

## 1. Introduction

The wetland 'Krammer Volkerak', also known as 'Volkerakmeer' is a former tidal zone extending over an area of over 6,450 ha. situated in the provinces of Zeeland, Noord-Brabant and Zuid-Holland.

Since its closing off from the East Scheldt tidal waters in 1987 the once salt waters of the Krammer Volkerak have become fresh waters without tidal action. The lowest lying parts of the clayey foreland soils, the former mudflats and sandbanks, are permanently submerged, the higher parts have fallen dry. The changes in the abiotic environment of the area have led to adaptations and changes in biotic communities which are still taking place. Given the experience in similar areas it is not unlikely that new communities of national and international value will develop. Among the first priorities in the area's administration and management are a policy of non-intervention, and the preservation of the area's characteristic quiet.

In 1988 part of the area, consisting of permanently exposed mud flats and salt marshes including the adjacent zone of shallow water, 3430 ha in all, was designated as partly state-owned, partly privately owned nature reserve under the Nature Conservation Act.

## 2. Scientific value

### 2.1 The area's scientific value before it was closed off

Until 1987 the Krammer-Volkerak was a tidal area open to the North Sea. It has always been part of the long south-western Dutch coast line with thick layers of sand and clay left behind by tidal streams and rivers.

Erosion and sedimentation led to the development of mudflats, sandflats and clayey salt marshes criss-crossed with widely branching tidal gullies, levees and basins. A wide variety of valuable biotic communities emerged due to differences in soil composition and water regime. The vegetation was determined by the extent of flooding on the low mud flats and the higher salt marshes. On the lower lying parts common cord grass and glasswort were common. Sea arrow grass and sea aster could also be found in higher parts. On the intermediate salt marshes the vegetation was more varied and included such species as sea poa and sea lavender. Sea purslane, sea couch grass, marsh mallow and common reed were found on levees.

The varied environmental conditions also favoured a rich variety of animal life. The lower lying salt marshes and mud flats and the open waters supported molluscs, crustaceans, worms and fish which served as food for the numerous birds. Even mammals such as common seal, otter and common porpoise were found in the area before it was closed off.

The Krammer-Volkerak was and still is of major importance as a

loafing-site for migrating birds. Of the following species at least 1% of the total north-western European population made a stop-over in the area:

cormorant, bean goose, brent goose, wigeon, oystercatcher, turnstone, grey plover, knot and curlew. Other species found in great numbers included: great-crested grebe, greylag goose, mallard, pintail, teal, golden-eye, scaup, red-breasted merganser, dunlin and avocet. On the permanently exposed lands small numbers of little tern, ringed plover and kentish plover, avocet and common tern.

## 2.2 The area's scientific value after it was closed off

When the Krammer-Volkerak was closed off in 1987 the tidal area became a fresh water lake. A more or less stable high water mark was fixed; the highest parts of the tidal land, 1,780 ha in all, would no longer be flooded apart from the edges where the water level might be raised or lowered by the effect of wind, waves and rainfall. Adjacent to these dry lands are zones of shallow water (of up to 1.5 m in depth). The Krammer-Volkerak has a water regime similar to that of the Eendracht and Zoommeer fresh water lakes.

The vegetation on the former tidal land develops in step with the development of the salt and nutrient level of the soil. After 1987 salt levels dropped rapidly. In 1989 upper layers were largely desalinated. As a result halophilous species were replaced by salt-avoiding plants. Common cord grass, so characteristic for a tidal environment (Slikken van de Heen), gave way to species favouring nitrogen such as hastate orache and grass-leaved orache and herbage like rosebay willow herb, creeping thistle and prickly sow thistle. Willow, birch, elder, alder, sea buckthorn and bush grass have established themselves in large numbers. Halophilous species and salt tolerant species have largely disappeared and still only grow locally in lutum rich basins.

Due to stagnation in the draining process the pace of desalination is slower on mud flats where halophilous species can still be found. Vegetation cover as a whole has increased with lesser sea spurry gaining predominance over glasswort and annual seablite. Sandy areas however desalinate faster. There the halophilous species have given way to a richer variety of species to include annual meadow grass, foliaceous moss, sea mayweed and rosebay willow herb. Bush grass and the tree species mentioned previously have all established themselves or have thrived on the sandy heads.

On the Krammersche Slikken the original salt tolerant vegetation of glasswort, seablite and sea aster has held its own. In some places herbage and willows have emerged.

The water supports such species as beaked tassel weed, a plant favouring brackish water which will give way to species as baby pond weed and greater water thyme, species that thrive in eutrophic fresh water and are increasingly found.

The area's animal life has changed as well. Molluscs, crustaceans and worms which need a marine environment have disappeared. Chironomidae and zebra-mussel have taken their place.

The numbers of marine or salt tolerant fish species have dwindled. Fresh water species such as perch, zander, tench, carp, rutilus, white bream, ruffe and spined loach have taken over.

The number of waders, in particular grey plover, oystercatcher, bar-tailed godwit, curlew, dunlin, sanderling and knot which used the area as a feeding site has declined sharply. The area near the Philipsdam however is still used as a resting site at high tide in the East Scheldt.

Avocets use the area as a place to rest, moult and feed. There are now 400 to 600 breeding pairs a year.

The number of waterfowl has increased: great-crested grebe, cormorant, mute swan, greylag goose, barnacle goose, shelduck, wigeon, pintail, shoveler, tufted duck, pochard, golden-eye, red-breasted merganser, coot and avocet. The increase in the number of great-crested grebe is spectacular.

As to other birds: the little gull, swallow, sand martin and house martin have greatly increased in number due to the larger number of insects, notably of chironomidae. The sparsely grown mud flats, notably the man-made islands serve as a breeding ground for the kentish plover, ringed plover and little ringed plover, avocet and lesser black-backed gull, black-headed gull, little tern and common tern. It is remarkable that one or two pairs of little gull and over a hundred pairs of the mediterranean black-headed gull are breeding, the last being the largest population in western Europe.

Birds nesting along the shore include the great-crested grebe, mute swan, (barnacle goose,) shelduck, gadwall, shoveler, tufted duck, pochard and coot. On the higher more densely covered salt marshes the mallard, oystercatcher, skylark, meadow pipit, blue-headed wagtail, marsh warbler, bluethroat, stonechat, reed bunting and sometimes the bearded reedling build their nests. Also the marsh harrier, kestrel and short-eared owl. Small mammals in this area include roe deer, fox, weasel, polecat, wood mouse, common shrew, common vole, musk rat, brown rat and root vole.

The Krammer-Volkerak with its large stretches of exposed land and shallow water and its geomorphologic and soil factors provides conditions favourable to the development of new nature values. In the management of the area the openness of the landscape in the adjacent areas of East Scheldt, West Scheldt and Grevelingen will be combined with smaller scale elements so that a more sheltered landscape can develop in places. The open element is a favourable environment for geese and ducks, the scrub and woodland of the sheltered spaces will attract other species.

A number of development measures have already been implemented. They include work on bank protection, man-made islands and measures for an active biological management of waters.

The following developments are expected:

Plaat van de Vliet The wet part of this area is sheltered and can develop into an area rich in aquatic plants and marine animals. Fish and birds diving for food, such as great-crested grebe, aythya-ducks

and merganser. The exposed part can support a rich variety of moist dune valley vegetation which is rare in the Netherlands. Horse grazing also takes place.

Slikken van de Heen (west) The wet part is very suitable for the development of a varied water and embankment vegetation. A pasture has been laid out for extensive geese grazing. The land is also used for horse and cow grazing. On the higher parts where grazing is less intensive trees may grow which may eventually host colonial nesting birds and raptors and song birds.

Slikken van Heen (east) In the western part the development of woodland will be a priority to enable the blue heron and cormorant to breed. In the eastern part which will be used for extensive grazing an open landscape with herbage and scrub vegetation is likely to develop.

Dintelse gorzen A differentiated landscape will emerge with extensive grazing: woodland, willow grove, dry grassland and moist areas.

Hellegatsplaten Management here opts for extensive grazing with horses and cows (Heck's) to create an open, varied landscape (grassy meadows and shrubs). Grazers will limit the volunteer growth of reed, trees and shrubs.

Krammersche Slikken For some time the landscape will be characterised by extensive open stretches of land due to extensive grazing. On the bare patches higher up such species as lapwing and plovers will build their nest. The man-made islands are already frequented by large numbers of duck and dozens of the mediterranean black-headed gull, black-headed gull, common tern and little tern. In the lowest lying parts and in the quiet, shallow water with the scattered man-made islands pondweed is expected to flourish and will provide a ready food supply for passing migrants such as bewick's swan, wigeon, pochard and coot. This area in the Krammer-Volkerak may become a major reproductive site for fish, a feeding site for the black-necked grebe, grey heron, spoonbill and osprey as well as a moulting site for duck.

Noordplaat This former sandflat was raised artificially, embankments were built and parts are now above the newly fixed high water mark. Initially the island will be a resting site for migrant waterfowl such as cormorant and duck and for ground nesting birds such as plover, gull and tern. As succession proceeds and scrubs and trees become established it will be an excellent breeding site for marsh birds and reedbirds and possibly cormorant, spoonbill and grey heron.

### 3. Criteria for identifying wetlands

#### A. Quantitative criteria for identifying wetlands of importance to waterfowl:

A wetland should be considered internationally important if:

- a) it regularly supports 20,000 ducks, geese, swans, coots or waders,
- b) it regularly supports 1% of the population of one species or subspecies of waterfowl,
- c) it is used regularly as a breeding site by 1% of the breeding pairs of one species or subspecies of waterfowl,

The Krammer-Volkerak:

- a) in 1990 hosted 130,000 ducks, swans and geese and 20,000 coots.
- b) the species exceeding the 1% standard include:  
great-crested grebe,  
cormorant, spoonbill, bewick's swan, greylag goose, barnacle goose, brent goose, shelduck, wigeon, teal, pintail, shoveler, tufted duck, gadwall, golden-eye, red-breasted merganser, coot, bar-tailed godwit and avocet.
- c) the 1% standard is met or exceeded by avocet and kentish plover.

B. General criteria for identifying wetlands of importance to plants or animals:

A wetland should be considered internationally important if:

a) it supports a large number of rare, vulnerable or endangered species or subspecies of plant or animal,

a) the area supports the following threatened or endangered species: red-necked grebe, black-necked grebe, slavonian grebe, little grebe, bewick's swan, marsh harrier, hen harrier, osprey, peregrine falcon, merlin, golden plover, ruff, wood sandpiper, black-winged stilt, avocet, mediterranean black-headed gull, little tern, short-eared owl, sand martin and bluethroat. The area supports the largest colony of mediterranean black-headed gulls in western Europe and is a stop-over for thousands of little gulls and black terns in spring. The rare beaked tassel weed which favours brackish water will be replaced by fresh water plants.

b) it is of special value for maintaining the genetic and ecological diversity of a region,

b) the wetland is of importance to maintain the genetic and ecological diversity of the Delta area as a whole.

c) it is of special value as the habitat of plants and animals at a critical stage of their biological cycles,

c) the Krammer-Volkerak is an area where numerous species of bird can breed without being disturbed. It is also an important moulting and foraging site.

C. A wetland should be considered internationally important if it is a particularly good example of a specific type of wetland characteristic of its region.

Since its closing off in 1987 the once salt waters of the Krammer Volkerak have become fresh waters without tidal action. The changes in the abiotic environment of the area are expected to continue for some time. New communities of national and international value will develop.

#### 4. Situation and boundaries of the wetland

The wetland is bounded:

- on the west by the Grevelingendam and Philipsdam with the Krammer locks;
- on the north by the flood barrier of Goeree-Overflakkee and the Volkerakdam with the Volkerak locks;
- on the east and the south by the flood barriers along the shores of Noord Brabant and Zeeland.

For the exact demarcation of the area see accompanying map which also indicates proposed shipping routes.

#### 5. Administration and management

The administration and management of the area are aimed at maintaining and developing the high potential of nature values in the area. This aim finds expression in the following:

- The Krammer-Volkerak is designated as a core area in the national ecological network in the Nature Policy Plan of the Netherlands (1990). The policy for core areas is aimed at safeguarding and enhancing existing nature values.
- In the Structure Plan for the Rural Areas in the Netherlands (1993) the area is designated as a core area (and/or nature development area) with water-borne recreation fitted in.
- In the Beleidsplan voor het beheer en de inrichting van het Krammer-Volkerak (1987) (policy plan for the management and development of the Krammer-Volkerak), drawn up by the authorities concerned, the channels are designated for the purpose of shipping, the dry grounds and shallow waters are designated for the purpose of nature. Co-use is a possibility as long as it does not interfere with the function of nature.
- The dry grounds and the adjacent shallow waters were designated as privately owned nature reserve (130 ha) and state owned nature reserve (3300 ha, including open waters) under the Nature Conservation Act in 1988. Management plans will be drawn up for these areas.
- A management plan for the dry grounds and shallow waters of Krammer-Volkerak, Eendracht and Zoommeer was drawn up in 1991. The emphasis is on large units of management where natural processes are allowed to run their course. Fragmentation should be avoided. Other

possible uses that do not conflict with the function of nature are also given.

- In the relevant regional plans a large part of the area is designated primarily for the purpose of nature.
- In the relevant land use plans most of the dry grounds are designated for the (shared) purpose of nature or are designated as areas of special scientific or landscape value.
- The management of the dry grounds was temporarily in the hands of the Public Works Department of the Ministry of Transport, Public Works and Water Management. In 1991 the management was handed over to the Society for the Preservation of Nature Reserves (the area in Noord-Brabant), the National Forest Service (the area in Zuid-Holland) and the Zeeuwse Landschap Foundation (the area in Zeeland). The waters are managed by the Public Works Department of the Ministry of Transport, Public Works and Water Management.

## 6. Other uses

### 6.1 Low-altitude flight routes

The Krammer-Volkerak is traversed by the low-altitude flight route VOII. This flight route was designated in 1988 in the 'Regeling vlieghoogten militaire luchtvaartuigen' regulating the flight altitudes for military aircraft. It was again designated in 1994 in the 'Regeling VFR-nachtvluchten en minimum vlieghoogten' for low-altitude flights of military helicopters and for military aircraft used for training purposes.

### 6.2 Policy plan

The 1987 policy plan for the management and development of the Krammer-Volkerak provides for co-use as long as other uses do not interfere with the function of nature. Uses include:

#### Shipping

Channels not designated as nature reserve under the Nature Conservation Act are used for the purpose of shipping as a complementary function of nature. The designation of the area as a wetland has no consequences for the area's commercial shipping or recreational boating. Nor does it affect the natural fluctuations of navigable channels and their maintenance. Future adaptations will be judged on their merits.

#### Recreation

Leisure activities such as recreational boating and recreational fisheries must not damage nature development and existing nature values (the presence of nesting birds and concentrations of waders) must not be disturbed. Co-use for recreational purposes will therefore initially be limited. Opportunities will increase when a more sheltered landscape has developed and chances of disturbance become less.

In accordance with what has been said in the explanatory notes to the designation of the area as a nature reserve under the Nature



Conservation Act day recreation projects for the benefit of local communities and weekend or longer-term recreation for people living locally can be realised near Oude Tonge and Ooltgensplaat. Preparations for these projects started in 1994. The exact place and size of the projects are still to be determined. If recreational pressure becomes too high the Plaat van Vliet or the north-eastern part might be considered for a supra-local day recreational project after giving proper weight to local interests. Under the 'Regeling snelle motorboten rijkswateren' (Regulation for fast motor boats on national waters) 1993 (amended 1994) part of the area is designated as a shipping route where fast motor boats are allowed to exceed the 20 km/h limit every day and/or where waterskiing is allowed every day.

#### Commercial fisheries

At present fisheries is subject to licensing under the Fisheries Act and the Nature Conservation Act. Further conditions may be set should this prove necessary. The 1987 policy plan provides for fishing rights to be issued for commercial and recreational purposes after a 10 year period to allow fishing stocks to recover.

#### 7. Consequences of the designation as a wetland

The designation of Krammer-Volkerak for inclusion in the list of wetlands has the following consequences:

- Under article 3, paragraph 1, the government is obliged to formulate and implement its planning so as to promote the conservation and the wise use of the wetland as far as possible. The necessary steps have been taken as the above sets out.
- Under article 3, paragraph 2, the government is obliged to arrange to be informed at the earliest possible time if the ecological character of the wetland is changing or is likely to change whether this be the result of technological developments, pollution or other human intervention. The government is also obliged to report these changes. The administration of the area is organised in such a way that the government is notified immediately should such changes occur.
- Under article 4, paragraph 2, the government is obliged to compensate for any loss should the boundaries of the wetland be restricted because of its urgent national interest. No real threat is expected for the Krammer-Volkerak now or in future. The obligation to compensate cannot be honoured since in view of the nature of the area, in particular its relation to its saline environment, there is no real possibility of any compensation.
- Under article 4, paragraph 3, the government is obliged to encourage research and the exchange of data and publications regarding the wetland. Developments in the Krammer-Volkerak are being monitored by several government bodies. The research carried out so far has been concerned with water quality, sedimentation and nature

development of land and water. The results will be published and will be used in the management of the area.

- Under article 4, paragraph 4, the government is obliged to endeavour to increase the waterfowl population through management. This obligation is fulfilled because management is aimed at maintaining and developing the nature function of the area.

#### Obligations under national policy

The hunting and shooting policy, which was reviewed in 1994, prohibits the hunting or shooting of migratory species in areas included in the list of wetlands and other nature reserves and allows the shooting of resident species only under well-defined conditions. This policy has also been incorporated in the management plan for the area.

Nature reserves come under the Environmental Management Act. Under article 4.9, paragraph 4 of this Act provincial authorities should give nature reserves in provincial environmental management plans the status of 'area where the quality of the environment or parts thereof requires special protection' (article 4.9, paragraph 3c).

This is not desirable for parts of the Krammer-Volkerak which lie within the bounds of noise sources or other disturbing activities (such as Dintelmond industrial site, wind farms on Volkerakdam and along Sabinadijk, the low altitude flight route VOII, shipping channels and motorways). In the explanatory notes therefore it has been laid down that article 4.9, paragraph 4b of the Environmental Management Act shall not apply to the Krammer-Volkerak.