



Rijkswaterstaat
Ministerie van Infrastructuur en Milieu

Defragmentation measures for the protection of our wildlife heritage



mjpo

Fauna able to pass infrastructure

A lot of fauna crossings have been delivered during the last year and many more are in the pipeline. These wonderful achievements by the government and provinces are attracting attention both within the Netherlands and abroad. After all, fauna crossings promote the diversity of plants and animals species and give populations that have been forced back behind infrastructure the chance to mix with others of their own sort again. These crossings are highly effective. There were less than 1,200 badgers in the Netherlands around 1980, but thanks to cohesive measures, including wildlife crossings, there are now estimated to be more than 4,500.

And greater biodiversity also improves the water, air and soil quality, because a balanced biological system is highly beneficial for the cleanliness of the environment.

These crossings are more useful than ever now that climate change is also breathing down our neck and plants and animals are migrating to habitats that suit them better.

The Netherlands is doing a good job, in the opinion of international nature managers: it is a model country.

At the recent conference of the Infra Eco Network Europe (IENE) in Hungary, the Directorate-General for Public Works and Water Management (Rijkswaterstaat) therefore received an award for its work. Retrospect.

These days in Holland it almost goes without saying that crossings will also be constructed for fauna when new road and railway infrastructure is built: wildlife crossings such as tunnels, ledges, stump walls, underpasses and ecoducts (overpasses) are included in engineering works.

We know where these structures are needed because, as a result of - amongst other things - the studies stipulated by the Flora and Fauna Act, we know what species can be found where and where the bottlenecks are.

Crossings for existing infrastructure

The situation is, of course, different for existing infrastructure.

Hans Bekker of Rijkswaterstaat has been a zealous advocate of retrofitting existing infrastructure with fauna crossings for years. 'We became aware of the barrier formed by infrastructure in Limburg early in the seventies', Bekker recollected. 'Approximately 25% of the badger population was run over and killed then. The social pressure,

from the Badger and Tree Association (Stichting Das en Boom), amongst others, was very high. It had to stop. So the Rijkswaterstaat constructed its first badger tunnel. Five tunnels were subsequently built under the A73 near Nijmegen. A discussion naturally arose as to whether this was Rijkswaterstaat' job.

But the Rijkswaterstaat felt that it was, and went on to build its first ecoducts, over the A50 between Apeldoorn and Arnhem, in the eighties. The two were built very close together: at Woeste Hoeve and Terlet, based on the migratory routes, because the pressure of big game was high in this area. By the eighties, ecology had become an official part of Rijkswaterstaat policy and environmental impact assessment. Defragmentation initially focused on the badger. The then Minister of Transport, Public Works and Water Management (Verkeer en Waterstaat, V&W), Kroes, felt that this was important and requested an overview of badger bottlenecks. More than thirty tunnels

were constructed in the early nineties – there are now around five hundred. Meanwhile, more attention was being given to amphibians, the weasel family and reptiles which, thanks to the many existing tubes and pipes, could be provided with passages relatively easily.

In 1995, Minister Jorritsma of V&W gave her permission for the setting up of the IENE. Many countries signed up. The Habitat Fragmentation due to Linear Transportation Infrastructure (Cost 341 Action) project arose on this basis.' Bekker became chairperson and, together with colleagues, drew up guidelines for fauna provisions (Leidraad Faunavoorzieningen) which comprised guidelines for the choice and construction of the provisions.

These guidelines are now used all over the world under the title 'Handbook Wildlife and Traffic'.

The Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme, MJPO):

The Kootwijk ecoduct was built in 1999 and the Boerskotten ecoduct near Oldenzaal was even earlier. Research showed that they were well used. But, in the meantime, the building density and infrastructure in our country increased substantially and the barriers too. There was a need for collaboration on the construction of mitigating measures for the bottlenecks.

Rijkswaterstaat, the Ministry of Economics Affairs, Agriculture and Innovation, provinces and ProRail combined forces and set to it. In 2004, the MJPO came into being.

This was a cooperation project between the ministries of V&W and VROM (now Infrastructure and Environment), LNV (now Economy, Agriculture and Innovation), involving the designation of more than two hundred bottlenecks between the National Ecological Network (NEN), existing motorways, canals and railway lines.

The central government works under the direction of the provinces in this joint venture. In 2018, when the NEN is complete, the national infrastructure must be passable for fauna.

MJPO is an area-based programme. This is why the local parties involved generally

RWS receives award

At the recent IENE conference in Hungary, Hans Bekker of the RWS received a personal award for his work. IENE was set up in 1995 during the Habitat Fragmentation & Infrastructure conference. Hans coordinated this, led the realisation of the European Handbook on Defragmentation and ensured that most European countries joined IENE.

IENE recognised his role as bridge between policy and implementation, ecologists and civil engineers, science and practice, old hands and newcomers, and between central government and regional partners.



Foto: Wim van der Ende

The Treekerwissel ecoduct over the N227 Amersfoort-Doorn. The ecoduct connects the expansive military practice terrain in Soesterberg to the country estate of Den Treek that forms a transition between the Utrechtse Heuvelrug National Park and the Gelder Valley. Remarkably, this white ecoduct has not been smeared with graffiti so far. This is probably because of the animal illustrations and the name of the ecoduct which has been applied in graffiti-style. Graffiti artists do not besmirch each other's work. Moreover, a coating has been applied to the ecoduct to keep the concrete structure nice and white

A new railway line in the vicinity of an existing road in Sweden had no effect whatsoever on the existing meadow birds

(Statement from the international IENE Conference 2010 in Hungary)

cooperate on solutions they all support. This works very well. Parties that are hesitant are easier to convince and more likely to help finance the activities in question. ProRail and/or the Rijkswaterstaat can only independently realise a defragmentation provision in an area if it is clear that the infrastructure concerned is exclusively national infrastructure. In practice, this does not take place very frequently because other interests, such as recreation and water storage, can often benefit from projects. It is now more than six years since the start of MJPO, and Hans Bekker, MJPO programme coordinator, acknowledges the importance of collaboration. 'If you make good agreements about responsibilities and actions at the beginning, the process is more likely to go smoothly. You also have to communicate clearly and make sure that up-to-date information from the parties is always available. This means a good website, for example, but personal contact is also essential. You have to go out to the sites and exchange ideas. Solutions are only possible if people have seen what you are talking about with their own eyes.' Bekker would also like to see more structural

cooperation in the spatial development. 'It is a real pity if you build a crossing of some kind and shortly afterwards another road or industrial estate appears right next to it and undoes everything you have realised. Area-based cooperation is vital, it produces synergy.'

Recreational co-use

'Wildlife is under tremendous pressure all over the world', Bekker feels. 'And you can say ok, then no nature, but nobody really wants that. Everyone likes flowers and animals. The Netherlands is, furthermore, a very unusual country. We have a great many different landscapes and, therefore, a lot of species that enjoy particular attention on a European level. This gives us additional responsibility as regards our biodiversity. That is why NEN and Natura 2000 areas have been designated. And if we make connections between them, as a result of which these species have a better chance of survival, we will really have achieved something for the generations to come.' 'But', he added, 'humans are a part of it all'. We asked whether that meant that ecoducts should be used by people too. Bekker

replied as follows: 'Some fauna provisions might be suitable for co-use, but it is clear that, in some cases, it is difficult to reconcile the ecological function with recreational activities. We do, however, have to take the need for recreation seriously. People use the Crailoo ecoduct, for example. Research seems to indicate that people and wild animals tolerate one another on an ecoduct in an environment dominated by people. Co-use appears to work in areas of this kind. Experiments have also been carried out with recreational co-use abroad. We will have to wait and see whether the results here and elsewhere show whether it is feasible. And we need international cooperation for this. Our ministry's policy is *yes, unless*'

Now for the management

The construction has been organised. 'Now for the management', Bekker said. 'The idea is to incorporate the fauna crossings in the geographic information system, a detailed overview of the areas managed by the government.' And, furthermore, he feels that we really have to start taking climate change seriously. 'We have to pursue this together with other countries. And anticipate the crossings that will be most beneficial. Which means that we will have to make choices, in enhancing the NEN too.'

The founders on MJPO



Theo van de Gazelle, deputy Director-General of the Rijkswaterstaat:

In his then capacity as chief engineer and director of the Rijkswaterstaat, East Netherlands Department, Van de Gazelle worked on the tender on the package of nine ecoducts. 'This is a unique joint venture; the combination of forces by the Rijkswaterstaat, ProRail and the province of Gelderland is highly effective. Only we underestimated the design', Van de Gazelle feels. 'We aimed at something purely functional, but appearances count too. It costs a bit, but so what? It is not going to be cancelled because of that, is it? It is a good thing that the Rijkswaterstaat is actively working on provisions for fauna,' he said, 'and is making so much progress'.



André van der Zande, former Director-General LNV:

'The MJPO is simply essential', in Van der Zande's opinion. 'And it is not expensive, it is a very efficient investment, which also benefits recreational activities. But you have to ensure that there are as many functional combinations as possible with, for example, recreation and the water system', Van der Zande advised. 'And take very good care when designing the crossings, because it is very precise work. Start by asking what kind of animals you want. The implementation of the NEN is not under discussion. It is just good to give everything a good shake up now and again and get rid of all the unnecessary bits and pieces. They will hold on to the original intentions of the NEN and simply continue participating at an international level.' Van der Zande is not concerned about the crossings: 'You might have different ideas about how to implement the crossings, but there is no doubt that they are going to be implemented, along with the NEN. The government is definitely assuming responsibility for it and will continue, otherwise there is no point.

The Boerskotten ecoduct on the A1 at Oldenzaal. Pinewood fences have been placed on both sides of the ecoduct to reduce the impact of noise and light from traffic



Cees Veerman, former Minister of LNV and signatory of the MJOP on behalf of the ministry, spoke to us:

'It was difficult to explain to the general public that the connections between conservation areas are necessary', Veerman remembered. 'I was an enthusiastic supporter, I made the LNV responsible for the realisation of robust crossings and, therefore, for the bottlenecks caused by the national infrastructure. I felt that the barriers caused by the infrastructure in the rest of the NEN should be paid for by V&W. The Rijkswaterstaat and ProRail had to sort this out, in my opinion.

It was wonderful that we, the three ministers (LNV, V&W and Housing, Spatial Planning and the Environment [Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, VROM] – ed), agreed on the fact that we had to tackle defragmentation. All three of us were convinced of its necessity.'

The natural habitats approach continues to be required under the European Habitats and Birds Directives, Veerman said.

'And crossings are part of this. If you do not create them, you get bogged down in the prohibited significant effects in the directives: the survival of a species must be assured, you have to be able to guarantee that.

Incidentally, I think that the Rijkswaterstaat is doing a good job. You do not have to convince the staff of the importance of a healthy ecological system, they are fully behind it. Their views on the conservation of wildlife are excellent.'

The 25 Swiss ecoducts were financed through fuel tax

(Statement from the international IENE Conference 2010 in Hungary)

Facts and figures

- The National Ecological Network (NEN) is a network of Dutch nature protection areas with connections between them; The NEN has to be ready in 2018;
- Natura 2000 is a network of European nature protection areas. In the Netherlands there are 162 of these areas and they are almost all located in the NEN;
- The Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme, MJOP), which was set up to ensure that crossings are made over or under existing governmental infrastructure, is essential for the realisation of the NEN;
- Solutions were found for 55 bottlenecks by 2010. In 2010, 2 ecoducts over the A2 were delivered and work was started on the construction of 5 ecoducts in the Veluwe area. In 2012, there will be approximately 25 more ecoducts. In the meantime, smaller fauna crossings are being constructed, including 80 by ProRail.

Annual meeting on the Netherlands' Long-term Programme on Defragmentation: **Let us just take stock**

Every year, representatives of the organisations working on the Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme, MJOP) get together to exchange experience and advice. This autumn the meeting was characterised by cutbacks.

Secretary of State of the Ministry of Economic Affairs, Agriculture and Innovation (Ministerie van Economische Zaken, Landbouw en Innovatie, EL&I) Mr Bleker wants to economise on the National Ecological Network (NEN) by reviewing the objectives. As a result, projects involving the creation of habitats for rare species are in danger of being scrapped. He also wants to put a stop to investment in the robust crossings, as they are termed, although the management will be allowed to continue. 'However, this is no reason to give up all together', said Marcel Oosterwegel of the regional EL&I Department for the East. 'The need to reconnect is not under discussion, and neither, therefore, is the NEN. What we do want to do is find out what is absolutely necessary. The important thing is to enhance the NEN. Of course the investments have not been for nothing. Agreements that

have been made will not be brushed aside and we will try to prevent the waste of capital. But we must, of course, prepare for cutbacks.' The EL&I expects more clarity about what is and is not possible at the beginning of 2011.

The participants at the MJPO day suggested that 'We ourselves have to come up with proposals - in good time'. 'The NEN is a splendid instrument and we must not let go of it. Fauna provisions are not a luxury in the NEN, but a necessity. Let us work out the elements that can wait and whether we can create adequate provisions in a slightly less extravagant form. If robust crossings are no longer possible, perhaps we should lower our ambitions a little and construct narrower ones. If we do not create crossings, animals will stay trapped between railway tracks and asphalt, populations will weaken and large numbers of animals will be

run over and killed unnecessarily. But whether the need for genetic exchange is necessary all year round or only periodically is a question we can think about. And should roads and railways with little traffic be defragmented? And is it really necessary for fish in the Alblasserwaard to be able to swim to the Vinkeveense plassen? It is, however, essential to think more about the north-south corridors because of the shifting climate zones. What climate adaptation measures should we take?' Ongoing projects are not under discussion and others have been documented by the respective administrative bodies. But there are other planned projects which have to be reconsidered and about which recommendations have to be made. Those responsible for the MJPO will meet with the provinces in the spring of 2011 to talk about the possibilities.

Information: www.mjpo.nl

A unique wildlife crossing has been constructed over the N359 aquaduct at Galamadammen, near Stavoren. A nice wide, wet, green strip over the road connects the Frisian lakes on both sides of the road



Minister of Infrastructure and Environment, Schultz van Haegen: Two new developments



Foto: Rijkswaterstaat, Serge Bogaerts

In her speech at the opening of the widened A2 between Deil and Everdingen on 1 November 2010, Minister of Infrastructure and Environment, Schultz van Haegen drew everyone's attention to two firsts. 'Never before in the Netherlands has an ecoduct spanned eight lanes, two exits and two local roads', she said. 'This project comprises the construction of no less than two of these immense ecoducts. You could say that we are creating a double 'green A2' for animals. These ecoducts will enable the populations on both sides of the road to mix again. We will also be setting up new areas

for wildlife to compensate for the construction of extra lanes on our roads. This is, in itself, not new. What is new, however, is that we are cooperating intensively with farmers and other private land owners in the area. This is another first for the Netherlands. These farmers and land owners will be creating and managing the new natural environments on their land for reasonable remuneration. We are effectively turning the equivalent of approximately 130 football fields between the rivers Lek and Meuse into wet and dry wildlife habitats.'

Tender for nine ecoducts

Suppose that you are jointly responsible for the management of a rare landscape with unique flora and fauna, but the area is criss-crossed with roads, railways and suchlike, making the natural habitats too small. As a result, the populations are threatening to degenerate and there is no doubt that ecoducts are needed.

The central government and the provinces of Overijssel, Gelderland and Utrecht, found themselves in just this predicament. They agreed on the necessity of ecoducts and drew up plans to construct no less than sixteen of them. Ultimately nine were built. The rest have been delayed because they are intended for densely populated areas, which means that rapid progress is unlikely due to public inquiry procedures, the land purchase problems that can be expected and associated costs. And speed was, of course, of the utmost importance.

For the first time in our country, tenders were invited for nine ecoducts in a single package. Building consortium Hegeman Beton- & Industriebouw BV/Mobilis TBI Infra BV was awarded the contract. They had experience with ecoducts. A cooperation agreement was concluded between the Directorate-General for Public Works and Water Management (Rijkswaterstaat), the province and ProRail to guaran-

Nine ecoducts in one procurement. The new Nijverdal ecoduct over the A35 and the railway line is now ready



Foto: Wim van der Ende



One of the ecoducts under construction at Hoog Buurlo (A1)

tee organisational flexibility, administrative embedding and certainty. ProRail was responsible for the contract, the province involved those in the vicinity and Rijkswaterstaat coordinated the construction. Bert Stegehuis, of Rijkswaterstaat, East Netherlands Department, is ecological advisor and coordinator of the defragmentation programme.

Building aesthetics committee

The requirements had been laid down, the budget had been reserved. Nothing seemed to stand in the way of rapid implementation. But the design was apparently all wrong. Municipal building aesthetics committees see things differently, according to those involved. Stegehuis explained: 'A building aesthetics committee requested a 'green appearance', for example. But what is the best way to realise that? Does it mean an earth wall overgrown with greenery or is a screen with ivy adequate? If you want an earth wall, the ecoduct becomes broader and, therefore, a lot more expensive.' A middle column was qualified as an 'undesirable object'. But does that mean that nothing is allowed in the middle or that the shape of the column has been rejected? 'Design matters such as the materials used to make a screen and its colour cost time and money', Stegehuis concurs. 'We underestimated the importance of design.' Jeroen Pastink of Hegeman and environmental manager of

Rijkswaterstaat, East Netherlands Department, Paul Hoogerwerf, agree that this should be tackled differently in the future. 'The client and contracted party must consult with the building aesthetics committee right from the very early stages of the planning and the designer and architects (including landscape architects) have to be involved too. You must know the requirements and wishes of all the parties concerned.' Pastink explained the situation: 'Building aesthetics committees have a different point of view. We lay out an ecoduct for the fauna we expect there, but we also aim keep the appearance of the infrastructure as attractive as possible by standardising the shapes along the road. Municipalities, however, are locally oriented and look at the immediate environment.'

Efficient

Incidentally, the tendering of so many ecoducts did turn out to be as efficient as we expected for the contractor. The design & construct contract works well, in Pastink's opinion. 'You are not tied to a design that has been laid down in advance so you can use your own discretion and apply the best possible design and the best possible building techniques.' 'We make beautiful traditional concrete work, it is marvellous to do', his colleague Coen Wouda, site manager of the Hoog Buurlo ecoduct, added. 'The very idea

of an ecoduct like this; you feel as though you are really accomplishing something for the country.'

Experience

Hoogerwerf continued: 'The know-how you acquire with one ecoduct can be applied to another. Regarding planning procedures, for example. The land use planning procedures for constructing ecoducts are very time consuming. And so is the communication process: who you have to involve when. And how do you coordinate with the nature managers who will be managing the areas adjoining the ecoduct?' This is extremely important, in Hoogerwerf's experience. 'They know the fauna and flora in their areas and this enables us to gear the vegetation and layout of ecoducts accordingly. But cooperation is very useful for practical matters too. For example, they indicate what can and cannot be felled and where the paths leading to ecoducts should be built.'

Slightly fewer

The partnerships opted for in the project have worked out well. The contractor is very committed to the project, according to Stegehuis, who would, incidentally, not advise potential successors to construct nine ecoducts simultaneously. 'In fact, it requires a great deal of consultation with the interested parties. Half the number would be more practical', he feels. 'At least in the Netherlands, where a great many parties have a say in what goes on.'

Canada is focusing first on measures to keep the animals away from the road, thus ensuring that there is sufficient food and water. Ecopassages will only be considered when food is lacking (Statement from the international IENE Conference 2010 in Hungary)

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An ecoduct must blend nicely into the landscape (from left to right and from top to bottom)

1. The Borkeld (A1) in the nature reserve bearing the same name at Rijssen, Overijssel 2. Groene Woud (A2) at Boxtel, North Brabant 3. The Doorbraak (A35) at Almelo, Overijssel 4. Construction of the ecoduct Woeste Hoeve (A50) in 1988, Gelderland 5. Waterloo (A73), Limburg 6. Barriers constructed out of tree stumps guide the animals, Utrecht 7. Woeste Hoeve as it is now 8. Boerskotten (A1), Overijssel 9. Terlet (A50) Gelderland

Is the design of ecoducts important?

'Plain and efficient has always been the point of departure in ecoduct planning, but design is implicit in this', according to Jan Willem de Jager, senior advisor in Spatial Quality of the Directorate-General for Public Works and Water Management (Rijkswaterstaat)'s. 'Look at what we now have, bold statements, these ecoducts. they function well and give the area identity. You can see that ecoducts are not just regular viaducts. Most fit perfectly into the structure of the landscape.' De Jager has been working on fitting in roads for years. 'Many ecological networks have been fragmented as a result of the construction of roads and other barriers in the past. It is reasonable to demolish

ecological barriers'.

He does think, however, that the Rijkswaterstaat should communicate its ambitions with regard to design with the Building aesthetics committee in good time because this can prevent delays in implementation. 'Incidentally, this does not apply solely to ecoducts but to all engineering structures, in fact. There must be agreement on the required appearance of the ecoduct on the conceptual level. With what structures or elements in the surroundings does the ecoduct have to be in keeping? With the cross section of the road? With the organic shapes in the surroundings? Or with the structures in the landscape?

If the points of departure are clear and the Building aesthetics committee is in agreement - and with it, the municipal council, normally speaking - the architect can get down to designing the ecoduct.' De Jager does not feel that a single fixed design is possible for all ecoducts. 'Every situation is different. The altitude, the cross section of the road and the landscape context are different for each location. And every location deserves an ecoduct with its own identity.'

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What does the Society for the Preservation of Nature in the Netherlands think about defragmentation?

'The fauna corridors are quite something', Wim Knol of the Society for the Preservation of Nature in the Netherlands (Vereniging Natuurmonumenten, VN) and manager of the Veluwezoom feels. 'The Veluwe is seriously fragmented by motorways, railways and other infrastructure and these ecoducts will redress this situation to a large extent. And the general public are aware that something is being done for our wildlife. That is important too. We get a great many enthusiastic reactions regarding the ecoducts. A lot of ecological networks were criss-crossed by roads in the past of course. It is really good that the Directorate-General for Public Works and Water Management (Rijkswaterstaat), ProRail and other relevant organisations are now jointly working to mitigate the effects of these ecological barriers.

The province is also making every effort to promote the realisation of wildlife corridors. It is concentrating on strategic spots on the edges of the Veluwe. This is a great achievement which fits in perfectly with the Rijkswaterstaat's initiatives', Knol feels.

Opportunity

'The Dutch government has been doing a good job as regards the fauna in the Netherlands', commented Machiel Bosch, manager of the Southwest Veluwe for the VN. When the A50 was constructed, it ran right through the valley of the Heelsumse beek. It was a unique and perfect valley. That would never happen nowadays. For example: the A50 is now to be expanded into a six-lane highway. But to mitigate for this, an ecoduct will be built near Wolfheze between the Wolfhezer and the Doorwerthseheide, an area which, in the past, formed a habitat for all Dutch reptile species. As a result of the



Tunnel over the parallel road under ecoduct Woeste Hoeve

Netherlands' Long-term Programme on Defragmentation (Defragmentation Long-term Programme, MJOP), these animals will get a second chance.'

Spread

The fact that the nature reserves will, in the future, be united and the deer will perhaps spread out and be attracted to the maize and grain in agricultural areas is, as yet, no reason for concern. An increase in collisions with big game are not expected either. Fences for boar, red and fallow deer will prevent that. Besides which, red and fallow deer, in particular, are very timid. Knol expects the fallow deer to fan out to the central and northern areas of the

Veluwe. The red deer will go to the south. And the wild boars? 'They will be hunted if they go into built-up areas or if they cause a lot of damage. There is no alternative. Extra fencing may help in built-up areas. But we are not only concerned about the larger animals, the small ones are at least as important', Knol concluded. 'And do not underestimate the value of animals for plant species that do not spread easily on their own; this is a point which is often forgotten. Climate change has an enormous influence on propagation. We cannot afford to ignore this. So the management and landscaping and vegetation in the vicinity of an ecoduct is important too. And this is one of the results of the MJOP: serious attempts are being made to create the right biotope. It involves much more than just building a structure and waiting to see if it helps.' Exchanging experiences is equally important.

Germany is constructing ecoducts measuring 10 metres wide over the high-speed railway lines for bats

(Statement from the international IENE Conference 2010 in Hungary)

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Monitoring

The value of ecoducts

Monitoring shows that wildlife corridors are used by more animals than was estimated. It would, however, be nice to know the precise extent to which they contribute to the chances of survival of species, including the genetic exchange between populations on either side of such a corridor. It is possible to measure the effects of such a corridor, but this takes time, and often requires a substantial budget too.

'Just to give you an idea. You have to distinguish between use and effectiveness when researching the situation', said Edgar van der Grift, specialist in wildlife corridors at Alterra, a research institute of Wageningen University & Research Centre (WUR). 'You can investigate the use of a corridor with, for example, ink and sand beds, on which passing animals leave their prints. Infrared cameras are also frequently used. The research is carried out by specialised research agencies in accordance with fixed standards so that the quality of the research improves, studies are easier to compare and we get more out of the results.'

Effectiveness measurements

'Assessing effectiveness is much more complicated', Van der Grift continued. 'The first condition is that clear and verifiable targets are formulated for the defragmentation of the countryside. Secondly, research must be carried out before and after a corridor has been created. Long-term monitoring is usually necessary before firm conclusions can be drawn. For many species, monitoring for a period of less than five years is not meaningful. As a result, a study of this kind is expensive, although this naturally depends on the number of objectives to be tested and the number of species involved.'

But costs easily run to several tens of millions of euros. On the other hand, suppose that a study shows that a wildlife passage is less effective than was thought. And that instead of one passage you might need two in order to maintain a population. You would want to know that, surely? I feel that a model country like the Netherlands should have a leading role in monitoring and in research into the effects of wildlife passages on the viability of populations.'

Much used

The Directorate-General for Public Works and Water Management (Rijkswaterstaat) has had a great many passages, large and small, monitored and the results are good. A particularly interesting find is that, as hoped, bats use ecoducts to traverse roads and that not only do viviparous lizards use the stump walls on ecoducts to traverse

Wildlife tunnels and grids prevent animals from ending up under cars and are also instrumental in guiding them across the road at the appropriate spot (left) ... The ensuing result at night-time. Photographs taken by a camera trap



roads, but also for shelter.

Jeroen Brandjes of Bureau Waardenburg has been monitoring the use of corridors, both wide and narrow, in the Netherlands and Belgium for fifteen years. 'All types of wildlife passages are used and some by many species of animals, but we still do not know much about their effectiveness', Brandjes said. 'We have now established that corridors have been of enormous help to the badger, but I would hesitate to make any definite claims with regard to other animals. Anyway, it has struck me that most of the passages are exceptionally well used, those that are well constructed at least, including by species you would not expect. For example, polecats, weasels and amphibians go through narrow badger pipes and squirrels have even been observed doing the same. But it is true, you do not know whether there is any genetic exchange and

whether you are observing twelve different polecats or just the one. If you want to know that, you need transmitters and DNA research. We can only investigate these aspects with mice. We catch them and cut off some of their fur which regrows in a darker colour, enabling us to identify them. We can then detect them using cameras. This gives us insight into the population size and the proportion of the population that uses the passage.'

In any case, it is wonderful that the Dutch government is doing this for our wildlife, in Brandjes' opinion. 'And there is no harm in saying that.'

Compromise

The Society for the Preservation of Nature in the Netherlands (Vereniging Natuurmonumenten) opted for a middle course when investigating the effectiveness of passages.

They carried out DNA research amongst deer and wild boar on both sides of the Terlet ecoduct. And the effectiveness of the ecoduct was proven: the animals were related! A study is currently ongoing to investigate whether the exchange amongst lizards and adders is working this well too.

The Society for the Preservation of Nature in the Netherlands also wants to know more about the behaviour of and use of terrain by deer. To this end, fifteen deer throughout the Veluwezoom National Park are to be given transmitters and cameras will be used. 'Then we will be able to see how far they travel and how they respond to disturbances', Veluwezoom manager, Wim Knol said. The initial results have shown that this knowledge is important for the discussion on the recreational use of ecoducts and their vicinity. 'Incidentally, wildlife managers are a good source of information, as regards the animals at any rate. And vice versa: the transmitters and cameras help them gather knowledge.'

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Groene Woud Ecoduct

In Australia, valuable roadsides are legally protected by conservation agreements. This ensures that they are not destroyed by future road expansions without much ado

(Statement from the international IENE Conference 2010 in Hungary)



Should people be allowed to use ecoducts?

Are ecoducts still attractive to wild animals if walkers, cyclists, horses and dogs use them too? Opinions are divided. Some people answer this question with a resounding: no, it is irresponsible! Others say that it is not as bad as all that. And still others think that we should be able to design our ecoducts such that animals are not disturbed by human beings using them.

In any case, the discussion is up and running and the research too, because recreation and well-being are becoming increasingly important and there are not that many ways for people to traverse the busy engineering structures in our transport infrastructure.

The policy of the Ministries of Transport, Public Works and Water Management (V&W) and Agriculture, Nature and Food Quality (LNV) is 'yes, unless', but the guiding principle is the continued survival of the target species.

The Waterloo ecoduct in Limburg is accessible to people. The same applies to the Zanderij Crailoo ecoduct in the Gooi and the Slabroek ecoduct in North Brabant. It remains to be seen whether the Rumelaer ecoduct will also be opened to the public.

Concrete recommendations

Alterra has investigated the consequences of people on the Zanderij Crailoo and Slabroek ecoducts. Crailoo is used by approximately 180,000 people annually. Around 300 of these people risk entering the natural part of the bridge reserved for wildlife. About 60,000 people traverse the Slabroek ecoduct every year. Alterra's conclusions were as follows: many species will continue to use ecoducts with cyclists, walkers and horsemen and women, provided the passage is wide enough and the recreational zone well screened off.

The animals will, however, only appear when the people have gone and some will traverse the ecoduct at a higher speed than would normally be the case. 'It does not look as though there are any animal species that definitely turn their backs on the ecoduct because of the presence of people', according to researcher Edgar van der Grift. However, Directorate-General for Public Works and Water Management (Rijkswaterstaat) member Stegehuis noted that no conclusions can be drawn from this study about the effects on red deer because they are not found here. Incidentally, Stegehuis does not expect the recreational co-use of the ecoducts to be that great. 'There are bicycle viaducts next to the Borkeld and Boerskotten and our point of departure is that if there is a bicycle path within a kilometre of an ecoduct, there is no need for recreational facilities on it.'

An Alterra study with concrete recommendations for whether the recreational co-use of ecoducts should or should not be allowed was published in early December. 'The study enables us to base the discussion on recreational co-use more on the facts and less on emotion', Van der Grift feels.

Terlet

The Society for the Preservation of Nature in the Netherlands (Vereniging Natuurmonumenten, VN) is also keen to know whether it is a responsible move to allow people onto ecoducts. 'We do not carry out any specific research, but we do try to get a picture of how animals are influenced by people. That is why we installed webcams at Terlet. These webcams show that deer, boar and cows use the ecoduct during the day too', continues Wim Knol, manager of the Veluwezoom. 'But on typically busy recreational days, like Sundays, the animals steer clear of the ecoduct until dusk. Walkers, horsemen and women, cyclists (including all terrain cyclists) and dogs do disturb the animals. It might be possible on Zanderij Crailoo, but there are no deer or boar there. Furthermore: if, for example, you let people onto the Terlet ecoduct, the surrounding countryside, which is still quiet, will also be disturbed. It is simply essential that there are quiet areas in this park too.'

Slabroek ecoduct (A50), North Brabant, between Oss, Uden and Nistelrode. The bridge is 10 metres wide and has a cycle path. It was constructed to mitigate the extension of the A50





Foto: Wim van der Ende

In the busy Gooi region, in the province of North Holland, the animals appear to have become accustomed to people. Here, combined use of the Crailoo ecoduct by people and animals seems to work well

The 2001 EU objective to halt biodiversity decline by 2010 has not been achieved. Even the rate of decline has not slowed down. To promote the functioning of Natura 2000, attention now needs to be given to the crossings between the Natura 2000 areas

(Statement from the international IENE Conference 2010 in Hungary)

You cannot allow everything everywhere.'

There will, incidentally, be a footpath up against the ecoduct near the Wolfhezerheide, but it will be physically separated from the ecoduct by a two-metre-high wall. The VN is happy with the solution. Machiel Bos, manager of the south-west Veluwe for this organisation gave his standpoint: 'We are not advocates of this kind of thing, but it is necessary here. The nature reserve is too close to the built-up area, so people will come anyway.'

As long as they are wide enough

Ecoduct nature managers are afraid of experiments with recreational co-use because it might be very difficult to reverse them afterwards.

The Dutch Forestry Commission (Staatsbosbeheer) is somewhat concerned about the tendency to allow people onto ecoducts as well. 'It is almost as though the priority is shifting to the people', Klaas van der Laan, manager of De Kempen, said.

'Nationally, at least. The province of

North Brabant has a green heart.'

Another five ecoducts are to be built in this region. One over the A50 near Maashorst, two over the A2 around Eindhoven and two over the A67, one of which will be constructed in cooperation with Dutch-speaking Belgium. 'This means that De Kempen, an area of approximately 16,000 hectare, will once more be unbroken', Van der Laan added. 'And it would be really fantastic if another ecoduct could be built at the Reuselse Moeren, because then another two dynamic high moorland areas would be united.'

Van der Laan would prefer not to have any asphalt strips across the ecoducts in De Kempen. 'They get warm. Reptiles go and lie on them, with the risk that cars run over and kill them.'

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How do you prevent people from disturbing the wildlife on an ecoduct?

- It is essential that an ecoduct is wide;
- The fauna and people must be guided along parts that are separated from one another. The separation must be difficult for people to climb over and must provide the fauna with cover. It can, for example, be made of stump walls or prickly plants;
- The recreational part must be connected to foot and cycling paths in the vicinity;
- Sensitive parts should be closed to people and vandalism must be anticipated;
- Lighting should not be installed.

ProRail: Administrators can be proud



Foto: Hollandse Hoogte, Han Bouwmeester

ProRail is also working hard on defragmentation. Deer straying onto the railway lines is not something ProRail enjoys seeing. Crossings above and below the railway lines will help to prevent this. Eighty smaller tunnels will be built for small fauna

'I may be a technician', Raymond Krukkert of ProRail feels, 'and as coordinating project manager for railway crossings I am responsible for around 210 projects, all of which are important, but the bottlenecks named in the Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme, MJOP) are getting plenty of attention too. I cannot emphasize enough how important defragmentation is. You might wonder what good a pipe or ledge under a bridge can do but it will be 2018 before you know it. That is the deadline for the National Ecological Network (NEN) and the corridors between the key ecological areas. ProRail, the Directorate-General for Public Works and Water Management (Rijkswaterstaat), provinces and water boards will then be able to show our children what we achieved when the biodiversity in our country reached an all-time low. In 2018 we will be able to fly over the Netherlands and point out what we have done to improve the infrastructure for man and animal. It is a lasting achievement that today's administrators can be proud of. We have to propagate the MJPO body of thought and the value of biodiversity any way we can, including through our educational system. It has to become a culture. That is what we have to

work on now. Why does a bee hotel at a station make it onto the news but the MJPO not, at least not yet? We have to show the public more of what happens in a wildlife tunnel: use billboards along roads and at stations to describe the work in progress, for example.'

'The ecology on our planet is a vital part of life', Krukkert continued. 'And that is why ProRail is working on it. You cannot stop something as important as this.'

Eighty new passages

In November, ProRail gave the starting signal for the construction of more than eighty small fauna passages. Small tunnels will be constructed in the ground or water under the railway, and ledges in small water tunnels. These structures are intended for the use of otters, badgers, stoats, polecats, pine martens, weasels, hedgehogs, grass or ringed snakes and amphibians. The provinces have

now designated still more bottlenecks at railway lines, so ProRail will ultimately have to solve a lot of additional problems too. Camiel Meijneken is ProRail's project manager and ecoduct specialist. 'The MJPO has raised the awareness of ProRail with regard to the fact that our railway lines form barriers and that it is simply not enough to create provisions for fauna only when laying new tracks. But our managers are having to get used to the idea. They have to maintain the passages and structures leading to them and keep them clean. This is new. How to reach the problem points is also going to take a lot of thought. Few of them are located in meadows, the majority being in more rugged areas. Will we be able to access them with the requisite equipment? It is, of course, possible from the railway line, but we prefer not to close sections, even for short periods.'

So far

ProRail has been working on measures to mitigate the barrier effect for small and large fauna for years now. Ecoduct Crailo in the Gooi near Hilversum is one of the larger ones. The Vloedgraaf ecopassage, ProRail's first MJPO project also deserves mention: it comprises a twelve-metre-wide wet passage under the road and railway bridge. There is now a spacious passage under the railway and an ecoduct over the motorway at Nijverdal as well. Two new MJPO passages are to be built soon: the Zwaluwenberg ecoduct near Hilversum and Hulshorst ecoduct near Harderwijk. They are to be delivered in 2012. And the Op Hees ecoduct near Den Dolder and an ecoduct near Weerterbergen are on the programme too. But this is just the sum total so far; there will be lots more in the future, according to Krukkert.

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We have meanwhile conducted studies on the use of wildlife facilities by target species. What we need now is information about the ecological effects of wildlife facilities on populations

(Statement from the international IENE Conference 2010 in Hungary)



Foto: Hans Bekker

De Munt ecoduct over the E19 (Antwerp-Breda) and the HSL (high-speed railway line) near Loenhout will be completed in autumn 2011. A nature bridge will be built over the same road and over the HSL railway line near the Peerdsbos nature reserve. Wide rows of vegetation on both sides of the bridge will hopefully offer sufficient protection to encourage small wildlife to venture to the other side. Belgium also has an eco-veloduct – a bridge for cyclists and animals – which once served as a road bridge prior to its conversion

The Netherlands and Belgium collaborate on construction of ecoduct

The Netherlands and Dutch-speaking Belgium are collaborating on the construction of an ecoduct over the A67/E34 in De Kempen. It will be the first ecoduct built by the Netherlands in collaboration with a neighbouring country.

Dutch-speaking Belgium is working hard on biodiversity. Signs erected here and there along main roads inform motorists about the ecological management of the verges and innumerable fauna tunnels and a number of ecoducts have been constructed: one near Maastricht and one in Flemish Brabant between Leuven and Namen. An unusual feature of the latter is that horse riders are allowed on a five-metre-wide bridle path which is separated from the rest of this fauna overpass by tree stumps. 'Cyclists and pedestrians are not allowed on this path because they may disturb the natural fauna. We opted for this location precisely because it is a long way from any bicycle and footpaths', said Marleen Moelants, coordinator of nature-related measures at the Roads and Traffic Agency in Dutch-

speaking Belgium, and responsible for fauna crossings. 'But horses and fauna tolerate one another well.' The De Munt ecoduct, which measures sixty metre in width, will soon be completed. It spans the E19 (the Netherlands-Antwerp) and high-speed railway line to Brussels. 'It is not in a nature conservation area, but an agricultural area', Moelants feels, 'because of Natura 2000 we run the risk of limiting our activities solely to conservation areas. We cannot afford to do this. If we ignore the fauna and flora in the areas used for agriculture because of it, the biodiversity will suffer.' The Flemish are, therefore, not doing things by halves. In addition to the ecoduct, the crossing will also comprise twenty-five concrete tubes and five culverts. The first sixty-metre-wide ecoduct in De

Kempen is to be jointly realised and paid for by the Dutch and the Belgians; it should be completed in 2012. Belgium is making the greater part of the land available, the government having provided a part of the old royal hunting grounds for this purpose. 'Our collaboration with the Netherlands is working extremely well', Moelants feels. 'We are learning a lot from the Dutch. We tend to have a rather ad hoc approach whereas the Netherlands has a good picture of the bottlenecks and measures required thanks to the Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme). We still have to do some work on this, but the Flemish government are backing the fauna provisions all the way. Of course, now and then someone asks why we are investing so much in frogs and not in bicycle paths. But people generally react positively when we explain the importance of defragmentation measures. These measures are not the only things we are investing in though. Provisions for fauna are simply part of our responsibilities, as are bicycle paths. It is not a case of one or the other, but both.'

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A study in Japan showed that imitating fear screams of deer was initially very effective in keeping deer off the road, but after four times the screams went unheard

(Statement from the international IENE Conference 2010 in Hungary)

What do you do in an area with high land pressures?

In some areas every square metre is highly coveted. Take Utrecht for example: a province with a lot of cities and expanding villages, a great deal of activity, an infrastructural junction and high recreational pressures. And it is not saturated; the province will continue to grow for some years yet. But what about our fauna and flora and the countryside in general?

'Twenty years ago we realised that our nature reserves were becoming isolated due to the infrastructure and development, that air and water pollution were increasing in an unacceptable manner and that the water levels in many areas were no longer in keeping with the functions of these areas', Chris Klemann of the province of Utrecht feels. 'Something had to happen. The National Ecological Network (NEN) arose, funded by the central government and the province. There was, as yet, still no money for defragmentation.

The broadening of the A2 between Utrecht and Amsterdam became the impulse for a real structural plan for ecoducts. The position of the Directorate-General for Public Works and Water Management (Rijkswaterstaat) was: we make roads, verges and fauna ecoducts, but we cannot take care of the ecological passages leading from the surrounding areas to the ecoducts. We suggest that these problems be tackled by means of an area-based approach. This would ensure that the adjacent land owners also cooperate in the natural planning and landscaping and

take responsibility for opening up the neighbouring areas.

That went down well with the provincial political body.' So the province of Utrecht received the push it needed from the Rijkswaterstaat and Ministries of Agriculture and Environment through the Netherlands' Long-term Programme on Defragmentation (Defragmentation Longterm Programme, MJOP).

'We also thought, for example, that we had everything sorted out in the heart of the Heuvelrug, but the Rijkswaterstaat pointed out that we had too much construction and too many roads, which also formed barriers to the flora and fauna. Just the one ecoduct over the A28 at the Leusderheide was simply not going to have sufficient impact. So we

The beautiful ecopassage near Elst, under the secondary road N225



did something about it.

We drew up a defragmentation programme for our provincial roads and identified twenty bottlenecks. Measures to sort our five of these bottlenecks have now either been completed or are currently being implemented: Elst has a large underpass, the N227 has an ecoduct near the Den Treek country estate, the Beukbergen country estate now also has an ecoduct near Huis ter Heide and Soesterberg is getting one. The most appropriate forms and sites of the other fifteen passages are now being worked out. And further bottlenecks will be added to the list because new marshy areas have been earmarked in West Utrecht.

Ecoducts and fauna passages are hitching a ride with the reconstruction of the roads by

the Rijkswaterstaat in the province of Utrecht', Klemann continued. 'The collaboration with Rijkswaterstaat, ProRail, site managers and the water boards is excellent. Private land owners are sometimes a little more hesitant, but they do eventually see the benefits of a more varied and richer fauna and flora on their land. And an ecoduct on a country estate is beautiful too, don't you think? Incidentally, the province has also gained from advice from members of the hunting fraternity. We are learning from one another. They collect data on crashes involving game and advise on fencing and sites.'

Rijkswaterstaat

The Rijkswaterstaat has four ecoducts planned for the short term, according to ecologists Wim Schouten and Martijn de Haan. 'They should be operational in 2012. One will be built over the A28 near Huis ter Heide, one over the A27 near the former Bosberg rest area and two on the A12 near Maarn and Maarsbergen. The latter two will also span the railway line.'

The way the Rijkswaterstaat is tackling the broadening of the A12 between Utrecht and Veenendaal, a stretch of around 20 kilometre, is an indication of how serious it is taking defragmentation. The aforementioned ecoducts will be constructed, along with fauna tunnels for mammals, amphibians, snakes and bats, continuous banks, pine marten bridges, badger tunnels, a bat cellar and a tunnel for amphibians.

Opinions on recreational co-use differ greatly. 'Our ministry's policy is *yes, unless*', Wim Schouten concluded. 'It is difficult; you have to weigh up each case separately. It is already busy in the Gooi near Crailoo, but should you allow cycling, walking and horse riding in a sanctuary? I personally think that if you create a provision for animals and plants they should be the ones to benefit from it – and benefit to the full.'

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Many countries are working on a national defragmentation plan

(Statement from the international IENE Conference 2010 in Hungary)



Herman Limpens, bat specialist of the Dutch Mammal Society: The Directorate-General for Public Works and Water Management is taking bats seriously

Bats follow linear elements in the landscape; these might consist of bushes, rows of trees, watercourses or banks. In fact, they will follow anything as long as it forms a line. Few species will fly as far as a motorway if there are no 'guiding lines' to lead them there. But if a linear structure is interrupted by a road, there will be a lot of casualties.

They may also turn around at this point and become isolated from the population on the opposite side of the road. Crossings, such as culverts, tunnels, underpasses under viaducts and banks and bridges with vegetation, can provide the guidance they need. This type of 'hop-over' is therefore important for bats, and also for genetic exchange within bat populations.

We have to know what bat species occur in an area if we are to provide them with dedicated passages of the correct design.

Under flyers

There is a large group of bats which prefer to fly under obstacles: through culverts or tunnels, for example. But the passages must be dark. Some use tunnels of more than five metres in height, provided they are dark. And this latter condition cannot always be

met because road users make use of these tunnels too. The Directorate-General for Public Works and Water Management (Rijkswaterstaat) and LED experts are investigating the ideal light for such tunnels. Amber-coloured light appears to be the best compromise.

Over flyers

There are also species which prefer to fly over roads rather than under them. Bats like to use ecoducts to traverse roads. For example, fly over a bridge with vegetation, a bank or even an ordinary bridge. Good examples are the bicycle bridges over the A50 near Eindhoven and the small combination ecoduct over the N297, parallel to the Roermond-Maastricht railway, near Nieuwstad. A hedge has been planted on this bridge.

Bridges without any particular guides function the best as hop-over if the banks are packed in with vegetation, or in other words, there are only short distances between the crowns of trees or spinneys. However, well thought out management is essential. Trimming and pruning everything at once will lead to the bats becoming disoriented.

Rijkswaterstaat is doing a lot for bats

Herman Limpens, bat specialist at the Dutch Mammal Society (Zoogdierverseniging), advises the Rijkswaterstaat on designing for bats. 'The Rijkswaterstaat is doing a lot for bats,' Limpens said. 'Both in the construction and planting and in the management.'

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In Croatia, it is forbidden to walk or hunt on an ecoduct. Camera images have been used to prosecute hunters

(Statement from the international IENE Conference 2010 in Hungary)



Bats

Bats live in networks. They usually roost in a building or tree and have fixed flying routes and hunting areas. They have a matriarchal system, the mothers living in the same place generation after generation. Bats may travel long distances when foraging. The Noctule bat can reach a speed of no less than 75 km/h and hunts with ease in an area of around forty kilometres in diameter. The Pond bat is slightly slower, with a flying speed of 50 km/h, but it covers the same area while hunting.

Sleeping Pond bats near a monitor programme nest box

Reconnecting the grey dunes

Few countries have as many different landscapes as close together as the Netherlands: marine clay areas, peat areas, dry sand landscapes, wet sand landscapes, hilly country, river areas, the sea, and the dune and coastal landscape, of course. In Zuid-Kennemerland there is an area of rare grey dunes measuring approximately 7000 hectare.

These grey dunes arise behind the first dune ridge, also known as the coastal ridge, at spots where the wind-induced dynamics are low enough to allow herbaceous plants, mosses and short grasses to form a low, dense ground cover.

The dunes are silver-grey in colour and primarily sustain vegetation with silver-grey leaves such as sea buckthorn, sea holly and creeping willow. There are a great many different species in this area; this is a result of the calcareous nature of the sand, diverse microclimates and the fact that bare dunes alternate with others which are covered in plants. It is much-frequented by birds such as the wheatear,

but species such as the blue-winged grasshopper, grizzled skipper, rabbit, fox, roe deer, sand lizard and fallow deer also enjoy this environment.

The grey dunes are, however, intersected by two busy roads, running from Zandvoort to the coast. The province of North Holland, the municipality of Zandvoort and the waterworks PWN and Waternet have now drawn up a plan for an ecoduct to mitigate some of the impact of these roads, which they hope to realise by 2013 and which will be co-financed by European funds. At the same time, breaches will also be made in the coastal ridge to allow the wind to blow through them and create

active dune areas where the vegetation remains low.

Sjakel van Wesemael, regional manager of PWN's Nature and Recreation spoke to us: 'This is a unique natural area which we all have to protect. We do not believe in having different organisations all managing a little bit of land, we all have to pull together. Plans have also been made for two other ecoducts to the north of the ecoduct over the Zandvoortselaan in the Zuid-Kennemerland National Park: one over the railway line and one over the provincial road. These will reconnect the Noordwijk dune terrain with that of IJmuiden. Actually, we hope to be able to create yet another crossing with the polders to the east too. That would really be giving the biodiversity a helping hand'.

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Too much focus is placed on large, appealing target species. Do not forget the little ones; they do not automatically follow the big ones (Statement from the international IENE Conference 2010 in Hungary)

From the air, it can clearly be seen how a road cuts mercilessly through a nature reserve. But improvement is on the way. This animation shows an image of the near future



Vloedgraaf underpass: If it had not been for the MJPO, the problem would probably not have been solved yet

'The Netherlands' Long-term Programme on Defragmentation (Defragmentation Long-term Programme, MJOP) gave us the push we needed', Michel Smits, member of Roer and Overmaas Regional Water Authority's Policy, Research and Consultancy Department feels. 'Otherwise it might have taken quite a while longer for us to tackle this bottleneck. At Susteren there was a railway bridge over de Vloedgraaf, a tributary arm of the Geleenbeek, which always caused flooding in the adjacent area when there was a lot of water to be discharged. It was simply too narrow there. ProRail and the water authority could not arrive at a solution - until the

MJPO was drawn up. Suddenly there was an opportunity to get to grips with the problem - to everyone's advantage. As a result of this area-based approach, the bridge now has more room for the brook, a twelve-metre-wide underpass for fauna and a passage for cyclists.'

The bridge over the Vloedgraaf was delivered in early 2010, but its success is already evident. The rare water shrew, viviparous lizards and roe deer are only some of the animals benefiting from the new underpass. 'Water authorities do not have the explicit task of caring for terrestrial fauna and, furthermore, in the case of the existing



Foto: Wim van der Ende

Vloedgraaf, and on the left a footpath/cycle path under the railway bridge

bottlenecks, the responsibility rests with the owner of the engineering construction in question. But we always take the migration of flora and fauna into account when restoring stream valleys', Smits said. 'Because you can do a great deal with very few resources, such as here where there is now a lovely cross connection between De Meinweg, Brunsummerheide, the Meuse dunes and the area where the Meuse forms the boundary between the Netherlands and Dutch-speaking Belgium.'

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Experiment with a more climate-proof ecoduct

The vegetation used on ecoducts is determined on the basis of the target plant and animal species and the most appropriate habitat for them. A sustainable design is subsequently created which should last for a hundred years.

Climate change has not, as yet, played a role in this design. 'But it should', eco-engineer at the Infrastructure Service of the Directorate-General for Public Works and Water Management (Rijkswaterstaat) Victor Loehr feels, 'after all, we take climate change into account in the case of the coast and rivers.

There will be wetter and dryer periods in the future. We therefore have to create water systems on the ecoducts which will ensure that these habitats are maintained even in the event of heavy precipitation and drought. It can, for example, take decades to develop heath vegetation on an ecoduct and it would be a pity if such a habitat were to be destroyed in one fell swoop by an extremely dry summer. The target species would lose their habitat.'

Extensive drainage

An ecoduct will be built when the A74 is constructed between Venlo and the German

border. By way of experiment, the contract stipulates that the water management on the ecoduct must sustain optimum growth of the vegetation under four climate scenarios described by the Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut, KNMI). 'The KNMI models are the best reference we have in the Netherlands', Loehr said.

A contractor has already been selected and the company in question has opted for a solution which combines comprehensive drainage with sections for the retention of rainwater on the ecoduct and in the substructure of the earth banks; if necessary, the drainage water can subsequently be used for watering the ecoduct in dry periods.

Check climate proofing

The requirement with respect to climate proofing is experimental and this was duly discussed with the contractor. The ultimate result should provide insight into whether this type

of requirement is advisable for other ecoducts and the best possible formulation.

Other countries do not yet have any experience with this aspect of ecoducts either, although the British and Americans are of the opinion that climate change should have a role in the design of provisions for fauna. Loehr would prefer Rijkswaterstaat to examine about ten existing ecoducts, fauna tunnels and culverts to see whether they are climate proof. Is this feasible? And are we actually going to do it? Otherwise we will only be arousing false expectations. 'This would reveal the requirements we ought to be setting for new fauna provisions. And we certainly need continuous, robust ecosystems if we are to retain and promote our sadly-deteriorated biodiversity under the ongoing climate change. Fortunately the Netherlands is taking the situation seriously.'

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Fragmentation as a result of infrastructure development is recognized within the EU as an important factor for the decline in biodiversity (Statement from the international IENE Conference 2010 in Hungary)

Badger population growing thanks to fauna crossing

'Defragmentation measures taken to help the badger are also very beneficial for animals such as the hedgehog, hare and rabbit', Jasja Dekker of the Dutch Mammal Society (Zoogdiervereniging) feels. 'They need the same conditions.'

'The badger population was deplorably low in the sixties', Dekker said. 'Badgers are animals of prey and were consequently hunted. The remaining badgers did not tolerate the PCB and heavy metal pollution well, their habitats became increasingly fragmented by infrastructure and construction, and many animals were run over and killed on the roads.'

Now he estimates the number of Dutch badgers at around 4,500. 'This is partly a result of the tunnels that were made specifically for them - research has shown that the number of roadkills has decreased.'

Badgers like to defend the boundaries of their territory and these boundaries may be as far as two kilometres from their setts. And they will not let an obstacle such as a road stand in their way. An obvious measure is, therefore, to keep the vegetation on the verges low so that badgers can at least see when a car is coming. In addition, badger tunnels have to be clean and dry and fences are needed to guide the animals to the tunnels. The passages under the motorways are in good condition, Dekker observed. 'But a lot of badgers still die on provincial and municipal roads. Fortunately that is easy

to solve, because both the appearance of badgers and the sites at which they are run over are traceable, so it is not that difficult to find the spots where we have to intervene. That is how we went to work in the Gooi, for example. Collaboration between local badger groups and road managers have led to considerably fewer road mortalities amongst badgers.' Incidentally, we have to watch the hedgehog carefully too, Dekker warned. 'A lot of hedgehogs are killed on the roads. We could probably reduce the numbers run over considerably by curving hedgerows that grow at right angles to the roads sideways or by planning a tunnel at that spot so that the hedgehogs are guided to it by the banks. And of course: by paying extra attention to the spots where casualties are high.'

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Or: *Badger (Meles meles) road mortality in the Netherlands: characteristics of victims and the effects of mitigation measures. Dekker, J.A en G.J. Bekker. Lutra 2010, 53 (2). P 81-92*

Variation in smaller wildlife tunnel entrances



Foto: Wim van der Ende



Foto: Wim van der Ende



Foto: Wim van der Ende

Defragmentation Longterm Programme (MJPO) – a good example

Ellen Verolme is head of the department Integration Networks, which is the environment and nature department of the Directorate-General for Public Works and Water Management, Service Traffic and Shipping (Rijkswaterstaat Dienst Verkeer en Scheepvaart, DVS). This department is responsible for programmes such as air quality and noise, ecological verge management and the coordination of the Multi-year Programme on Defragmentation.

Verolme: 'Rijkswaterstaat has a clear role where it concerns nature. We have legal obligations based on the Flora and Fauna Act, Nature Protection Act and the Water

Framework Directive, and there are also interdepartmental policy agreements.

We are responsible for the management of the road and waterways network and for the nature within our management area, and we choose to adopt the kind of management that generates the greatest possible variety of plants and animals. We realize, of course, that this nature is part of a coherent system that stretches beyond our management boundaries. That is why we naturally pay attention to defragmentation during development and reconstruction so that flora and fauna habitats are not adversely impacted by the infrastructure. The Multi-

year Programme on Defragmentation is a logical consequence of that.'

'In the near future we aim to think very hard about our tasks. What the outcome will be is unpredictable at this stage. We want to work in greater cooperation', says Verolme. 'See where the opportunities lie. In this way, all parties will be able to work on their part of the programme.'

She believes the MJPO is a good example of how it should be done. 'Area-focused. The province will be in charge. ProRail, Rijkswaterstaat, municipalities and water boards will each carry out their part. Great!'

A lot is being done abroad

Anyone who regularly visits a conference understands that vague feeling of disappointment. The 'it was a waste of my time' feeling that arises when the lectures are not aimed at the audience, but at the speakers themselves. Verbose points of view that clarify nothing and deliver nothing new, let alone inspire. But this was not the case during the annual international conference of the Infra Eco Network Europe (IENE), which was held this year near Budapest. There was no holding back as far as dynamics and involvement were concerned. Approximately 175 participants from Europe, Asia, Australia and the United States, representatives from 37 countries, gave an account of their studies on optimal defragmentation and the behaviour of animal species, of the policy, of the observed effects of their fauna facilities, and of their intentions. It was a very successful event. The following is an impression.

Germany

Germany has 50 ecoducts of which 22 will be delivered shortly and 33 are in the planning stage. The German government explicitly stated that it will make every effort to develop a network of nature reserves. As a result, they are now working on the Bundesprogramm Wiedervernetzung (Federal Programme for Cross Networking), which will determine the defragmentation efforts. Incidentally, defragmentation is not the only motive behind these efforts, but also the reduction of traffic collisions with wildlife. Support from the hunting world was also an important incentive to invest money in defragmentation. Naturschutz en Jagd (the associations for Nature Conservation and Hunting) are cooperating in this regard.

Wooden ecoduct near Rügen

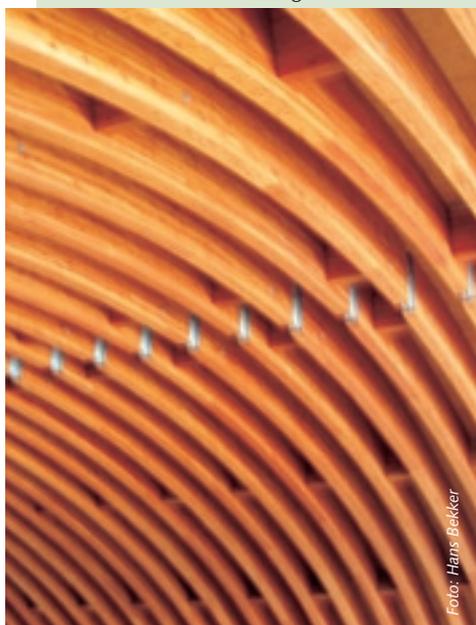


Foto: Hans Bekker

The Czech Republic

Most East European countries are working on fauna crossings, largely near new roads. The Czech Republic, however, is also working on existing roads. This is necessary due to the significant number of accidents. Fauna facilities are now projected covering approximately two thousand kilometres and robust crossings must be constructed in order to realize a good ecological network.

Sweden

Approximately ten people die each year and about ten thousand people are injured after collisions with wildlife, particularly with large wildlife such as elk, bear or reindeer. This costs the state a lot of money. To improve safety, Sweden mainly works with grids, clear road verges and detection equipment. For the smaller species, the minimum necessary measures are now being formulated.

Spain

Spain has 160 ongoing projects for wildlife crossings, mainly as a result of the many Natura 2000 areas in that country. Furthermore, climate change is already manifesting itself in Spain; it is estimated that the temperature there has increased by 3 degrees Celsius. Many areas are becoming too arid. They are already starting to anticipate this.

The United States

A biologist from the Department of Transportation (Washington): 'We are inspired by Europe. That motivates us. A lot of attention is paid to fish migration here. We do very little where it concerns road defragmentation. Fragmentation is a big issue, but there is less compassion for ecology, although this is beginning to emerge. We now need to set standards, just like we have for safety standards, because you should not see defragmentation as being something special.'

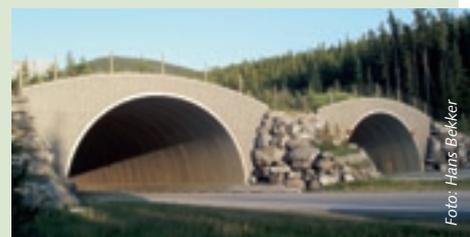


Foto: Hans Bekker

Canada: Banff. Transcanadian highway

The United Kingdom

Historically, there has always been a lot of attention in the United Kingdom for the landscape, which has led to the preservation of landscape elements such as hedges, walls and landscape structures. In built-up areas, however, nature conservation is difficult to achieve. British politics is committed to protecting nature and the environment with programmes such as Valuing green parts / Making space for nature / Sustainability. 'Biodiversity is important', says an employee of the British Department of Transport. 'We see it as a duty – the associated costs are of secondary importance. We need to talk about that. It is not an emotional issue, but just a professional interest in putting things into perspective.'



Foto: C. Rosell

Passage in Spanish wetlands used inter alia by otter, wild boar, badger and polecat.

The United States and the United Kingdom are of the opinion that climate change must receive more attention

(Statement from the international IENE Conference 2010 in Hungary)

Poland

An abundance of defragmentation measures are being put in place on new roads in Poland. Work is underway on the construction of new motorways with a total length of 700 km. Solutions will be found for those areas where the ecological network (nature reserves, Natura 2000 and ecological crossings) becomes fragmented. Approximately 25% of the project cost comprises environmental measures: soil, noise, landscape and nature.

At the end of November, three employees from Rijkswaterstaat Department East Netherlands visited colleagues from Rijkswaterstaat Poland (GGDKIA).

Poland has a large ecological network. There are roads where fauna passages have been or will be constructed every 200 metres: tunnels for amphibians, bat passages above the road, barriers along the road in the interest of, inter alia, birds in the Natura 2000 area and as protection from car headlamps, wide passages under the road, very wide tunnels in combination with a brook (sometimes several tens of metres wide and more than 5 metres high), grids and ecoducts.

In total, almost 100 ecoducts have been projected. Of these, there are approximately 20 in progress that have been designed for the larger target species such as deer, swine, bear and wolf. They will be monitored during the first three years following construction and then every five years until forty years after realization.

Construction of the roads will involve cutting down a significant amount of vegetation. This will be compensated by sufficient ecopassages, pools and protection.

Bert Stegehuis

One of the latest Polish ecoducts



Foto: Bert Stegehuis

Stag beetle

Have you ever heard of the stag beetle? It is the largest ground beetle in our country, measuring nine centimetres long. This rare little creature is more heavily protected than the red deer. What it has in common with red deer is that it is also threatened by fragmentation of its habitat. Both animals are protected by the Bern Convention and the stag beetle is also protected by the European Habitat Directive. Protecting and connecting habitats is the magic formula for that. Where this was chiefly a moral obligation in the seventies, it is now chiefly an international legal obligation. When beetles are sometimes laughed at, remember that "stag beetle" must be read as "old rich deciduous forests, with old oak trees". Ecoducts, road verges and other ecozones form lifelines for many species and their habitats, including the stag beetle and deer. This is also what keeps Rijkswaterstaat on the move.

Hans de Vries

Colophon

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