



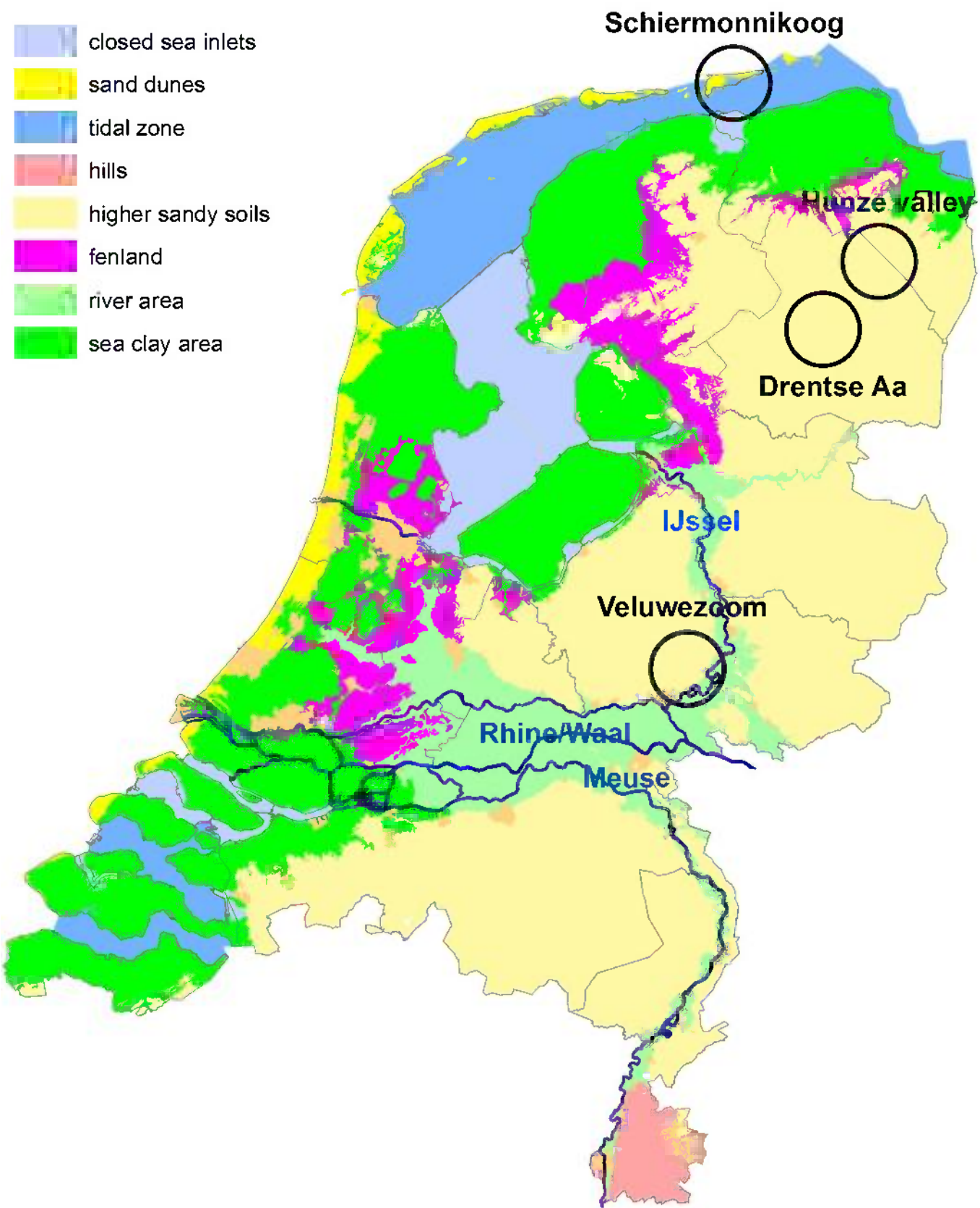
Inspiring natural landscapes in a crowded country

Five examples of nature-based
solutions in Dutch landscapes



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Physical geographical regions and locations of examples



The Dutch government's vision for nature 'the natural way forward' provides a platform for forward thinking and action

The Dutch government's 2014 vision document on nature, *The Natural Way Forward*, shows that changes in society have taken nature policy into a new phase. The establishment of a National Ecological Network of protected areas during the past 25 years has been a success story, but this has still not been enough to halt the decline in nature. In the vision document the government, the provincial and local authorities and a number of environmental and social organisations set out their strategy for the continued strengthening of ecosystems and biodiversity in the Netherlands. Their aim is to create ecological systems that will not only be able to withstand the pressures of society, but also thrive under those pressures.

The Natura 2000 sites are the cornerstones of the National Ecological Network. Now the network is becoming more interconnected, the focus of nature policy can shift from individual protected species and areas to the scale of the landscape as a whole – examples being the Rhine-Meuse floodplain in the central belt of the country and the coastal dunes. In addition to conserving species and habitats on specific sites, greater emphasis will be given to making room for natural processes. This will facilitate the

development of robust systems: areas with low maintenance needs and feasible objectives that can adapt in a natural way to changing circumstances, such as changes in the climate.

Achieving this adaptability in the Dutch Natura 2000 sites will require a shift in priorities towards the development of resilient natural systems characteristic for the sites in question. This in turn needs to be based on a strategy for the integrated development of ecosystem quality at the scale of the landscape. To this end research is being done into how the matching of objectives and measures to the robustness and vulnerability of characteristic species and habitat types can contribute to a more effective and cost-efficient conservation, restoration and development of ecological qualities.

In the Netherlands, the extra room needed for the operation of natural processes and to provide the insurance of alternative habitats for species and communities can only be found in landscapes with a long history of human occupation and mostly with ongoing economic activities.



More resilient ecosystems will help us fight climate change and build a more secure future

This brochure presents five examples of area development in very different landscapes in the Netherlands. These examples also illustrate the shift in the public perception of nature and the changes that have taken place in nature policy and conservation management. In all five areas it has been possible to establish a sustainable ecosystem of high ecological quality and at the same time increase the value of the landscape for recreation, water storage and regional economic development. These successes can be attributed to the development of new robust natural areas as well as areas that permit characteristic vulnerable species and communities to exploit alternative habitats; in short, to more robustness and more naturalness.

More robustness results from a combination of ecological, social, governance and economic aspects:

- the establishment and dispersal of flagship, umbrella or keystone species, such as the white-tailed eagle, beaver and otter;
- more room for natural processes which can fluctuate considerably from year to year, such as flooding, stagnation, erosion and sedimentation, and grazing by wild herbivores;

- a starting situation with hardly any vulnerable characteristic natural values and/or regional heritage values;
- public backing and regional involvement, urgency and inspiration from prime movers, local and regional government support, and the opportunity to combine budgets (e.g. for infrastructure, recreation, habitat creation and restoration, and sustainable agriculture).

More naturalness can be seen in:

- a greater impact of natural processes in the landscape, such as groundwater dynamics and flooding;
- more ecological connectivity in the landscape, with opportunities for characteristic species and communities to reach and use alternative habitats throughout the landscape, for example in response to a series of wet or dry years;
- greater exchange of individuals between populations;
- room for spontaneous development and interaction between species, such as predation, grazing, pollination and seed dispersal.



Real examples of nature-based solutions in dutch landscapes provide inspiration for future generations

The potential for the development of more robustness and naturalness at the scale of the landscape depends on the starting situation. For example, are there any active landscape-forming processes, such as large-scale erosion and sedimentation? Will it be possible to restore the ecological integrity of a drainage basin of a stream or river? Where are the important cultural or archaeological values to be found? Is the landscape important for agriculture?

The table below summarises the starting situation in five landscape types as indicated by the presence or absence of natural features.

The examples in this brochure illustrate developments in areas which have become much more natural on a large scale. The starting situations were different and included agricultural landscapes.

The only unrestricted natural landscapes in the Netherlands are on the Wadden Sea Islands. In some places the influence of the North Sea is entirely unchecked, the best example being Schiermonnikoog National Park.

Fish migration projects show that constraints imposed by poor water quality and physical barriers are being removed throughout an increasingly large area of the Rhine basin, which can now be considered to be a large-scale restricted natural system.

The Hunze valley illustrates how a cultural landscape can be developed into a robust natural area of the large-scale restricted natural type that is of international significance for breeding birds and important for flood protection, recreation and the regional economy.

The Veluwezoom National Park has grown from a small-scale semi-natural landscape into the only large-scale restricted natural landscape of the higher and drier sandy soils. The area has been a tourist attraction in the Netherlands for over a century.

The current large-scale semi-natural landscape of the Drentse Aa drainage basin has slowly but surely developed from a small-scale agricultural landscape with many vulnerable natural values and important cultural heritage features.

landscape type	landscape-forming processes	ecological integrity of the landscape	surface- and groundwater dynamics	spontaneous development	biomass harvest
unrestricted natural	**	**	**	**	
large-scale restricted natural	*	**	**	*	
large-scale semi-natural		**	**	*	*
small-scale semi-natural		*	*		**
cultural					**

** feature is strongly present or has a strong influence on the landscape; * feature is present or has an influence on the landscape

Schiermonnikoog National Park: a naturally developing Wadden Sea Island

'In Schiermonnikoog National Park you can see how the landscape is continually being shaped into rich and unexpected forms. This is unique in a man-made country like the Netherlands.'

Chris Braat, Nature Warden for the Wadden Sea area, Natuurmonumenten

Once a plaything of the North Sea, which swallowed up whole villages, the island has become more stable, although coastal erosion and accretion still keep it on the move. The high natural values on this island go hand in hand with almost 300,000 visitors each year.



What has been achieved?

The island of Schiermonnikoog consists mainly of beaches, dunes and saltmarsh in a landscape that is continually being shaped by the natural processes of wind and wave action. This is an area that needs no management to retain its high biodiversity. The one village and single polder are situated in the slightly older western half of the island where the natural processes have been contained. Here the land needs to be managed to prevent natural succession to woodland and maintain the rich biodiversity. The residents of Schiermonnikoog are heavily involved in the life of the island and have an important voice in decisions to do with conservation management.

The untamed eastern part of the island is the best example of a natural Wadden Sea Island in its element. For one thing, at 4,500 hectares it is a relatively large area. And, in contrast to other Wadden Sea Islands, just a small part of the island has been 'tamed' by the construction of a sand-drift dike along the northern shore. The eight kilometre walk from the eastern tip of the island to the western edge leads from a recently formed saltmarsh to one about 200 years old. The latter has an

attractive variation in relief, with lower lying areas on the Wadden Sea side, natural levees on either side of the creeks, and salt pans and mud basins behind the levees. To the north the saltmarsh is bordered by a dynamic dune system. During storms and unusually high tides water from the North Sea breaks through these dunes and floods the saltmarsh, rejuvenating it by leaving behind a layer of fresh sand. The sea thus feeds the growth of the island – a natural characteristic of all the Wadden Sea Islands – and over the past 30 years this natural accretion of sand has caused Schiermonnikoog to grow by about four kilometres in an easterly direction. The western end of the island consists of a beach plain formed by the gradual amalgamation of sand banks from the sea with the island. This vast beach has been colonised by a species-rich pioneer vegetation.

What was the starting situation?

To explain how this dynamic coastal zone between the North Sea and the Wadden Sea develops it is informative to go back in time. Around 1300 Schiermonnikoog lay five to six kilometres further to the west than it does today. From about 1600 the western part of the island was

subject to continuous erosion and several villages were lost to the waves. The island then shifted eastwards. More than 2.5 kilometres were eroded from the west coast, while at the same time the deposition of sand at the other end of the island extended it seven kilometres eastwards. Until the 1950s, during periods of high water the eastern side of the island was almost entirely flooded by the North Sea and the seawater would run through channels between the dunes to the Wadden Sea (washovers). In 1923 the Badhotel collapsed into the sea. In 1959 the sand-drift dike was built, cutting off an active washover from the sea. The beach plain behind this dike subsequently developed into a primary dune slack and is now an extensive reed marsh which is only covered by seawater during high storm surges. As this area is no longer raised by the intermittent deposition of sand from the sea it cannot keep pace with the rising sea level. Its conservation value was drastically reduced and by 1995 almost nothing was left of the previous rich diversity of flora and fauna. The washovers are therefore of great importance for the ecology of the area and for the safety of the coast.

The west of Schiermonnikoog (behind the island head) consists of dunes that are not under the direct influence of wave action. This area contains many different habitats, with a full range of transitions between calcareous and calcium-poor, wet and dry, north- and south-facing slopes, and wind-blown sand and closed woodland. Over the past 20 years this area of dunes has undergone a rapid change with the growth of herbaceous vegetation and closed woodland. This is because for many years areas of open sand were planted with beach grass, nitrogen deposition loads have increased and the rabbit population has been decimated by disease.

How were the successes achieved?

Both the island head and the 10 kilometre long island tail are still under the influence of natural processes, which drive the dynamic development of a wide diversity of environments, vegetation types and communities. Here the coast can grow naturally, in step with the rising sea level. Possibilities for reactivating the original washover area by removing parts of the sand-drift dike are currently being investigated. But as some of the island residents can still remember how much hard work went into building



this dike in the first place, free and open discussions will be held with the island residents before any action is taken. Sand drift has already begun over a small area and towards the eastern end of the sand-drift dike a small breach made by the sea allows a limited amount of water to flow through.

The development of the island was heavily debated during the preparation of the management plan for Schiermonnikoog National Park. Not only do ecologists want to stop the dunes becoming overgrown, but the residents and tourists do as well. However, regularly clearing the vegetation and stripping the soil is not an attractive option for such a natural island as Schiermonnikoog. The strategy which was finally chosen, in consultation with the islanders, is based on restoring the natural processes in the dunes: sand drift, wave action and the influence of wild herbivores.

The islanders will remain involved in the plans for the future of the island and want to have a voice in all future decisions on management activities. Although the management plan for the National Park was drawn up with the involvement of the islanders, consultation during the implementation of the plan is also proving to be important. The residents are involved in questions like where exactly the soil will be stripped or excavated to create blow-outs in the dunes, and where to erect a temporary fence during the introduction of large herbivores. Asking people for their opinions requires care and takes time, but the best solutions are often those arrived at with the involvement of local people – for one thing because they know their island better than anyone else.



Fish migration in the main rivers: towards the restoration of river basins

'The return of houting and salmon to Dutch rivers shows that the ecological restoration of migratory fish is on the right track. More is needed for the return of twait shad and sturgeon, including measures in estuaries, along the coast and in the sea. The return of these species would be a great step forward.'

Tammo Bult, Director of IMARES Wageningen UR

The Netherlands encompasses the delta of the Rhine, Meuse and Scheldt. Large populations of migratory fish used to swim up these rivers to their spawning grounds, but the rivers were radically altered and for hundreds of years were unsuitable for migratory fish. For the past thirty years work has been ongoing to restore the natural qualities of these rivers.



What has been achieved?

The only open migration route was through the Nieuwe Waterweg ship canal, the entrance to the Port of Rotterdam. In 2014 a fish ladder was built in the IJsselmeer Dam and a second is planned, and from 2018 the discharge sluices in the Haringvliet will be kept ajar. Along with the ending of the intensive river fishing industry, all these developments have greatly improved conditions for the return of migratory fish since the 1980s. Salmon and houting have returned to the main rivers after a long period of absence. Since the 1980s the quality of the water in the Rhine and, more recently, the Scheldt has vastly improved, and fish ladders have been constructed to bypass barriers in the river. Since 1990 all the weirs in the Meuse, Nederrijn-Lek and Overijsselse Vecht have been fitted with fish ladders, and the barriers in many of the upper reaches of the rivers have also been made passable for migratory fish. The Haringvliet Dam and the IJsselmeer Dam, which close off the former Haringvliet and Zuiderzee estuaries from the sea, are the last major barriers to fish migration in the main channels of the Meuse and Rhine.

As the populations of migratory river fish had declined sharply throughout Europe, the chances of natural recolonisation were small, and so reintroduction programmes were started for a few species. The salmon was chosen as an important indicator species for the restoration of the Rhine, and later for the Meuse. The release of salmon in its spawning grounds in Germany, France and Belgium has led to thousands of adult fish returning each year to these spawning grounds via the main channels of the rivers. But the losses during the period of out-migration of the smolts, their stay in the ocean and the return of the adult fish to the Rhine are still too high for the maintenance of a viable population. Salmon are therefore only present in these rivers because young fish are regularly released into the upper reaches of the rivers. The houting, which is related to the salmon, disappeared from the Rhine in the 1930s and was only present in the Wadden Sea area and the rivers that discharge into it. In 1992 a start was made with a programme of releasing young houting in the Lippe, a tributary of the Rhine just over the Dutch-German border.

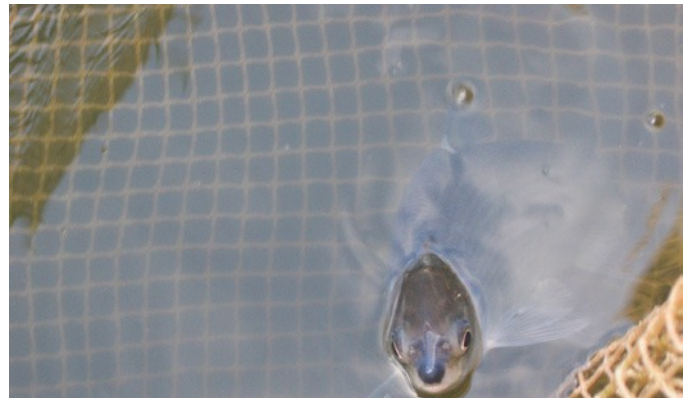
Houting now migrate to the river IJssel to spawn, but very few migrate into Germany. Whereas in the past houting were entirely dependent on migration between the sea and the rivers, the IJsselmeer is now a suitable environment for the fish to mature in and only part of the population migrates into the ocean.

In 2008 a start was made with the reintroduction of Allis shad into the German part of the Rhine, and in 2012 the first radio-tagged European sturgeon were released into the Rhine to investigate the possibilities for the successful reintroduction of this critically endangered species. The numbers of some migratory fish species that never disappeared entirely but were severely depleted, such as the sea lamprey and river lamprey, have picked up over the past 20 to 30 years.

In contrast to these migratory fish, the eel spawns in the open ocean and matures in rivers and freshwater bodies. Eel numbers have declined sharply since the 1970s. This species has no distinct populations that return to the same river; instead there is one mixed population for the whole of Europe, which means there is no direct link between local restoration measures and trends in population size.

Wat was the starting situation?

The Rhine was an important habitat for the European sturgeon and salmon until into the nineteenth century and the river used to support a flourishing fishing industry. But one by one the migratory fish species disappeared because of overfishing, the construction of weirs and barrages, pollution, and habitat loss caused by activities such as gravel and sand extraction. The European sturgeon went first, followed by the Allis shad, houting and salmon, and the completion of the Delta Works finally put an end to the breeding population of twait shad in the Netherlands. However, sea lamprey, river lamprey and sea trout never disappeared entirely from the country. Both species of lamprey do not necessarily return to the river where they were hatched to spawn and there is a considerable exchange of individuals between rivers. Trout can develop into migratory fish (sea trout) or non-migratory fish (river or brown trout), which has enabled them to maintain their populations in the upper reaches of the Rhine and Meuse.



What is still lacking compared with the historical natural situation are well functioning estuaries. Only the Scheldt still flows into the sea through a relatively natural estuary. Following the recent major improvement in water quality in the Scheldt, the twait shad, a migratory fish species that is heavily dependent on estuaries, has made a comeback in the river. Unfortunately, there are no suitable estuarine spawning grounds available to this species in the drainage basins of the Rhine and Meuse. A similar problem faces species such as the smelt, flounder and stickleback.

How were the successes achieved?

From the 1950s to the 1970s the water quality in the main rivers was very poor and migratory fish were largely absent. After the Sandoz chemical spill in the Rhine near Basle in 1986 the International Commission for the Protection of the Rhine coordinated a series of restoration measures in the riparian states of the Rhine. As an important target species for these operations, the salmon served as a flagship species. Plans and agreements were also made for the restoration of fish migration in other rivers, such as the Meuse, Scheldt and Ems. Many water treatment plants have been built and emissions have been reduced, leading to much improved water quality in the rivers, first in the Rhine and later in the Meuse and Scheldt. Fishing is also restricted, including bans on salmon and sea trout fishing, and an EU Regulation has been adopted to help the recovery of the European eel. The introduction of the EU Water Framework Directive in 2000 reinforced the drainage basin approach and led to measures to facilitate fish migration at pumping stations, weirs and hydroelectric power stations.

The Hunze valley: from potato fields to living river basin

'The white-tailed eagle and the beaver show that with vision and a dose of audacity we were able to support the development of a high quality, robust natural area in the Hunze valley. Working with a group of partners, we have in a short time restored a coherent river valley landscape around the living Hunze river.'

Eric van der Bilt, Director of Stichting Het Drentse Landschap

A large area of new nature of European significance that provides recreational opportunities, a boost for the local economy, water storage for urban areas, carbon sequestration and heritage values – all achieved in twenty years by working from an ecosystem-based vision.



What has been achieved?

Between 1995 and 2015 3,000 hectares of wetlands were created in the Hunze valley, including the restoration of meanders along a 30 kilometre stretch of the river. During the short to medium term the valley will be able to store rainwater during peak discharges. At the end of 2015 about 70% of this robust natural system, which is under the influence of nutrient-rich surface water, had been established in an unbroken area.

Various characteristic bird species of rivers and nutrient-rich marshland, including the kingfisher and the nationally endangered black tern and bittern, have re-established themselves in the area. Entirely unexpectedly, numerous other marsh birds have settled here as well, some of them not previously recorded as breeding in North-West Europe. These include the whiskered tern (since 2012) and the white-winged tern (since 2014). After its reintroduction in 2006, the beaver population has grown rapidly and now amounts to 80 individuals. The water sedge, a northern plant species rare in the Netherlands, has moved out of its refuges and is becoming established in the new marshland. Many obstacles to fish migration have been

removed so that fish migrating upstream from the Wadden Sea, such as eel, ide and common dace, can again swim into the upper reaches of the Hunze. The area is also regularly visited by white-tailed eagles and otters.

The further development of the area is being driven by the river system: a free-flowing river that regularly floods. This increasingly dynamic river system and the occasional high water levels give the area its robust character. The landscape works took account of existing local natural values, for example by retaining populations of characteristic marshland plants when reintroducing meanders in the river. Cattle from local farms graze the area extensively to keep the valley landscape open. Management costs are low.

But much more has been achieved than the development of new habitats. The restoration of the old course of the river and the reorganisation of land holdings along the Hunze not only gives residents in the area greater opportunity to enjoy the landscape, but also attracts new visitors from the region. Guides have been trained to lead excursions in the area. Opportunities for recreation in the



area used to be limited, but are now well provided for in the form of walking, cycling and canoeing routes. Several historic farmhouses, a windmill and a church have been restored and some converted into information centres with audio and visual presentations about the history of the Hunze valley. The area is also popular among anglers, the cafes are doing good business and the valley has become a much more attractive place to live. Moreover, the water storage capacity of the area has proved its worth already. Early in 2012 the city of Groningen remained free of flooding thanks to the temporary storage of peak discharge water in the climate buffer polders upstream.

What was the starting situation?

The upper reaches of the Hunze straddle the more elevated glacial till soils in the province of Drenthe and the lower lying former raised bog landscape that extends eastwards to Germany. The Hunze flows through the Zuidlaardermeer Natura 2000 site (2,100 ha) and currently discharges into the Wadden Sea via the Ems Canal. The river is 90 kilometres long from source to mouth.

In the second half of the twentieth century the land holdings in the Hunze valley were reorganised and improved for agricultural use. This involved a considerable lowering of the water table and as the peaty soils dried out they sunk and oxidised, releasing carbon dioxide and methane in the process. Before 1995 most of the middle reach of the Hunze was a canalised river flanked by extensive potato fields and the area had little value for wildlife. The quality of the water in the Zuidlaardermeer lake, which was designated under the Birds Directive, was poor. No-one could have imagined how in 20 years' time this area would be transformed into an attractive place for both people and wildlife.

How were the successes achieved?

The initiative to restore the Hunze valley ecosystem was launched in 1990 after a group of land managers from the provincial conservation organisations visited several river valley landscapes in the north-east of Poland. This encouraged both organisations to join with the WWF in 1995 and draw up a vision for the whole catchment of the Hunze, from the source to the Wadden Sea. This ecosystem approach has proved to be a key success factor. The underlying vision allowed the partners in the

project to patiently work together over a period of many years on the development of an interconnected series of new wildlife habitats around the river. In the first instance there was little government support for transforming the Hunze valley into a more natural lowland river valley system; the valley was almost completely given over to agricultural production with little or no ecological value and all the attention was focused on the much better known Drentse Aa river valley nearby, which already contained some valuable wildlife habitats. It was only after the publication of the Hunze vision in 1995 that the national and provincial governments included the area in the National Ecological Network.

The serious flooding in the northern part of the province of Drenthe and the city of Groningen in 1998 prompted the water authorities and both provincial governments to embrace the vision, because restoring a more natural landscape with wetland and wet grassland habitats provides opportunities to buffer the water system and prevent flooding and water shortages. Led by Drenthe provincial government, the area-based Hunze project was started in 2000, with the aim of creating a support base among the residents and users of the area. A lot of effort was put into exchanging land and relocating farms to 2,000 hectares of easier to work higher ground, which benefited both the farmers and the nature-based development of the Hunze valley.

In 2013 the 1995 vision document was updated to produce the 'Hunze Vision 2030', in which all the parties involved are participating. A new objective is to investigate possibilities for carbon sequestration within and outside the natural habitats. The development of the Hunze drainage basin from a seemingly hopeless situation into a large, robust natural system with opportunities for various forms of recreational and other uses is an inspiration for the development of other lowland river valley systems, both in the Netherlands and abroad. Crucial for the success of this project was the ecosystem-based approach and support from government and the local population.



Veluwezoom National Park: new ecosystem quality in an old forest and heath landscape

'The Veluwezoom is an iconic park. It is unique in the Netherlands because of its size and topography, the large number of visitors it attracts, and the management regime geared to letting natural processes take their course as much as possible.'

Jeroen de Koe, Manager of Veluwezoom National Park, Natuurmonumenten.

The Veluwezoom is the only place in the Netherlands where large areas of forest and heath are developing naturally under the influence of large herbivores, self-regulation and an extensive management regime. To a certain extent it is an ecological experiment. The Park receives more than two million visitors each year, who go for the extensive heathland and old forests, and, by Dutch standards, the unparalleled landforms and fine views.



What has been achieved?

In 1996 the area was divided into a number of zones in which the management strategy reflects the natural conditions. The large dry plateau of the Veluwe with its poor sandy soils is being allowed to develop into a more natural forest and heath landscape, with a few former agricultural enclaves. The flanks of the plateau, which are etched with erosion valleys and covered with rich loess soils, are heavily used for recreation and are managed as a semi-natural landscape. The estates zone at the foot of the Veluwe is managed as a cultural landscape. This last zone runs into the clay soils of the floodplain of the river IJssel (a distributary of the Rhine).

Since 2000 the Park has been one of two areas in the Netherlands where large herbivores are treated as non-domesticated animals. These Highland cattle are free to behave in a fully natural way, which is not possible in managed herds, and their numbers are determined only by the food supply. The sexes make use of the terrain in different ways. The cows and their calves prefer the richer

soils of the former agricultural enclaves and the adjacent areas of forest and heath; they keep these enclaves open and recognisable as cultural elements in the landscape. The bulls criss-cross the entire area in small groups and find food in open areas in the forest and on the heaths, where they are responsible for the natural succession of the 'grassy heathland' with purple moor-grass into 'bilberry heathland'. This development, which not only obviates the need for turf stripping but actually makes it undesirable, was first documented in the Veluwezoom. Despite the extensive heathland management regime, the heaths are not developing into woodland because the young trees, mainly Scots pine, are used by the cattle as rubbing posts and this eventually causes them to break. Some measures are taken to maintain the habitats of a few characteristic species of dry forest and heath that are declining in numbers in the Netherlands, such as the bushcricket and the heath fritillary.

Since 2003 the carcasses of animals culled under a plan adopted by the provincial government are left in the area



to support the biodiversity and natural mineral cycles. Visitors are informed about the reasons for leaving the carcasses of these animals in the terrain. One of the species that depend heavily on the carcasses of dead mammals for their survival is the raven. The first breeding pair of ravens to be sighted since their reintroduction into the Netherlands in the period 1969–1992 was in the Veluwezoom National Park. The Veluwe as a whole contains more than 80% of the national population of ravens.

In the self-regulating forests natural qualities new to the Netherlands are beginning to appear and the continuous extensive management regime has led to the accumulation of much dead wood from pine trees planted here between 1875 and 1925. In many respects the natural development of the area is an ecological experiment. An unexpected observation is that birds that nest in holes, such as the stock dove, jackdaw and great spotted woodpecker, are not increasing in numbers, in contrast to the picture nationally, and some are even in decline. The reasons for this are not known. Apparently our knowledge of the transition to more natural forest and heath landscapes is still limited.

The high recreational value of the Veluwezoom lies in the large size of the area, the strong visual and landscape connections with the river floodplains, and the experience of nature it provides, particularly the presence of red deer, wild boar and roe deer. Recreational uses have been successfully integrated into the landscape through the management zoning, restrictions on motorised vehicles, the construction of 'transferia' with car parks and public transport stops, a renovated visitor centre, the removal of small car parks and the construction of wildlife observation posts.

What was the starting situation?

The Veluwezoom is a dry forest and heathland system and is part of the 90,000 hectare Veluwe Natura 2000 site. The largest part of the current 5,000 hectare area was already owned by Natuurmonumenten before the Second World War. Until the 1970s timber production and the hire of hunting rights were important sources of income for the society, but since 1984 the management regime for most of the 3,500 hectares of forest has been as natural as

possible. Many stands of exotic conifers, such as Douglas fir and larch, have been cleared through a form of 'transformation management'. Until the 1950s the 1,500 hectares of heath were mown or cut and later also burnt in places, and in the 1980s small areas of grassy heath were stripped of the surface layer of turf. The considerable area of unstripped heathland that is now grazed all year round is unique in the Netherlands.

How were the successes achieved?

Extensive land acquisitions in 1930 led to the establishment of the first National Park in the Netherlands, which at that time covered 2,200 hectares. Although certain parts of the site have been managed for conservation since the first land acquisitions in 1911, the general principle of 'ecological management' was only fully introduced at the end of the 1970s. This followed a broad public debate about the management of forests and natural areas after a major storm had damaged large areas of forest and there was a real possibility that they would be replanted as monocultures. In parts of the Park, open areas resulting from past storm damage have been able to regenerate spontaneously without any intervention. In 1982 the first forest grazing trial with Highland cattle in the Netherlands began on an area of 177 hectares and in 1989 this was adopted as the standard management practice for 4,500 hectares of forest and heath.

In recent years the dogmatic discussions about naturalness have gradually faded into the background. 'Doing nothing' is no longer a goal in itself, but a means to make an area more natural than it was. In the 2014 vision document for the Veluwezoom the underlying management principle is the use of large-scale autonomous natural processes, but with smart integration of recreational, cultural and heritage features and functional restoration of the habitats of endangered characteristic species. This is best seen in the management of the heathland, where the aim is to create greater diversity and structural variation through natural processes, without letting them become overgrown. The existing roads, verges and paths provided for recreational use add to the biodiversity.



Drentse Aa drainage basin: nature and culture for the 21st century

'The Drentse Aa is a source of inspiration for the way water can shape the landscape.'
Piet Schipper, Staatsbosbeheer

Over the past fifty years, under the influence of the many significant changes in society, the valley of a small river has been transformed from a small-scale agricultural landscape into a cohesive National Landscape of 34,000 hectares in which nature and culture can thrive and develop.



What has been achieved?

In 2015 Staatsbosbeheer, the government agency which is responsible for the management of the Drentse Aa National Landscape, drew up a new vision for the area which redefines and integrates ecology and cultural heritage. The document was prepared in response to the changing social environment, climate change and international policy (Natura 2000, Water Framework Directive). The southern part of the National Landscape, which has large water infiltration areas, bog pools, springs and streams, can develop into a natural woodland landscape; in the historic *esdorp* landscape of open field villages surrounding the middle reach of the river the main objective is the conservation and restoration of the cultural heritage and associated natural values; in the northern zone containing the lower reach of the river there is room for water storage.

Situated within the National Landscape is the Drentse Aa Natura 2000 site (3,900 ha), which includes the whole catchment of the river. It therefore encompasses a coherent natural system of a size unique in the Netherlands. Until the beginning of the 1990s the conservation management regime was geared to continuing the historical land uses, such as hay meadows and pastures. Since then, the management regime for the middle reaches of the river has been geared to restore the

hydrological regime to a more natural state with marshland communities in the wettest areas and hay meadows on the higher ground. This transformation from an agricultural landscape to a more natural river valley as part of a small-scale landscape pattern has been successful. It can be seen in the increasing numbers of breeding birds characteristic of herbaceous vegetation and maturing woodland, such as the yellowhammer and more recently the European stonechat and the red-backed shrike. The projects to raise the groundwater levels begun in the first decade of this century have led to a strong increase in numbers of marsh birds such as the greylag goose, bluethroat and water rail. The meadow birds that were prominent around 1965, such as the black-tailed godwit and northern lapwing, are declining in numbers.

The water quality has improved considerably since the 1960s. A fish migration plan has been introduced and there are now 28 species of fish in the area, including the current-loving ide, common dace and gudgeon. After 90 years absence the common clubtail, a dragonfly of river habitats with clean, oxygen-rich water and banks with bare sandy patches, has returned. As a consequence of restoration and extensification management, the areas of the moderately nutrient poor vegetation have increased at the expense of fertilised grassland.



The establishment of the National Landscape in 2002 with consultative bodies representing a broad cross-section of society has led to an increase in the number of activities and the creation of a visitor network with hosts and special excursion guides. Residents and residents groups have also started their own projects, such as environmental plans and experiments with new crops and regional products.

Wat was the starting situation?

In 1965 the area was mostly in agricultural use, with a few small nature reserves along the river. The valley contained large populations of meadow birds, including about 600 breeding pairs of black-tailed godwit and 400 pairs of northern lapwing. The land in the valley bottom was predominantly nutrient-rich grassland, but some rare species could still be found in the unused corners of fields and in ditches. Around this time just about all the fish had disappeared from the river and streams because of the untreated discharges from the villages and industries. The whole landscape was under severe pressure from new development around the villages and agricultural land consolidation and improvement schemes.

How were the successes achieved?

The original reason for protecting this area was not nature conservation but the landscape. From the systematic reclamation of the large heathlands in the 1920s and 1930s until the 1960s much of the traditional small-scale agricultural landscape in the province was lost at a rapid rate, rivers and streams were canalised, and major land consolidation and improvement schemes were proposed. Public resistance and protests against these schemes led to the establishment of a National Landscape.

The provincial government and Staatsbosbeheer have been working to protect nature, the landscape and cultural heritage in the area since the 1950s. Following severe flooding around 1960 the provincial government also began work on a programme to improve the water management regime in the area. To accommodate the rapid developments in farming techniques it became necessary to reallocate holdings and rationalise the field layouts. A list was prepared of farmland to be acquired for the purposes of conserving nature and protecting the landscape and cultural heritage in the area, which led to

intensive consultations between the provincial authority and national government. In 1965 a vision for the Drentse Aa area was published as an input to the development of the land consolidation schemes. Agricultural organisations put up stiff resistance to this plan, but from 1969 the national government reserved a sum of one million guilders a year for a period of ten years to acquire land holdings as bargaining chips for exchange during the preparation of the land consolidation plans. Around 1970 problems with the abstraction of drinking water prompted new legislation, which led to the gradual cleaning up of the Drentse Aa, at that time effectively an open sewer, and its restoration to a healthy river.

The close cooperation between the provincial government and Staatsbosbeheer as well as the long period of preparation made the 1965 vision a turning point in the approach to nature conservation in the Netherlands, allowing the development of a landscape reserve within an agricultural area. It was also a new (and costly) operation for national government. In fact, the Drentse Aa was 20 years ahead of the establishment of the National Ecological Network as proposed in the Nature Policy Plan of 1990.

During this process the nature conservation community and a part of public opinion were in direct opposition to the agricultural sector, which has coloured the relationships between these groups to this day. A compromise was reached thanks to the mediating role of the provincial government. Under the government's National Parks policy, a plan for the establishment and management of a park with a diverse set of objectives was produced in 2002 after a long period of preparation. The plan seeks to involve as many different parties in subsequent planning processes as possible, and finance and implement projects in the region. This has led to an improvement in the relationships between different groups in the area and more people and organisations have become involved, stimulated in part by the growing interest in sustainable farming. The continuing involvement of local people in the management of the landscape is expected to further increase their appreciation of the area.



Main lessons

Even in a crowded country with a long history of reclamation, exploitation and intensification the naturalness and ecological robustness of areas can be greatly improved.

Opportunities for creating more naturalness arise at all spatial scales, from more ecological management of ditches to incentives for natural coastal erosion and accretion. However, the greater the compatibility of measures with land use and management at the landscape scale, the more sustainable they will be.

More robustness can only be achieved at the scale of the landscape. Space is needed to accommodate the effects of largely unpredictable natural processes, such as flooding after extreme rainfall, and for pulling together funds from different area development projects.

Crucial for the success of all examples was the ecosystem-based approach and support from government and the local population. Asking people for their opinions requires care and takes time, but the best solutions are often those arrived at with the involvement of local people.



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