ASSESSMENT REPORT

The State of the Wadden Sea and the Implementation of the Esbjerg Declaration

The 7th Trilateral Governmental Conference of the Wadden Sea
Leeuwarden, November 30, 1994

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1 INTRODUCTION

The Trilateral Wadden Sea cooperation is based on the **Joint Declaration on the Protection of the Wadden Sea**, which was signed at the 3rd Trilateral Governmental Conference on the Protection of the Wadden Sea in Copenhagen in 1982. In the Declaration, the three countries declared their intention to consult each other in order to coordinate their activities and measures for implementing the obligations resulting from

international legal instruments in the field of nature protection, in particular the Ramsar, the Bonn and Bern Conventions, the EC Bird Directive and other relevant EC Directives with regard to the comprehensive protection of the Wadden Sea region as a whole including its flora and fauna.

The Ministerial Declaration, adopted at the last Trilateral Governmental Wadden Sea Conference in Esbjerg in 1991 (Esbjerg Declaration), initiated a new era in the trilateral Wadden Sea cooperation. The Esbjerg Declaration entails a guiding principle for the trilateral Wadden Sea cooperation, common principles and common objectives for the human use of the area based on the common principles.

The adoption of the Esbjerg Declaration resulted in a momentous input into the protection of the Wadden Sea as an ecological entity unprecedented in the trilateral cooperation. In the period since the adoption of the Declaration, the three countries have been engaged with the implementation of the principles and objectives. The Assessment Report is an evaluation, prepared for the 7th Trilateral Governmental Conference on the Protection of the Wadden Sea, which summarizes
- the progress with respect to the implementation of the Esbjerg Declaration based on, in particular, the national implementation reports and
- the status of the Wadden Sea ecosystem based on the Quality Status Report of the Wadden Sea, where appropriate supplemented with recent findings.

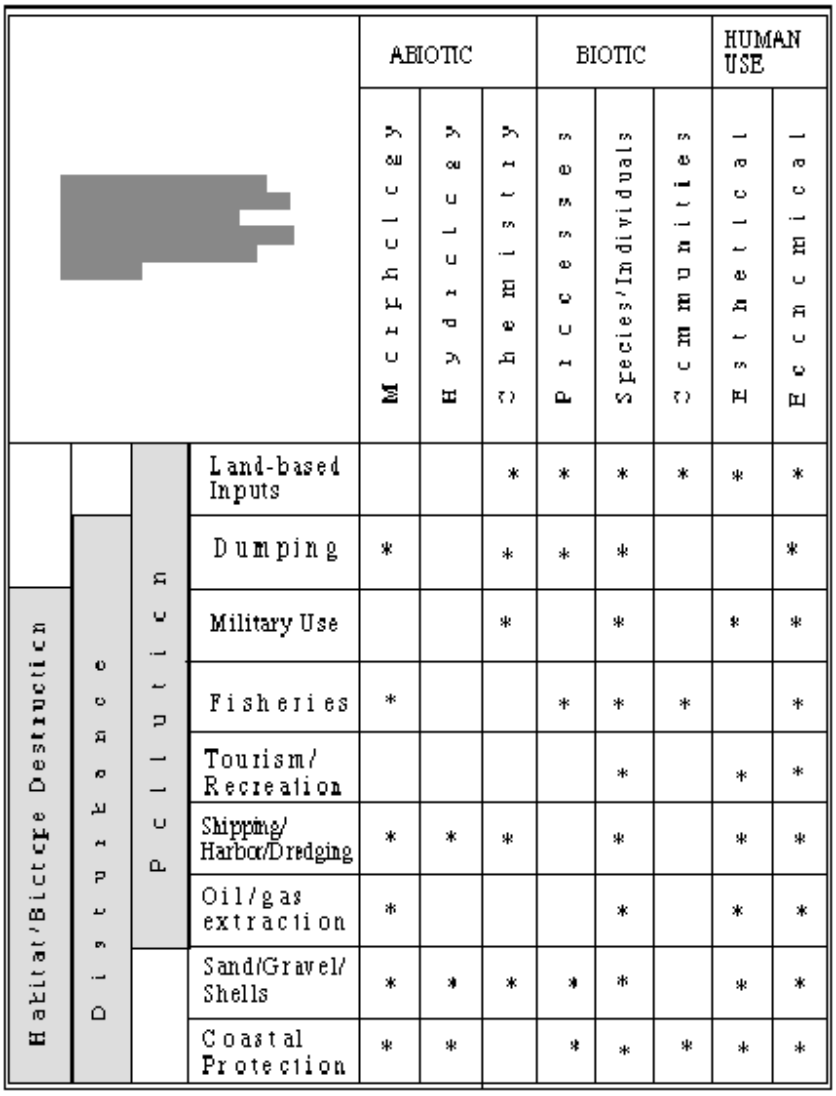
On the basis of the evaluation in the Assessment Report, the 7th Trilateral Governmental Conference defined the progress and main common shortcomings with respect to the protection of the Wadden Sea and determined the main common issues which should be addressed in the elaboration of the coordinated management plan.

2. STATUS OF THE WADDEN SEA ECOSYSTEM

2.1 Introduction

In the following, the main conclusions of the 1993 Wadden Sea Quality Status Report (QSR) are given, where appropriate supplemented with recent findings.
The anthropogenic impact on the Wadden Sea ecosystem has been assessed for the impact categories Pollution, Disturbance and Habitat Changes and Destruction, followed by an evaluation of their combined effects.
For the assessment, a number of criteria were used which are listed below:
- the degree of achievement of policy goals for the ecosystem;
- possibilities for regeneration;
- the uncertainty as to effects;
- the risk of an activity;
- the acute or chronic impact;
- the size of the impact.

These criteria have been addressed and specified in the Ministerial Declaration of the 6th Trilateral Governmental Wadden Sea Conference (Esbjerg, 1991) by means of a Guiding Principle and a number of common management principles.



			ABIOTIC			BIOTIC			HUMAN USE	
			Morphology	Hydrology	Chemistry	Processes	Species/Individuals	Communities	Esthetical	Economical
Habitat/Biotope Destruction	Disturbance	Pollution	Land-based Inputs			*	*	*	*	*	*
			Dumping	*		*	*	*			*
			Military Use			*		*		*	*
			Fisheries	*			*	*	*		*
			Tourism/ Recreation					*		*	*
			Shipping/ Harbor/Dredging	*	*	*		*		*	*
			Oil/gas extraction	*				*		*	*
			Sand/Gravel/ Shells	*	*	*	*	*		*	*
			Coastal Protection	*	*		*	*	*	*	*

2.2 Pollution

2.2.1 Introduction

The assessment of the pollution status of the Wadden Sea is based on the evaluation of data on concentrations of substances in water, sediment and biota. In many cases, data were only available for a limited period of time. Furthermore, data of different time periods and/or locations were in many cases not, or only partly comparable due to differences in monitoring and analysis. Therefore, conclusions regarding trends in inputs and concentrations, as well as overviews of geographical differences in concentrations, should be treated with some caution.

2.2.2 Nutrients

Riverine *inputs* of phosphorus generally decreased in the period 1980-1990. Inputs of total nitrogen from the IJsselmeer did not decrease, whereas Elbe inputs did from 1988-

1991. The latter is, however, most probably a result of the very low flows in these years. This pattern was confirmed by data from 1991-1993 (compare figure).

Elbe and IJsselmeer inputs (left hand side) and concentrations (right hand side) of phosphorus (PO43-) and nitrate (NO3-).

(GRAPHICS - under construction)

The pattern of nutrient inputs is reflected in the *concentrations* of nutrients in the water column: concentrations of o-phosphate are slowly decreasing in most parts of the Wadden Sea. Nitrate concentrations are relatively stable in the western Wadden Sea and decreasing in the Elbe estuary. As a result, the N/P ratio increased in the western Wadden Sea and the northeastern Wadden Sea (Danish part) and decreased in the eastern, Elbe-influenced Wadden Sea. The biological effects of changing N/P ratios are still under debate. There are, however, indications that an increase of toxic algae may occur. Furthermore, changes in algal species composition may result from the N/P ratio, which deviates substantially from the natural situation. These changes will probably have their effects on the whole food chain.
There are strong indications that hyperconcentrations of nutrients have caused a shift in plankton composition, an increase in primary and secondary production, and a shift in benthos composition into the direction of short-lived species. In recent years, an increase in macroalgae has been observed in the Wadden Sea. This phenomenon is thought to be caused by eutrophication but further research is needed. The same can be said for the black spots on sandy sediment which have increased in size and frequency.

2.2.3 Micropollutants

Contrary to nutrients, micropollutants occur in relatively small amounts in the marine environment. Two types of micropollutants can be distinguished, substances of natural origin and man-made substances or xenobiotics. The heavy metals and many polycyclic aromatic hydrocarbons (PAHs)belong to the first category. The second group contains substances like PCBs and pesticides.
The rivers are the main source of inputs of micropollutants into the Wadden Sea. Little is known about the influx of contaminants coming from the open North Sea. From the available data on riverine inputs of heavy metals, no clear trend can be concluded for

the period 1980-1990. However, *concentrations* of cadmium, copper and zinc in **sediment** generally show a decreasing trend. Despite this decrease, concentrations are still elevated: in 1990 concentrations of cadmium, zinc and lead in sediment were 2 to 3 times higher than their background levels. In the same year, the concentrations of mercury in sediment were up to 5 times higher than their background level.

The concentrations of the above heavy metals in **blue mussels**, show no decreasing trend. Average concentrations of cadmium and copper are, with the exception of the Elbe estuary, around background level. Concentrations of mercury and lead are in most cases above background level

The concentrations of the anti-fouling compound tributyltin (TBT) in the water of the open western Wadden Sea are below 1 ng/l. TBT concentrations in dogwhelk, transplanted to harbors and marinas in the Wadden Sea in 1992, ranged from 0.02 to 0.39 mg kg wet-weight, and total tin concentrations from 0.07 to 0.69 mg/ kg wet-weight. Sterility in females may occur already at a total tin concentration of 0.02 mg/kg wet-weight.

Data on concentrations of the organic micropollutants -PCBs, PAHs, dioxins- are too limited and patchy to be able to draw conclusions on trends.
For many other organic micropollutants -a.o. pesticides- there is hardly any information. A Dutch study has shown that many of these substances can be identified in the Wadden Sea. Most of them are not part of the regular monitoring programs.
Only for lindane, more data are available. The concentrations of this pesticide in water in the eastern Wadden Sea show a decreasing trend which reflects decreasing inputs from the Elbe as of 1987. Dutch lindane inputs have remained at the same level in this period, which is about 50% of the Elbe input figure of 1991.

It is unclear what the effects of the presence of sublethal concentrations of micropollutants on the ecosystem are. There is increasing evidence for an impairment of the immune and reproductive systems in seals and an increased disease frequency in fish. In general, there is an adverse effect on immune functions, physical development and reproduction, also in humans. There is not enough known to conclude whether pollution is the primary cause for diseases or whether it enhances the development of a disease.
2.2.4 Oil and dangerous substances from shipping and offshore activities

The oiling rates of dead birds washed ashore have decreased along the German coast. This was not the case for the Danish and Dutch Wadden Sea coasts. Most of the oil originates from ships' bunkers. In the beginning of 1994, an estimated number of 10,000 common scooters (*Melanitta nigra*) died in the Schleswig-Holstein Wadden Sea due to oiling.
It has not been possible to determine effects of the release of the pesticide Apron-plus in the Wadden Sea ecosystem.

2.3 Disturbance

When comparing the different causes of disturbance, some types of recreation -including hunting- and commercial fisheries are regarded as having the biggest disturbance impact on the ecosystem. Of the various types of disturbance, the negative effects of interference with the food supply through fisheries have been quite well documented. The combined visual and acoustical disturbance caused by slow aircraft -both military and recreational- is considered the most intensive form of disturbance.
There is, however, a general lack of knowledge about the effects of other sorts of disturbance and about the effects of disturbance on the population level.
To fill a part of this gap, the Dutch government has commissioned a three-year research program (1993-1995) with the aim of developing a more detailed insight in the interrelationships of water recreation and nature in coastal waters. This knowledge is necessary to develop and evaluate policies and management measures for these waters.
Also in the German Ecosystem Research Project, disturbing effects of tourism and recreation on natural values are being investigated.

2.4 Habitat changes and destruction

Embankments and coastal protection measures resulted in the permanent destruction of natural habitats. The salt marsh area has decreased considerably (see table) and there are hardly any salt-fresh water transitions left over.

Salt marsh area in 1987 and embanked salt marshes in the past 50 years (source:QSR 1993)

Salt marsh area in 1987 and embanked salt marshes in the past 50 years (source:QSR 1993)

region	**salt marsh area 1987 (km2)**	**embanked salt marshes in the past 50 years (km2)**
The Netherlands	77 (including summerpolders: 85)	22 (22%)
Niedersachsen	85 (including summerpolders: 117)	20(19%)
Schleswig-Holstein	51 (including summerpolders: 63)	107(68%)
Denmark	81	8 (9%)
TOTAL	**294** (including summerpolders:346)	**157 (35%)**

A new threat to the Wadden Sea is the possible sea level rise, which might result from

the green-hous e effect. It is expected that large areas of tidal flats and salt marshes might disappear. A subsidence of the bottom caused by the exploitation of gas may enhance this phenomenon.
Fishery of blue mussels and, in particular, cockles has caused considerable damage to the Wadden Sea ecosystem, especially the benthic communities. Many, in some parts all, natural mussel beds have been destroyed by blue mussel fishery and seed mussel fishery practices (see table).
There are indications of negative effects of shrimp fisheries as well.

Present distribution of intertidal mussel beds in the trilateral Wadden Sea:

region	**present area (km2)**	**changes**	**number of banks**	**source**
The Netherlands	0.2-0.3	95% referred to before 1988	2 (little parts, little structure)	Dankers (pers.com.)
Germany-Niedersachsen	27	30 to 50 %	137	Michaelis, 1993
Germany-Schleswig Holstein	25	stable	to follow	Ruth (1994)
Denmark	8.7	105% referred to 1988	to follow	Dahl (1994)
TOTAL	**61.0**	**-**	to follow	

The bad recovery of eel-grass from the wasting disease in the Dutch Wadden Sea is thought to have been caused, amongst others, by cockle fishery. The distribution of eel-grass in the Wadden Sea (see table) shows the very low abundance in the Dutch part.

Present distribution of eelgrass in the Wadden Sea (Reise & Buhs 1991, in: QSR 1993):

region	**present area (km2)**	**% of intertidal**	**% of total**
The Netherlands	1.0	0.1	0.4
Niedersachsen	42.8	6.5	20.7
Schleswig Holstein	131.3	15.1	63.4
Denmark	32.0	8.8	15.5
TOTAL	**207.1**	**4.8**	**100**

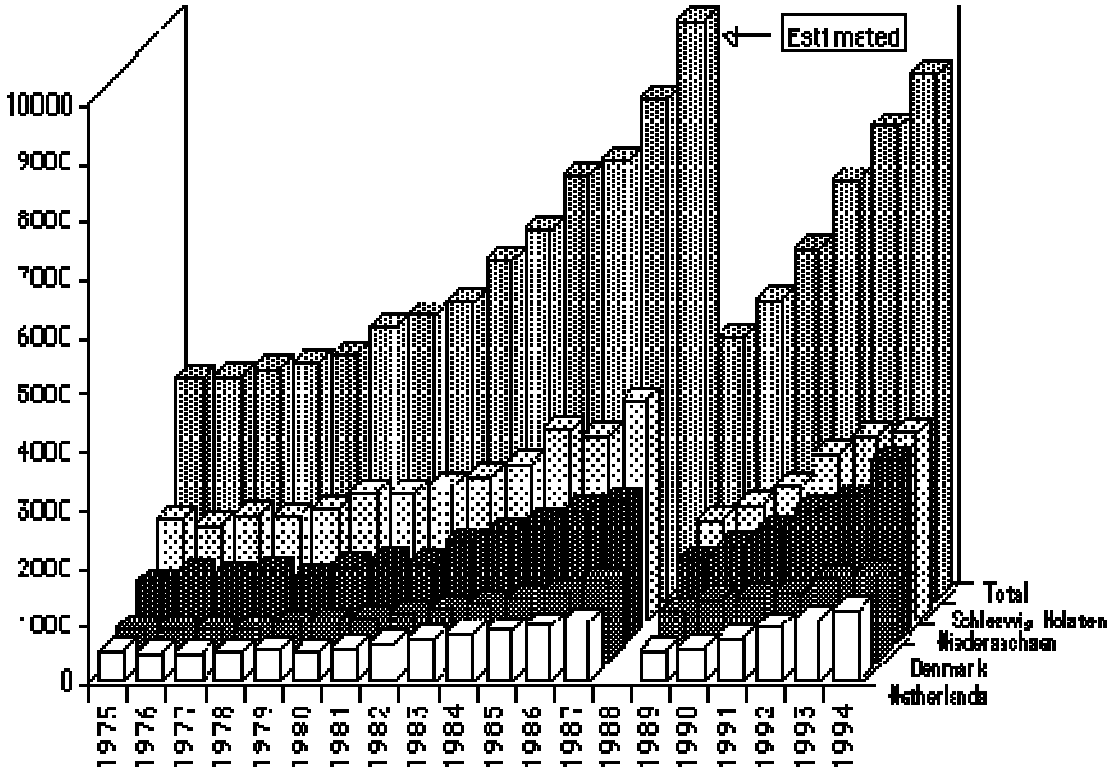
2.5 Combined effects

It is not possible to give an indication of synergistic effects of the various human activities on the ecosystem. It can be assumed, however, that the different 'stress factors' might at least be additive.
Indications of effects of a combination of stress factors come from research into fish and seal diseases.
An increase in fish disease prevalence was observed in areas with strong salt-fresh fluctuations (caused by coastal protection activities). This type of stress, combined with pollution, may increase the vulnerability for diseases.
The epidemic of the harbor seal in 1988 may have been enhanced by a decreased resistance due to the state of contamination and disturbance. The negative effect of contaminants on the seal immune system was recently demonstrated in a research project.
Decreased immunity caused by stress and pollution makes animals more vulnerable to a wide range of other threats, amongst which, human activities.

2.6 Status of some important species

2.6.1 Harbor seal

With regard to the development of the harbor seal population after the epidemic in 1988, the following conclusions can be drawn:
- the seal sup-populations in all different parts of the Wadden Sea have steadily increased since the collapse caused by the epidemic in 1988;
- the increase in numbers observed for the different sub-populations is higher after the epidemic than before (12 to 14 %, versus approx. 9 %);
- the significant differences in pup production between different sub-areas, which existed before the epidemic, are not observed anymore;



2.6.2 Waterbirds

According to the recently published report on the evaluation of numbers and distribution of 41 species of waterbirds, for the period 1980-1991 (Meltofte et al., 1994), the Wadden Sea is of outstanding importance to the well-being of a large number of waterbird populations as a moulting, fattening and wintering area. The estimated yearly total of individuals adds up to 10 to 12 million. All these species meet the Ramsar criterion, i.e. more than 1% of their respective populations use the Wadden Sea. However, in many cases more than 50%, and in some cases even the whole population, occur in the Wadden Sea.
For breeding birds and quite a number of staging waterbird populations, the islands and salt marshes, together with the adjacent polders and nearby parts of the North Sea, make up an integrated part of the Wadden Sea ecosystem.
During recent decades, considerable increases of total flyway population sizes have occurred for cormorant (*Phalacrocorax carbo*), dark-bellied brent goose (*Branta bernicla*), barnacle goose (*Branta leucopsis*), eider (*Somateria mollissima*), oystercatcher (*Haematopus ostralegus*) and avocet (*Recurvirosta avosetta*). The increases are attributed to improved protection -more sanctuaries, reduced hunting pressure- and possibly improved feeding conditions due to eutrophication.
Islandica knots, wintering in northwestern Europe, have decreased considerably.

The breeding populations of kentish plover (Charadrius alexandrinus) and little tern (Sterna albifrons) have decreased all over the Wadden Sea due to disturbance from

visitors on the beaches, where these birds breed. Considerable increases in the Wadden Sea breeding populations, over most of this century, are known for eider (*Somateria mollissima*), oystercatcher (*Haematopus ostralegus*), black-headed gull (*Larus ridibundus*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*) and herring gull (*Larus argentatus)* . These changes may be attributed to the already above mentioned improved protection and food situation.