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Cuperus, R.

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Chapter 5

Preparation and implementation of seven ecological compensation plans for Dutch highways



Ruud Cuperus, Marleen Kalsbeek, Helias A. Udo de Haes & Kees J. Canthers
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Preparation and implementation of seven ecological compensation plans for Dutch highways

Abstract

First-generation compensation plans (CPs) for Dutch highway projects have been evaluated with respect to implementation of the compensation principle (1993), which aims to counterbalance the adverse ecological impacts of large-scale development projects. Decision-making on the seven projects took place between 1993 and 1995. Specifically, we considered: (a) the processes employed to prepare and implement the compensation plans; (b) the methods used to identify, plan, and execute the compensation measures; and (c) the results yielded by these methods. We conclude that the CPs were prepared fairly uniformly, particularly in terms of the processes and methodologies used to derive compensation measures. Five of the seven CPs had become operational by 2001 and initial experience is now being gained on land acquisition and transfer of compensation sites to nature conservation trusts. Further progress of CPs is likely to be seriously hampered by growing demand for land for development in general and associated increases in real estate prices. Several problems are addressed and recommendations made with respect to: (a) developing a legal basis for the compensation principle, (b) the relationship with reallocation projects, (c) estimation of compensation costs, (d) an annual bias of CP budgets to account for rising costs, (e) contingency measures, and (f) criteria for CP (ex-post) evaluation.

Key-words: compensation principle; no-net-loss; process and organization; methods; implementation; legislation; costs.

1. Introduction

Throughout the world, nature is under threat from development projects. Many species are in decline, in both temporal and spatial terms, as a result of habitat loss, degradation and isolation (Reed 1995, NIPHE 1999). To counter this trend in the Netherlands, elaboration of the National Ecological Network has been in progress since 1990 (MANF 1990). The network, which aims to develop and

conserve a robust system of nature areas connected by ecological corridors, is expected to cover 7000 km² by 2018, i.e., nearly 20% of the Netherlands' land mass (MANF 1994). However, implementation of the network is being hampered by rising demand for land, mainly for urban development, road-building and reallocation of farmland (NIPHE 1999).

As a tool to enhance the effectiveness of Dutch conservation policy, the ecological compensation principle (no-net-loss) came into force in June 1993 (MANF & MHPE 1993), following earlier introduction in the United States, Canada and Germany (cf., Cuperus *et al.* 1999). The principle aims are to enhance the input of nature conservation interests in decision-making on large development projects and to counterbalance the adverse ecological impacts of such projects when implemented. We here adhere to the European terminology by distinguishing between mitigation (minimizing, rectifying, and reducing adverse impacts) and compensation (replacing natural habitat) as separate terms. In other words, mitigation measures are physically tied to the infrastructure, while compensation takes place elsewhere. This is in contrast with United States use of the term mitigation, which covers minimization, rectification, and reduction of ecological impacts as well as compensation (National Research Council 1992).

Policy implementation of the Dutch compensation principle coincided almost exactly with that of the Routing Act (Official Gazette 1994). One of the aims of this act is to structure the decision-making process on highway development and integrate it with the environmental impact assessment (EIA) procedure (Official Gazette 1979). As a result, ecological compensation has been incorporated into the various phases of the Dutch highway planning process (Cuperus *et al.* 2001). In the case of seven pre-Routing Act projects already approved between 1993 and 1995, the compensation principle was implemented too late to achieve its primary aim: to enhance the input of nature conservation interests in decision-making. However, all seven highway routing decisions state that a compensation plan (CP) was to be prepared, in line with the second aim of the principle: to compensate for adverse impacts. CPs have meanwhile been prepared for all these projects, and most are now operative (1 January 2001).

To provide relevant experience for future implementation of the Dutch compensation principle, we assessed the seven pre-Routing Act CPs with respect

to how compensation measures have been identified and implemented, to the extent that they are in progress. In doing so we have tried to develop some general notions regarding (a) identification of compensation measures, (b) initiator compliance with national and provincial requirements, (c) feasibility of compensation, (d) instruments for implementation, (e) process evaluation, and (f) ex-post evaluation of the measures. Results are discussed and recommendations and conclusions presented on implementation of the ecological compensation principle in the context of highway development in the Netherlands.

First of all, though, we briefly outline standing Dutch policy on ecological compensation and the method employed here to evaluate implementation in ongoing Dutch highway projects.

2. Dutch ecological compensation principle

In 1989-1990 the option of implementing compensation measures on a voluntary basis was introduced in several Dutch policy documents dealing with the conservation aspects of land development projects (MHPE 1989, MANF 1990, MTPW 1990). Several years later the compensation principle became official policy under the terms of the National Structure Plan for the Rural Areas (MANF & MHPE 1993). The principle is to be applied if any of five types of area, for the greater part consisting of the nature areas of the Dutch National Ecological Network, are affected by national infrastructure projects.

The National Structure Plan lays down the following principles for application of the Dutch compensation principle: (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. The ecological impacts of development projects and associated compensation measures are to be formulated in terms of 'nature target types', characterizing the desired diversity of the National Ecological Network in terms of abiotic processes and target species on different spatial scales (Bal *et al.* 1995).

Physical compensation encompasses ecological design and subsequent management of lands, not necessarily newly acquired. Beyond covering the costs associated with these activities, the Dutch government has introduced a (financial) 'quality allowance' for implementation of nonstandard design and management operations, designed to cover uncertainties in achieving ecological targets (through establishment of buffer zones round compensation sites, for example). For nature target types with development times of <25 years and 25-100 years, respectively, the allowance comprises one third or two thirds of the aggregate cost of site acquisition and design. Quality allowances for sites with development times exceeding 100 years are to be set on an ad hoc basis.

There is as yet no legislation to facilitate initiators' acquisition of lands for compensation purposes, and it is up to the parties involved to reach agreement on rough delineation of search areas for compensation, and on finding actual compensation sites. In the Netherlands, it is becoming clear that the compensation principle transfers the problem of finding compensation sites to other land-intensive sectors, particularly agriculture. Lacking a no-net-loss policy on the agricultural values of its land, the latter sector will a priori suffer sacrifices.

3. Compensation plans and evaluation method

Basic data on the seven highway (re)construction projects examined and the associated CPs (as of 1 January 2001) are provided in Tables 1 and 2 and Figure 1. The initiator of all these projects is the Ministry of Transport, via the Regional Directorates for Public Works and Water Management. The A50 project is proceeding fastest and will feature prominently in this article. The CPs were evaluated with respect to how the compensation principle has been implemented. This analysis is an ex-post evaluation, implying appraisal of the activities and situations following from a particular decision (Arts 1998), viz., the decision on preparing and implementing a CP. Relevant documents were analysed in terms of: (a) the processes employed to prepare and implement the compensation plan; (b) the methods used to identify, plan, and execute the compensation measures; and (c) the results yielded by these methods. As yet there is only limited documentation on CP implementation or anticipated results, and such information was provided by those involved.

Table 1. The seven first-generation highway projects with a CP.

Highway project	Province	Length (km)	Kind of development ^[a]
A50 Eindhoven-Oss	Noord-Brabant	30	C+R
N57 Veersdam-Middelburg	Zeeland	12	R
N37/34 Hoogeveen-Emmen-German border	Drente	42	R
A14 Wassenaar-Leidschendam	Zuid-Holland	5	C
A2 Holendrecht-Oudenrijn	Utrecht, Noord-Holland	25	R
A73 Venlo-Maasbracht	Limburg	40	C+R
N35/36 Nijverdal-Wierden-Almelo	Overijssel	12	C+R

^[a] C construction, R reconstruction

Table 2. Aspects of preparing CPs associated with seven highway projects.

	A50	N57	N37/34	A14	A2	A73	N35/36
Routing decision (month-year)	06-1993	12-1994	04-1994	12-1994	04-1995	05-1995	12-1995
Date of establishment of CP (month-year)	06-1995	11-1996	03-1999	03-1997	06-1998	03-2000	09-1998
Duration of CP preparation	2.0 ^[a]	1.9 ^[b]	4.9 ^[c]	2.3 ^[d]	3.2 ^[e]	4.8 ^[f]	2.8 ^[g]

^[a] MTPW (1995)

^[e] MTPW (1997)

^[b] LB&P (1996)

^[f] DLG (2000)

^[c] DLG (1998a)

^[g] DLG (1998b)

^[d] DHV (1997)

4. Results

4.1 Compensation plan preparation

4.1.1 Process and organization

A definitive CP has been established for all projects (Table 2). The time elapsing between project approval and establishment of the CP ranged from two years (A50) to approximately five years (N37/34, A73). The CP timetable appears to be

dictated by: (a) difficulty in reaching agreement among parties vis-à-vis policy and methods for complying with the compensation principle, (b) lack of experience in preparing and implementing a CP, and/or (c) delays in delineation of the Dutch National Ecological Network, rendering proper impact assessment and subsequent identification of compensation measures impossible.

The preparation of each of these CPs was supervised by a guidance group (Begeleidingsgroep) made up of representatives of external parties. In all the cases considered, the initiator (Ministry of Transport), the Ministry of Nature Management, the Provincial Authority and nature conservation trusts were represented, as well one or more of the following participants: farmers' association, polder board, municipality, reallocation commission, or potential future conservation trust. At meetings the respective guidance groups succeeded in reaching consensus on the basic elements of the CPs. Such consensus covered the methods to be employed for identifying ecological impacts and coherent compensation measures, the specific data to be used and collected for that purpose, and the outcome of the methodological analyses. The agricultural and environmental groups participating in the guidance groups took a critical stance towards the compensation principle, especially at the outset. The farmers involved responded positively to project initiators, however, offering search areas for compensation lands, in the knowledge that economically weak industries in such areas may benefit from compensation refunds. Environmental groups for their part were generally sceptical about initiator attitudes towards nature conservation, and demanded in-depth examination of ecological impacts and of the feasibility of proposed compensation measures. Municipalities, finally, tended to accept compensation sites on the lands they administer, thus yielding compensation refunds and a positive image. In those projects with substantial compensation objectives (approx. 100 ha or more: A50, N37/34 and A73), the draft CPs were also the subject of informal public hearings to supplement guidance group input. These hearings led to the plans being modified to include corrected mitigation and compensation measures, and several compensation search areas being shifted to locations with better potential for successful realization.

In all cases the initiator bears ultimate responsibility for implementing and financing the compensation measures. Land acquisition, where necessary, may



Fig. 1. The location of seven Dutch highway projects

Table 3. Avoidance and mitigation aspects of the CPs of the seven highway projects ^[a].

Item	A50	N57	N37/34	A14	A2	A73	N35/36
a. impact avoidance measures							
horizontal shift	-	-	+	-	-	+	-
elevated construction	-	-	-	-	-	+	-
extended sunken construction	-	-	-	+	-	-	-
marsh strips along infrastructure	-	-	+	-	+	-	-
diversion of ecological corridor	-	+	-	-	-	-	-
b. planned mitigation measures							
ecological design of roadside verges and ditches	-	+	+	-	+	-	-
fauna wire fences (km)	28	1	25	<1	-	68 ^[b]	8
adaptation bridge/viaduct (no.)	5	-	12	1	-	2 ^[b]	+
small fauna tunnels (no.)	23	+	40	3	-	82 ^[b]	10
adaptation / ecoculvert (no.)	-	-	3	3	-	20 ^[b]	1 ^[c]
fauna (deer) underpass (no.)	-	-	-	-	4	2	0/2 ^[c]
ecoduct (deer overpass)	-	-	-	-	-	-	0/1 ^[c]
recreation / fauna / cattle underpass (no.)	1	-	-	-	-	-	-
noise screen / acoustic wall (km)	-	-	3.0/-	-/0.4	-	7.2/-	-
adaptation of illumination regime	-	-	-	+	+	-	-
collection of polluted water in ditch/gutter	-	-	-	+	+	-	+
bentonite screens (no.)	2	-	-	-	-	-	-
transposition of badger sett (no.)	-	-	-	-	-	2	-
transposition of ant nest (no.)	-	-	-	-	-	4	-

^[a] In all projects, sound-suppressing asphaltic concrete was applied as a standard.

+: measure planned to offset impacts.

-: impact not relevant/measure not applied.

^[b] Some of these measures applied to the 'second-tier' road network.

^[c] In study: either 1 ecoduct or 2 deer underpasses.

either be realized by the initiator or delegated to other suitably equipped organizations. It is anticipated that land ownership and (long-term) management of compensation sites will be transferred to nature conservation trusts.

4.1.2 Methods for identifying compensation measures

Avoidance and mitigation of impacts. As highway trajectories had already been roughly delineated in routing decision documents, incorporation of avoidance measures in the standing design was feasible in a restricted sense only (Table 3, item a). However, in two projects horizontal shifts were applied locally in order to avoid — or at least reduce — ecological impacts on a valuable geomorphologic steep edge with seepage-water-dependent vegetations (A73) and on an ancient forest (N37/34). Furthermore, road construction was elevated locally in order to leave groundwater flows unaffected (A73). The A14 CP includes an extended sunken section, as a complement to the routing decision, in order to shield meadow birds from traffic noise. Marsh strips up to 35 m wide have been planned along two highways as ecological corridors (N37/34, A2). In another project (N57), an existing ecological corridor is to be diverted so that wildlife passage will remain functional after reconstruction.

All the CPs include mitigation measures addressing habitat degradation (noise, water table impacts, pollution, illumination) and habitat isolation. Generally speaking, the relevant reports judged these measures sufficiently effective (Table 3, item b), except for those addressing noise impacts. Only in the case of the A73 were additional compensation measures required (see next section).

Compensation methodology. When the compensation principle was introduced into Dutch policy, a method for identifying compensation measures had to be developed. This was undertaken within the framework of the A50 project (Cuperus *et al.* 1996). The method employed a limited number of indicator species, known or assumed to be sensitive to infrastructural impacts and ecologically linked to the habitat types present in the highway study area (Table 4, item a). Several breeding birds, a species group on which extensive information on breeding density was available, were selected so that the impacts of habitat loss and noise-related habitat degradation could be identified quantitatively (Reijnen *et al.* 1995). In contrast, mammal, amphibian, reptile, and butterfly species, on which only qualitative information was available, were selected as indicators for habitat isolation. The required compensation was then

calculated from the number of indicator species' territories degraded and the average territory size and habitat quality of the territories under undisturbed conditions. Because a method for predicting habitat isolation effects was lacking, these impacts were not covered by compensation but mediated through design and management of the compensation area.

Relevant parts of the A50 method were adopted in the CPs for the N57, N37/34, A14, and A2 (Table 4, item a). In the case of the A73, the A50 method was elaborated in greater detail and on some points substantially adapted (DLG 2000). First, infrastructural impacts on vegetation due to habitat loss and water-table depression were computed. These impacts were expressed in terms of changes in ecotopes, e.g., vegetation types associated with spatial units homogeneous in terms of vegetation structure, succession stage, and abiotic characteristics relevant to vegetation growth and development (Runhaar & Udo de Haes 1994). Second, GIS (geographic information systems) models for identifying impacts on habitat isolation were adapted for six mammalian species and 11 amphibian and reptile species. Estimated impacts were analyzed in terms of species distribution and density, home ranges, and modeled vulnerability to habitat isolation. Third, the compensation thus calculated was corrected for impact overlaps. Because the various ecological impacts are described separately for methodological reasons, giving the false impression of independent occurrence, merely totaling these impacts may overestimate the overall impact of the infrastructure in question.

4.1.3 Implementation of national and provincial policy

All the highway projects considered are in basic accordance with national policy on nature conservation and ecological compensation (Table 4, item b). In four projects quality allowances (see the explanatory section on the compensation principle) are expressed in monetary terms, in line with national policy. In the other projects, however, national policy on the quality allowance was overruled at the more stringent provincial level. The provinces in question demand a compensation ratio, i.e., ratio of replaced to degraded area, of greater than one. The ratios set by Noord-Brabant province range from 1.3 to 1.7 and are based on ecological value development times (Province of Noord-Brabant 1997). In the other province, Overijssel, compensation ratios vary from 1.1 to 1.7 and are based on development times as well as the degree of isolation of the

compensation sites relative to the provincial Ecological Network (Province of Overijssel 1999).

4.1.4 Identification of compensation measures

Most of the compensation measures proposed are associated with habitat loss or with habitat degradation due to traffic noise. Compensation (Table 4, item c) for individual projects ranges from 4 to 281 ha of habitat creation (generally conversion of arable land or intensively managed grassland to the desired habitat) and from 0 to 59 ha of habitat enhancement (restoration). One project (N57) shows an unambiguous one-to-one relation between habitat loss and creation, and between habitat degradation and restoration. Restoration appears to be associated exclusively with meadow bird habitat. In the N37/34 and A14 projects, creation of this habitat type was adopted as a final resort where habitat enhancement was deemed unfeasible. The ecological values to be developed (Table 4, item c) vary in development time and are generally described in terms of national nature target types. When the A50 and A2 CPs were being drawn up, however, the national typology was not yet operational at the provincial level.

In all the projects, financial compensation is included as an option of last resort. The projects seek physical, in-kind compensation, i.e., replacement in terms of equivalent habitats, species, or functions. In the A2 study area, however, physical compensation proved unfeasible because of real estate being unavailable, and according to the CP, financial compensation was therefore adopted instead. This budget is to be used to create 'environmentally friendly canal banks' some 3 km from the project area. These banks, permeable for fauna, are intended to form an ecological corridor perpendicular to the A2, thus improving the effectiveness of the mitigation measures realized in this project.

4.1.5 Instruments for implementing compensation measures

From the plans, the A2 excluded, we conclude that compensation objectives can be achieved by way of several instruments (see Table 4, item d). First, initiators may seek to acquire lands in the designated search areas if suitable compensation sites are available. Alternatively, the initiators may acquire lands outside these areas. By exchanging property with one or more other landowners in the search areas, they can then try to redirect the acquired compensation sites to their appropriate position. Second, enhancing existing habitat need not necessarily

Table 4. Compensation aspects of the CPs of the seven highway projects ^[a].

Item	A50	N57
a. Method for deriving compensation measures	indicators	nature target types
b. Allowance in money or area, allowance/ratio	a, 1.3-1.7	m, 1/3
c. Habitat lost (ha)	ns ^[b]	4
Habitat degraded (ha)	ns ^[b]	43 ^[c]
Compensation measures planned		
Creation of new habitat (ha)	281	4
Enhancement of existing habitat (ha)	-	17
Total compensation area (ha)	281	21
Financial compensation	if necessary	if necessary
Nature type to be developed	woodland, shrubland, grassland, marshland, fine- scale landscape	woodland, shrubland, grassland, amphibian pools
d. Planned instruments for realization		
Land acquisition when available/land exchange	+	+
Agreements on ecological management	+	+
Participation in reallotment or other local activity	+	-
Initiation of new reallotment	+	-
Search areas for compensation	map 1:50,000	approximate
Estimated feasibility of compensation	ns	'unknown'
e. Mitigation costs (US\$ mln and % of project budget)	4.9 (1.5%)	0.2 (0.1%)
Compensation costs (as above)	11.4 (3.6%)	0.1 (0.1%) ^[f]
Financial compensation (as above)	-	-
f. Evaluation aspects considered	process	-

^[a] +: yes, planned; —: no, not/hardly planned; nr: not relevant; ns: not specified.

^[b] Not specified due to complex calculation (A50) or complex modelling (A73).

^[c] Compensation for degraded habitat based on a 25% (N37/34), a 35% (A2, N14) and a 40% (N57) decrease of the breeding bird population.

^[d] Based on theoretical in-kind compensation of grassland.

^[e] Cost of ecoduct/underpasses not included.

^[f] Cost of enhancing 17 ha grassland not included.

^[g] Dependent on ratio between new habitat to habitat enhancement.

^[h] In the plan an equal sum is earmarked for a railway development project associated with the A2 highway.

N37/34	A14	A2	A73	N35/36
nature target types, indicators	nature target types	area typology	nature target types, indicators	nature target types, indicators
a, ns	m, 1/3-3/3	ns	m, 1/3-2/3	a, 1.1-1.7
47	5	0	ns ^[b]	12
59 ^[c]	527 ^[c]	23 ^[c]	ns ^[b]	1
47-94	8	(8) ^[d]	141	9-11
0-47	1	-	44	5
94	9	0	185	14-16
if necessary woodland, grassland, moist heathland, amphibian pool	if necessary woodland, grassland, marshland	+ (grassland) ^[c]	if necessary woodland, shrubland, heathland, fine- scale landscape, corn-field	if necessary woodland, shrubland, heathland, amphibian pool
+	+	nr	+	+
+	+	nr	+	-
+	+	nr	-	+
-	-	nr	-	-
map 1:10,000 'possible'	map 1:50,000 'unknown'	nr unfeasible	map 1:100,000 variable	map 1:50,000 -
0.6 (0.5%)	0.7 (0.2%)	33.2 (5.2%)	13.7 (2.8%)	0.3 (0.2%) ^[e]
2.3-3.1 (2.0-2.7%) ^[g]	2.4 (0.8%)	nr	12.3 (2.1%)	0.9 (0.5%)
-	-	0.4 (0.1%) ^[h]	-	-
-	-	-	process	-

Table 5. Progress of the CPs (assessment date 1 January 2001).

	A50	N57
Start of highway (re)construction (foreseen) ^[a]	1997	(2006) ^[b]
Start of implementation of CP	1995	1997
Expected completion of CP and highway project	2003	2010
Compensation objective (ha)	281	24
Compensation realised as of 2001 via acquisition (ha) and relative to CP objectives	195 (69%)	8 (100%)
Transferred to managing body (ha) and relative to CP objectives	59 (21%)	0 (0%)

^[a] MTPW (2000).

^[b] Project delayed for political reasons.

^[c] No physical compensation due to financial compensation.

involve land acquisition and may be achieved by seeking appropriate agreements with individual farmers. Such was the case in four of the projects (Table 4, item c). These agreements embody an annual per-hectare reimbursement, paid by the initiator, to facilitate ecological management of grasslands, and aim to enhance avifaunal and vegetational values. Third, the initiator may participate in a reallocation exercise under the Dutch Land Use Act (Official Gazette 1985) or cooperate with other local initiatives to effectuate a voluntary trade-off among nature, agricultural, or recreational functions by landowners and land-users. To count as a negotiating party, the initiator must first acquire land in the reallocation area. Specifically in this option, the initiator should be aware that compensation will be additional to current policy and plans. Fourth, the initiator may himself develop new reallocation activities, using the Land adaptation (*Aanpassingsinrichting*) provisions developed under the Land Use Act. In this option, reallocation is tightly integrated on a voluntary basis with large-scale development as well as with associated compensation measures for impacts on agricultural, ecological, and recreational functions in the same area (MANF 1993).

In all the projects, search areas for compensation are indicated either on a map (scale 1:10,000-1:100,000) or in general terms (Table 4, item d). Search areas are delineated in a 2-20 oversize ratio compared to the extent required for

N37/34	A14	A2	A73	N35/36
1995	1998	(2002) ^[b]	(2003)	(2006) ^[b]
1998	1997	-	2000	-
2005	2004	2010	2007	after 2006
94	15	- ^[c]	185	14
18 (19%)	0 (0%)	-	13 (7%)	-
0 (0%)	0 (0%)	-	0 (%)	-

compensation purposes. Compensation sites generally link up with the National Ecological Network or with other nature areas. In contrast, one plan (A73) opts to enhance habitat quality within a specific part of the National Ecological Network. In this particular case the province is willing to exclude the A73 compensation sites from the National Ecological Network area and include a similarly sized location elsewhere in the network. Generally, a rough estimate is given of the feasibility of acquiring compensation sites.

4.1.6 Costs of compensation measures

The overall cost of physical compensation is made up of the costs of acquisition, design, and management of the compensation sites and ranges from 0.1 to 3.6% of total project costs (Table 4, item e). In all the projects comprising physical compensation, the cost of long-term management is expressed in terms of a one-off lump sum capitalized over a period of 10 years. For the A2 project, the level of financial compensation is based on theoretical in-kind compensation.

The A50 and N37/34 plans have set a clear-cut moment for ending physical compensation: when highway (re)construction has been officially completed. The reimbursed compensation costs that could not be invested in compensation measures are to be donated to the so-called Green Fund (MANF 1995).

4.1.7 *Ex-post evaluation of compensation measures*

The CPs give scarcely any consideration to the evaluation of compensation aspects and in five projects they are not mentioned at all (Table 4, item f). The two exceptions, the A50 and A73 CPs, provide a timetable for evaluating the progress made on acquisition, design, and management of the compensation sites as well as specifying the instruments to be used for implementation. Ex-post evaluation, involving monitoring of actual ecological impacts and refinement of compensation measures where necessary, is not included in any of the plans.

4.2 **Compensation plan implementation**

4.2.1 *Process and organization*

The A50, N57, N37/34, A14, and A73 started CP implementation activities fairly soon after the terms of the plan had been established (Tables 2 and 5). The remaining two CPs (A2 and N35/35) are not yet operative, owing to postponement of highway (re)construction.

In the case of the A50 project, an administrative agreement was established six months after finalization of the CP, with each party committing itself to implementing the compensation measures according to a timetable running parallel with highway construction activities (MTPW 1996). In this agreement, the initiator confirms his primary responsibility for CP implementation. The municipal and provincial authorities are responsible for facilitating and eventually approving, respectively, the implementation of the compensation sites within relevant zoning parameters. The future managing bodies, viz., polder boards, municipalities, and the State Forestry Commission (*Staatsbosbeheer*), have committed themselves to appropriate management of the compensation sites from the moment of transfer onwards, with a view to establishing the required ecological values.

Implementation of the CPs for the A50, N57, N37/34 and A73 is overseen by one internal and three external bodies. An internal project group (*Projectgroep*) set up by the initiator handles implementational aspects, i.e., aspects relating to spatial planning, land acquisition, and realization of both the highway and the compensation measures. Aspects relating to ecological values are discussed in the expert advisory group (*Klankbordgroep*). The supervisory group

(*Voortgangsoverleg*) — under provincial directorship — monitors the process of achieving the CP objectives. Unresolved items raised by any of these bodies can be dealt with by the official group (*Bestuurlijk Overleg*), which is responsible for overall supervision of the highway project. All deviations from the CP are reported to this group, the highest project authority, by which they are approved and adapted as necessary. The participation of a sufficient number of parties in the process is taken by the initiator to signify adequate public support for the compensation measures.

4.2.2 Instruments for implementing compensation measures

Under national policy, land for compensation purposes has to be acquired on a voluntary basis. In the cases of the N57 and N37/34, initial acquisition of lands appeared to be fairly unproblematic. Although experience with the A50 was similar, it was anticipated in this project that it would be difficult to obtain all the land through negotiation with landowners. In 1997, the initiator therefore applied to the Ministry of Nature Management for approval of a land adaptation project in order to comply with the CP objectives. In 1999 the ministry approved this project, as support was pledged by the regional agricultural sector, in particular; in exchange this sector would benefit from the reallocation of lands. Clearly, the Land adaptation project has financial appeal for the initiator only if it makes implementation costs lower than they would have been if compensation measures were implemented without this instrument. From the start of land adaptation it proved difficult to acquire off-site compensation sites within the project (Table 4, item a). This was due to competing regional objectives, such as realization of the ecological network, a municipal landscape plan, and an agricultural structure plan.

4.2.3 Implementation of compensation measures

As mitigation measures are physically tied to the infrastructure, they necessarily follow the same time schedule as that of the infrastructure itself. For the highways presently under (re)construction (Table 5), mitigation measures could generally be realized according to the CP. With the A50, however, one planned underpass for deer could not be implemented because of unfavorable water tables. In exchange, one deer overpass, viz., an ecoduct combined with a cycletrack, was planned and is now under construction. Furthermore, five years after CP implementation, the A50 project shows 69% compliance with the objectives of the CP in terms of

hectares acquired (MTPW 2001) (Table 5). With the N57, the upgrading of 21 ha proved unfeasible owing to competing objectives of the province. In consultation with the provincial authorities, 8 ha of grassland were acquired by the initiator and are to be transferred to a managing body. Both parties considered the 8-ha acquisition as full (100%) compliance with the CP. The N37/34 and A73 projects, for which CP implementation activities still continue, show 19% and 7% compliance, respectively. The A14 CP is suffering a serious delay in implementation because of an absolute lack of real estate becoming available in the urbanized area in question (0% compliance). Given these disappointing results, an attempt is now being made to compensate off-site, viz., approximately 5 km from the highway.

With the A50, most of the compensation sites could be acquired in or close to the search areas. During 1999 and 2000 the initiator contracted out 59 ha of acquired lands to the State Forestry Commission. The contract regulates the free transfer of property to the Forestry Commission, the design and management of the compensation sites, and the desired ecological values to be developed over the years. It also sets the (one-off, lump sum, capitalized) budget to be transferred to the Commission for achieving the compensation objectives, as well as the penalties imposed by the initiator in the event of unsatisfactory management results.

In all the operational CPs, nature conservation trusts were consulted on the subject of land acquisition. This is because the efficiency of management of a compensation site is determined primarily by its soil and hydrological characteristics and its location relative to other properties held by the trust in question.

It was arranged with the municipalities in the vicinity of the A50 that the compensation sites would be implemented in their zoning plans following completion of the acquisition stage. In anticipation of this move, these municipalities recently earmarked the (agricultural) search areas for compensation in their zoning plans. Compensation sites located in these areas will enjoy protection under the zoning plans, so that the compensation principle will also be applicable to these sites in the event of future impacts by new developments.

Implementation of the A50 CP revealed a particular type of social impact. In areas where land has been acquired for compensation purposes, farmers appear willing to exchange their land for farmland in economically stronger regions, as they fear lower land prices and negative impacts on business operations, such as wildlife damage and superabundant weed growth.

Finally, due to the time constraints under which initiators' land purchasers operate, acquisition of compensation sites often has to compete with acquisition for road-building, especially when land has to be expropriated for the latter. However, given experience to date with implementation and the instruments employed for that purpose, it is anticipated that all the CPs will be implemented before the highways are (re)constructed (Table 5).

4.2.4 Cost of compensation measures

At the local level, preparation for highway construction always pushes up real estate prices, since the market increases the value of goods as they become scarcer. At the national level, too, property prices are also increasing autonomously as a result of road construction, urbanization, and even nature development (e.g., implementation of the ecological network). As an example, the cost of acquiring compensation sites for the A50 recently rose to approx. US\$34,000/ha, double the figure for 1995, the year in which the CP was established. The initiator, being a government agency, is not authorized to buy land above current market prices and is therefore unable to compete with private development corporations. This makes the initiator, along with other governmental organisations, a relatively weak partner in the real estate market.

4.2.5 Ex-post evaluation of compensation measures

Although ex-post evaluation was not foreseen in the CPs, ideas on evaluation were developed early on during implementation of the A50 CP. First, pre-impact sites were monitored for breeding birds (Braam & Teerink 1997). Second, it became clear that monitoring the design standards of the compensation sites would be more appropriate than monitoring the ecological values on those sites. The A50 project group therefore argues that the effectiveness of compensation measures, once realized, should be monitored in terms of (actual or potential) nature target type conditions (Bal *et al.* 1995) and not in strict terms of numbers of individuals of the species associated with the target types in question. The

alternative would be a stringent system in which there is an obligation to restore equivalent ecological values without considering ecosystem properties. However, there have been no serious evaluation activities during CP implementation because there were no instructions to this effect from the central Ministry of Transport.

5. Discussion and recommendations

5.1 Process and organization

The timetables for both establishment and implementation of the CPs assessed are relatively long (totaled at least 5-10 years). We anticipate that future Dutch CP timetables will be shortened as experience on process, methodology, and instruments for implementation grows (cf., Cuperus *et al.* 2001). Reaching consensus on these points with all the parties involved, including the managing bodies of compensation sites, will enhance the feasibility of compensation measures and thus shorten the duration of CPs. At the same time, initiators should be aware that striving too hard for consensus may hamper compliance with the compensation principle, as it may lower quality standards (Marsh *et al.* 1996). As a consequence, during implementation of the CP, initiators should balance consensus against basic compliance with the principle.

Serious problems may arise, however, if CP implementation does not remain in step with highway construction, reducing the efficiency with which its objectives are achieved. Separating the procedures for road-building and compensation may water down efforts to implement compensation measures in favor of realizing the highway itself, because of staffing constraints on the part of the initiator, for example. This may easily lead to the initiator making less effort to achieve compliance with the compensation principle, as an incentive is lacking.

5.2 Methodological aspects

As experience grows, methods for identifying compensation measures are bound to be adapted. One of the issues that needs to be addressed is the level of detail with which ecological impacts and the associated compensation measures are

described. Descriptions of these impacts will inevitably become more detailed as scientific understanding grows. Therefore, a balance should be sought between keeping up with research efforts and practical compliance with the compensation principle. Initial steps have been taken to tackle habitat isolation impacts resulting from infrastructure development and design coherent mitigation and compensation measures. A recent study (Pouwels & Van der Grift 2000) attempts to link an existing spatial decision-support expert system for predicting the stability and persistence of fauna populations after highway development. Another issue to be addressed here is development of nationally accepted methodologies for exchange of nature target types (out-of-kind compensation) and the use of compensation ratios, as applied in Germany (Von Kiemstedt *et al.* 1996) and the United States (Zedler & Callaway 1999).

5.3 Instrumental aspects

In the Netherlands, and especially in urbanized areas where little land is available, we believe that CP implementation time is not dependent on the instrument employed for acquiring land. Ad hoc acquisition preceded by property exchange to redirect the sites to suitable locations as well as reallocation projects (comprising either new or existing plots) require a relatively long time schedule owing to administrative constraints. However, the two instruments differ in their results. The success of ad hoc acquisition depends on the arbitrariness of lands becoming available, making achievement of CP objectives uncertain, while in reallocation projects compensation requirements can be met more readily as a 'land pool' is created and the right locations are ensured. Reallocation projects show a strong similarity with the US concept of 'mitigation banking' (Marsh *et al.* 1996), whereby site development and preservation are undertaken in advance of physical development, making the banking concept one step ahead of the Dutch reallocation concept. As long as mitigation banking is not yet operational in the Netherlands, initiating reallocation projects or aligning with current ones should, generally speaking, be given preference over ad hoc acquisition and redirection of lands when compensation objectives cover a substantial area, i.e., several dozen hectares.

5.4 Financial aspects

Compensation costs will continue to rise because of rising land prices, not only in the rural areas of the Netherlands, and any increase in land prices during implementation may have a dramatic impact on achieving the objectives set out in the plan. Budgets for physical compensation should therefore be estimated realistically, based on growing experience in this field, and be biased annually on an index-linked basis to deal with upward trends in land prices. Furthermore, CPs should explicitly reserve sufficient funds for monitoring and evaluation activities, and for contingencies, such as remedying unsatisfactory results (Treweek & Thompson 1997). Similarly, nature conservation activities facilitated by Green Fund financial compensation will also be adversely affected by rising land prices. Given their nature, financial donations cannot be biased in any way after transfer to the Green Fund. Financial compensation should therefore include an additional budget for contingencies.

5.5 Ex-post evaluation

Ex-post evaluation of the ecological success of CPs is very important, as these plans are originally approved on the basis of their intended results. The initiator bears prime responsibility for assessing CP implementation and for making adjustments as necessary. Serious attention should be paid to this point because monitoring activities are a rare occurrence (Brown & Smith 1998, Brawley *et al.* 1998). Furthermore, the time scale for reaching functional equivalency may exceed the usual monitoring period of 5-10 years, an issue rarely recognized by initiators (Zedler & Callaway 1999). From the Dutch CPs reviewed, we conclude that little if any progress has been made on developing ex-post evaluation criteria. As a result, adequate pre-impact studies are lacking in most of the CPs studied. In CP implementation, all that occurs is sampling of control and compensation sites (Anderson & Dugger 1998), but such an approach has shortcomings, as it may leave local environmental trends undetected.

5.6 Legislation

It would be logical to provide the compensation principle with a legal basis, as this would grant citizens a right of appeal in the event of unsatisfactory results

(cf., Cuperus *et al.* 2001). Appropriate legislation would improve initiators' efforts to implement CPs and evaluate the efficiency of their measures, as they would try to avoid citizen appeals to the State Council. In addition, the possibility of appropriating sites on the basis of a zoning plan should be seriously examined. If agreement can be reached between highway initiator and municipality on 'advance' implementation of compensation sites in the zoning plans, these sites can be legally expropriated for coherent reasons (Official Gazette 1965). Initiators should be aware that the (initial) step of implementing compensation sites in the zoning plan is crucial to success, as this option is grounded in consensus. There is also a need to optimize legislative instruments at the provincial level, as Dutch regional plans may, under well-defined circumstances, provide an expropriation title for initiators (De Laat 1997). Whatever the case, when it comes to developing specific expropriation tools at the national level, consensus with the government authorities in question must be reached.

5.7 Lessons for future CPs

Several lessons can be learned from the first-generation CPs that may lead to improvements in future plans. First, preparation and implementation of new plans are expected to speed up as ongoing experience gives initiators a better notion of the organizational, instrumental, and process aspects of ecological compensation. As time goes on, it is likely that compensation measures as well as the methods used to establish them will be more readily accepted by all the parties involved. Second, future projects will be subject to the Routing Act and some elements of the first-generation CP may therefore be examined earlier in the decision-making procedure, viz., prior to the routing decision. Aspects such as ecological values degraded, potential locations of compensation sites, and compensation cost estimates will then be covered by the routing decision. Furthermore, the citizens and parties involved can take advantage of the Routing Act's provisions for official public participation, superseding the form of participation described in this article, which lacked both formal grounds and clear consequences. As a result, in the future, a CP can be drawn up fairly soon after the routing decision, as the conditions for further elaboration have then been set and the relevant information is already available. In conclusion, then, ongoing experience and linkage with the Routing Act procedure will mean that initiators will be better able to comply with the objectives of a CP.

6. Conclusions

In the Netherlands, initial experience has been gained in implementing the 1993 compensation principle. From this assessment of the first-generation compensation plans (CPs) associated with seven highway development projects, three conclusions can be drawn: (a) in terms of both preparation and content, the CPs have been elaborated fairly uniformly; (b) the parties involved in compensation, frequently representing different interests, appear to be satisfied that most of their requirements are covered by the CP; and (c) this leads to the conclusion that the compensation principle is a potentially strong planning concept.

Several comments are in order, however. First, the plans studied are being implemented slowly because of the relatively long lead times of highway development and of the time required for finding and acquiring compensation sites. Second, it is too early to decide whether or not to adapt the Dutch land expropriation regime for the purpose of acquiring compensation sites. Additional experience with existing legislation and instruments must first be gained, on the basis of zoning plans, for example. However, from the angle of achieving compliance with no-net-loss, a legal footing of the compensation principle is desirable. Third, the 'fixed-price' character of Dutch highway planning may render CP implementation problematic, because of unexpected increases in compensation costs and introduction of contingency measures in the CPs. Fourth, evaluation of the CP implementation process appears to have received little attention in the CPs. In addition, ex-post evaluation, which serves to check, justify, and balance the efficiency of compensation measures, is lacking entirely in the seven CPs assessed due to the absence of an incentive.

The following recommendations are therefore made: (a) a legal basis should be created for both the compensation principle and ex-post evaluation; (b) the scope for introducing expropriation tools under the terms of regional and zoning plans should be investigated; (c) the pros and cons of the land adaptation concept on behalf of compensation should be investigated extensively; (d) compensation costs, which are subject to inflation, should be estimated more accurately in CPs; (e) the budget associated with CP implementation should be biased annually for the (scarcely predictable) rising costs of real estate; and (f) contingency measures should be included in CPs (including coherent budgets) and applied as necessary.

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