into the National Ecological Network wherever possible, most of the search areas were located in the (direct) vicinity of this network.

2.3 Finalisation of the compensation plan

During preparation of the CP a series of consultations were held with local and regional authorities and environmental and conservation groups. The draft plan was laid open to the public informally, drawing suggestions for alternative siting of proposed mitigating and compensatory measures as well as additional conservation action. The CP was revised and finalised by the minister of transport in mid-1995, becoming effective immediately (MTPW 1995a).

2.4 Implementation strategies

The CP described, first, the forms of mitigating action that were to be taken during the process of road construction; these measures had a solid legal status. With respect to compensation, second, the implementational framework specified that suitable sites were to be acquired 'amicably', i.e. without expropriation or other coercive means. Another basic proviso was that RWS was not to administer the compensation sites 'for eternity'. After completion of initial ecological management, these were to be transferred to specialised conservation agencies for further management. The objectives of the acquisition of lands were pursued as far as possible on the basis of cooperation and agreement, employing three basic strategies: (a) acquisition of lands, followed where appropriate by exchange with other parties, (b) participation in reallocation schemes, and (c) implementation of a Land adaptation project (*Aanpassingsinrichting*), primarily for the purpose of the CP.

2.5 Estimated costs

Using standard data for civil engineering and conservation work, the full cost of CP implementation was estimated at € 15.2 mln. (Table 3), 5.1% of the budget

initially earmarked for highway construction (MTPW 1995b). This figure comprises two elements: initial expenditure on site acquisition and preparation, and expenditure on management of the sites to the required ecological quality, the latter sum capitalised over 10 years (subsequent management to maintain such quality is the financial responsibility of the conservation agency managing the site). It is thus the objectives of the CP that determine expenditure on site acquisition, preparation and initial management, rather than a fixed budgetary stipulation. This cost estimate does not include additional staffing at RWS or other such organisational expenditure.

2.6 Road construction and compensation timetables

Construction of the A50 road link, comprising a highway from Oss to Eindhoven, was taken to hand in 1997. Several sections were completed from summer 2002 to summer 2003; the final section is scheduled for completion at the end of 2005. There has been debate on whether the motorway should be extended north through to Oss, but no decision on this point has yet been taken. Practical implementation of the CP began in 1995 and has generally been in tandem with the roadworks. After full implementation of the CP there will be an appraisal of whether targets have been met and, if not, what compensation is to be paid by RWS into a 'Green Fund', as specified under the terms of the Structure Plan for the Rural Areas.

3. Implementation of the compensation plan

3.1 Organisation and consultation

The first, organisational step in implementing the compensation plan was to prepare a statement of intent, an administrative agreement ('covenant') supported by all parties in January 1996. Responsibilities were assigned as follows: CP implementation: regional, Noord-Brabant Directorate of *Rijkswaterstaat* (RWS-NB); long-term planning protection of compensation sites: local and regional authorities; compensation site management: conservation agencies, local authorities and polder boards (*waterschappen*); pooling compensation sites in reallocation projects (see below): reallocation committees (*landinrichtingscommissies*). One of the aims of this collective statement of intent

was to remove some of the scepticism with which the CP was viewed by several parties. Environmental organisations had initial doubts as to the effectiveness of compensation as well as about long-term safeguards for ecological quality. Farmers, some of whom had memories of land being expropriated for earlier infrastructure projects, at first saw the new concept of 'compensation sites' merely as a new assault on their land base (Siemes 1996). Gradually, though, both these parties came to have more faith in the CP, with the farmers showing a growing willingness to think constructively about suitable search areas, in part due to the prospect of structural income from any compensation measures implemented on farmland.

A series of consultative forums were also established, both within the project office of RWS-NB and externally. In the latter category were three forums, with hierarchic responsibilities from the administrative down to the practical, charged with ensuring that site acquisition, design and management were carried out in accordance with administrative conditions and creating and consolidating public support. The chief task of the 'top', administrative body was to discuss and elaborate the basic terms of the compensation plan. Between RWS and the provincial government there were often differences of opinion on the best implementational framework, particularly with respect to the location of appropriate compensation sites. Coherent decisions proved troublesome to draft, slowing down the tempo at which the 'lower' consultative bodies were able to do their work.

Working in conjunction with these external bodies were two forums within RWS, again in hierarchic relation. Their task was to coordinate practical implementation of the CP, motivated in part by the fact that several of those charged with the business of land acquisition were employed at RWS.

3.2 Experience with the three strategies

3.2.1 Land acquisition

Considerable experience has been gained with both land purchase and exchange. Some of the parcels of land bought by RWS were not in themselves suitable for (creating) the targeted type of habitat (being too dry, for example) and exchange was therefore sought with plots of relatively unprofitable farmland (too wet, for example) to the benefit of both parties, here in terms of hydrology. In the course

of such exchanges, experience was gained with assessing and optimising the interests of the respective parties.

3.2.2 Participation in reallocation projects

As elsewhere, the Netherlands has experience with land consolidation schemes that seek to optimise the rural planning process through redistribution of land for agriculture, recreation, nature conservation, housing and other uses according to some previously established key. As a participant in the 'Sint-Oedenrode' consolidation scheme in progress in the area, RWS-NB was able to secure 25 ha for ecological compensation. Unfortunately the scheme runs from 2001 to 2005, which may cause the CP to over-run (timetable 1997-2003).

3.2.3 Implementation of a Land adaptation project

Application for a Land adaptation project (*Aanpassingsinrichting*; MANF 1993) for the area along the road section between Uden and Veghel was filed with the competent (provincial) authority by RWS-NB in 1997; the A50 itself was not included. The order was issued in 1999 and the following year a reallocation committee was appointed to oversee the process (DLG 2000). The principal aim of land adaptation is to facilitate the exchange of lands for ecological compensation and agriculture in order to tackle the local problems caused by highway construction. Additional aims were to implement and extend the National Ecological Network, improve environmental and water quality, and install several small recreational provisions. Land adaptation was chosen as a planning instrument because it allows for an integrated approach, which was held to be more conducive to regional support than *ad hoc* acquisition of lands. It was also felt that this would in principle be a more efficient, cost-effective and equitable way of implementing agricultural and conservation policy, including compensation. Land exchange under the terms of the Land adaptation project is meanwhile in full progress, with an attempt being made to achieve synergy between interests. The 10 metre 'green' zone along some of the watercourses, for example, planted with hedgerows, shrubs, wildflowers and other small 'landscape features', is to be widened to form a proper ecological corridor managed by polder boards or local councils. The plan is to widen these zones to 25 metres, planted similarly, using compensation funds for initial development and subsequent management (DLG 2000). Despite the longer timetable of the Land

adaptation project, from 2000 to 2008, the compensation targets it sets are to be achieved by the year 2003.

3.3 Progress to date

3.3.1 Mitigation

Most mitigating measures have been (or are being) implemented in conjunction with actual road construction. Wire fencing has been erected along most of the section completed to date and a variety of fauna tunnels have been constructed (Table 1). As road construction progressed, the original CP had to be adapted on several points. Revisions in the design of the road itself meant that two of the tunnels for larger (game) animals could not be implemented in their original form and alternatives therefore had to be developed (Table 1). One of the two impermeable clay lenses also proved unnecessary, the water table remaining undisturbed.

3.3.2 Compensation

As of 1 January, 2002, 226 ha of the 281 ha of lands required for compensation had been acquired, i.e. 80% of the target (Table 2). Most of this is farmland, scattered in plots along the new road, all of it within the original search areas. Twenty-four hectares have been earmarked for hedgerows and other 'landscape features' (see above), the full CP target, and on 7 ha work has already been completed (Table 2). Fifty-five hectares have been acquired under the 'Sint-Oedenrode' land consolidation scheme, more than the target, and 76 ha under the Land adaptation project, against a target of 92 ha (Graat 2002). This latter achievement, however, may conflict with the secondary aims of the land adaptation.

3.3.3 Tempo of land acquisition

Between 1995 and 1998 RWS purchased a fair amount of land, about 100 ha in all, but in the following years this tempo dropped substantially as real estate prices spiralled and it was not until the end of 2001 that acquisition could be taken up again in earnest (see 'Costs', below). All in all, though, these market pressures did not cause any real stagnation of the CP. On the northern section of the road, particularly, it was still relatively easy to purchase land direct from farmers, who are not in a strong economic position regionally.

3.3.4 Site preparation, management and administrative transfer

Once definitive locations had been found for compensation sites (i.e. following any land exchange) plans were drawn up for preparatory work on the site and initial ecological management. At about the time this work was completed, the site was handed over to the conservation agency taking responsibility for ultimate management, the Forestry Commission (*Staatsbosbeheer*), a local council or polder board. This agency is then responsible for the hands-on work of ensuring the targeted habitat quality is indeed achieved. As of 1 January, 2002, sixty-two ha of land had been transferred in this way, mainly to the Forestry Commission. Conditions and terms were laid down in transfer deeds – the first of their kind in the Netherlands – detailing such matters as site preparation (as necessary), management, costs, local public education and physical planning (i.e. zoning) guarantees.

3.3.5 Compensation via on-farm conservation

In the past few years a growing number of farmers have expressed interest in participating in ecological compensation projects by appropriately managing specific parts of their holdings. Farmers in the area set up an association specifically for this purpose (*Vereniging Agrarisch Natuurbeheer 'Maashorst'*), sending a tender to RWS in early 2002 for some 10 ha of new landscape features. These were to be implemented and managed by the farmers, who would also retain full ownership of the land. The planning status of the land would also remain unchanged. It was envisaged that after mutual agreement of terms RWS would pay the association a lump sum for services rendered. As a legal entity, the *Vereniging Agrarisch Natuurbeheer 'Maashorst'* would then enter into short-term contracts with individual farmers (for 6 years), itself bearing responsibility for ensuring that the full 10 ha was properly and durably managed during this period. After termination of this contract, design of new landscape features and consequent management could then be transferred to other farmers. Although this seems an attractive way of achieving ecological compensation (i.e., obviating the need for acquiring new lands), negotiations between the parties recently broke down, as the compensation demanded for lost income through 'unproductive' land from the agricultural point of view in the end appeared to be more expensive than land purchase. Another factor contributing to the failure of the negotiations were doubts by RWS on effective long-term protection of the compensation sites.

3.4 Costs

As the CP was being implemented the price of real estate in the area rose very substantially, mirroring national and regional trends (NIPHE 2000). One of the factors behind increasing land pressure was ever growing demand by regional and local government for a variety of planning functions, in particular the provincial authority (extension of National Ecological Network), local authorities (housing and 'landscape' projects) and polder boards (ecological corridors). In addition, though, local land prices inevitably rose with implementation of new infrastructure. In the vicinity of the A50 average prices have doubled in seven years, from € 22,700/ha in 1995 to € 45,000/ha in 2002. National policy dictates that RWS should pay no more than the going market price for real estate, so as not to contribute to price inflation.

Because of this rise in prices the allocated CP budget proved inadequate for implementing the full series of compensatory measures. In the year 2000 the overall budget for the A50 link was revised upwards (MTPW 2000), with a sizable portion of these new funds being earmarked for compensation, boosting the budget from the original € 10.7 mln. to 13.5 mln., or from 5.1 to 6.0% of overall project funds (Thoolen 2001).

Table 3 shows expenditure to date on mitigation and compensation. As of 1 January, 2002, less than half the compensation budget had been spent. Although expenditure on land purchase, the major budget item, is on schedule, expenditure on preparation and management of compensation sites is lagging seriously behind. Likewise, only a small slice of the budget for mitigation measures has been spent (<10%) because the most expensive provisions (ecoduct, modified viaduct, combined fauna and -hikers' tunnel) are still to be constructed.

3.5 Long-term safeguards

There are a variety of safeguards in place for long-term protection of the compensation sites. First, all lands potentially eligible for acquisition or use were checked by RWS to ensure that designation as a conservation site did not conflict with regional structure plans, reducing the risk of emerging ecological values being threatened by foreseeable future developments (prior protection). Second,

once initial work on the sites had been completed, the sites were entered into local zoning plans in their new function (*post factum* protection), providing safeguards against new physical planning interventions. Third, stipulations on long-term site management were included in the deeds detailing transfer of compensation sites from RWS to conservation agencies; in the event of gross negligence RWS can demand the return of the land in question or seek due financial reimbursement.

3.6 Dilemmas and insights

The lack of a clear implementational framework for the compensation plan meant that the need for RWS to operate efficiently often conflicted with other parties' desire for a well-defined 'playing field'. One recurrent dilemma in this context was what to do when a parcel of land became available without enough being known about its potential for realising the targeted type of habitat, or about unforeseen developments such as new housing, soil pollution or provincial planning changes. In cases like these the obvious strategy was to seek land elsewhere, possibly even outside the search areas, or revise the type of habitat targeted in the original CP. Unnecessary adherence to original targets may stand in the way of new insights and opportunities, but at the same time a flexible approach may mean deviating from earlier pledges to parties in the region. Other unforeseen developments proved more favourable, though. For example, purchase of a tract of land in the Aa valley by RWS for the compensation plan led the provincial government to designate more of this valley an ecological corridor than originally planned. Here, synergy resulted from two parties seeking land for nature development.

Finally, there is often the question of where the boundary lies between established and emerging policy. In the case of ecological compensation to offset the damage of infrastructure development this question is particularly relevant, because such compensation may not entail mere implementation of standing policy. For RWS, 'established policy' means a government approved plan with a specific budget attached, providing a guarantee that implementation of the CP is not interfered with by emerging policy.

4. Discussion

4.1 General

With no experience in the Netherlands to fall back on, the work of drawing up and implementing the A50 CP marked a novel, experimental phase of work at RWS. There were two main areas of experimentation and learning: mobilisation of personnel, within RWS and in the wider regional environment, and the need to act pragmatically as well as 'boldly'. Implementation also put additional pressure on staffing and funds, given the wide range of activities involved, in particular: establishing consultative forums with a variety of parties, land acquisition, contracting out practical work and participating in land consolidation schemes. The programmatic approach to ecological compensation adopted for the A50 has proved no guarantee that targets will indeed be met. In the first place, the lack of an implementational framework meant there was no clear prior idea of how a compensation plan was to be realised in practice. Second, actual implementation of compensation measures was one of the final links in a chain of events in the hands of other regional parties: RWS-NB itself (construction of the A50 link), the regional government (National Ecological Network, land consolidation schemes), local authorities ('landscape' projects) and polder boards (ecological corridors). Delays in these projects impacted directly on the progress and consequently success of the CP. Third, the effectiveness of compensatory measures is governed partly by extraneous factors. In particular, the availability of land in the immediate vicinity of the road varied in the course of CP implementation, and thus also the tempo of acquisition. In some cases, though, search areas lost their eligibility as compensation sites through unforeseen developments. For all these reasons, the A50 CP could not be elaborated in detail beforehand. More generally, implementation of a CP has proven to be a rather unpredictable process, which should be seen as a fact of life rather than as a flaw in the programmatic concept itself.

4.2 Implementation and implementation strategies

In all likelihood the CP acquisition target will have been fully or largely met by 2003. This will not be the case for preparation, management and administrative transfer of the compensation sites, however. The ultimate timetable for the A50

CP is thus fairly long, similar to that of actual road construction.

The decision to establish a voluntary agreement among parties helped create and consolidate regional support for the CP. Land consolidation schemes, on the other hand, proved to be less helpful than anticipated. As a tool for land redistribution, Land adaptation projects can in principle be a useful tool for effectuating ecological compensation, but suffer from a degree of inertia because of the large number of parties involved.

One development not foreseen in the A50 CP was the interest expressed by farmers, a number of whom formed an association for the specific purpose of participating in compensation projects, by creating and managing landscape features on their farms. No agreement could be reached on the fee to be paid, however. Even so, it is to be queried whether these features will be of the desired ecological quality without land purchase and revision of physical planning status. It will be many years before hedgerows to replace those damaged or destroyed by road construction develop equivalent ecological values. It may well be the case that short-term contracts lead almost automatically to young landscape features of limited ecological value with a potentially high 'turnover' rate. On the other hand, the area devoted to linear ecological features on farms in Noord-Brabant is relatively small compared with the rest of the country (Manhoudt & De Snoo, 2003). In principle, then, on-farm ecological compensation can certainly help boost biodiversity on and around farms in the Eindhoven-Oss region.

One option for effectuating compensation that was rejected from the start was government expropriation of lands, although this is theoretically feasible if local authorities agree on a revision of zoning plans. It was the view of RWS-NB, however, that any potential benefits would be severely outweighed by the resultant loss of regional support. The revised Routing Act (October 2000) provides for the option of expropriation on the basis of the Routing Decision. That this option has not been used in the Netherlands to date illustrates the government's unwillingness to resort to coercion.

4.3 Long-term safeguards

In the Netherlands as a whole, most of the experience gained over the past few years by RWS in the field of ecological compensation has been tied to land

acquisition and revision of zoning plans, on the premise that land ownership by conservation trusts provides the best safeguards for long-term protection of ecological values (Cuperus *et al.* 2002). With farmers now expressing ever more interest in on-farm ecological compensation, it is becoming increasingly urgent to establish whether the strategy followed to date should be continued (Terwan 2000, 2001). Apart from Noord-Brabant this is also relevant in the provinces of Limburg (A73 Venlo-Maasbracht road link) and Zuid-Holland (high-speed rail link). The situation in Zuid-Holland is comparable to that in Noord-Brabant, while Limburg farmers have gone one step further and are now seeking a change in zoning plans so that field margins can be set aside for conservation. These developments require a policy response at the national level, to provide an optimum guarantee of long-term protection of the ecological values developed at compensation sites.

5. Conclusions and recommendations

5.1 Conclusions

(1) The material and financial input of the Noord-Brabant Directorate of the Directorate-General of Public Works and Water Management (*Rijkswaterstaat*) to design and to implement the ecological compensation plan for the A50 road link between Eindhoven and Oss provide a good indication of the scope and detail of government duties in this area.

(2) By the time work on the A50 has been completed and the compensation plan implemented, the acquisition target of the compensation plan will have been fully or largely achieved. This will not be the case for preparation, ecological management and administrative transfer of the compensation sites, however. There will also still be funds outstanding on the compensation budget. If financial compensation should prove necessary, the terms of the Structure Plan for the Rural Areas would be fulfilled in a procedural rather than ecological sense, as the criterion of no-net-loss of ecological values would then not have been respected.

(3) Ecological compensation has not been achieved entirely as planned, for several reasons; (a) it could not be enforced, (b) an unambiguous implementational framework was lacking, (c) there was no prior specification of

the precise mode of implementation, (d) it followed on from and was therefore dependent on other parties' activities and objectives in the same region.

(4) Although there is growing support for the idea of on-farm conservation, the government has not yet adopted a policy position on this as a modality for ecological compensation. It is still unclear whether this option provides sufficient safeguards for no-net-loss of ecological values.

5.2 Recommendations

(1) An unambiguous framework ('playing field') for implementing ecological compensation should be developed at the national level, specifying in greater detail the following particular issues: definition of no-net-loss and appraisal thereof at compensation sites, the ecological targets to be attained at these sites, the location of the sites, and their long-term management.

(2) Future ecological compensation plans should specify the margins by which results may deviate from targets while still satisfying the 'no-net-loss' criterion. This would provide the flexibility required in practice while still providing clear goals as to the ecological quality criteria to be satisfied at individual sites.

(3) The government should take a position on on-farm conservation as a modality for compensating for the ecological impacts of road infrastructure. In doing so, the requirement of no-net-loss must be weighed up against situations with and without land acquisition and re-zoning of the farmland on which compensation is to be implemented.

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Literature

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