

INFORMATION QUALITY OF TMAP A-PARAMETERS Ecotargets and TMAP Hypotheses

The annex summarizes the information quality of the different parameters, together with an indication of possible gaps and necessary further steps. It is also indicated whether the priority A-parameter provide sufficient information about the status of the ecotargets and which steps are necessary for the further development of the program in order to be able to assess the progress made in realizing the targets” (§ 67.1 Leeuwarden Declaration).

For each target (or group of targets), the following topics are indicated:

- the parameters needed for the assessment of the target
- the related TMAP parameters,
- the preliminary conclusions and
- the necessary further steps.

Furthermore, it is indicated which information the priority A-parameters provide for the assessment of the TMAP hypotheses.

This document identifies the main gaps or shortcomings arising from the exclusion of some parameters and indicates the necessary further steps to fill the gaps.

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Appendix 1: RELATION BETWEEN ECOTARGETS AND TMAP PARAMETERS

Appendix 2: TMAP HYPOTHESES AND PRIORITY PARAMETERS

The TMAG evaluated the information quality of the TMAP parameters which should be elaborated with first priority until end of 1997, the so-called A-parameter. They have been selected regarding their importance for the ecotargets and the TMAP hypotheses taking also account of the practicability (technical effort of implementation). As a result, some parameters will be implemented later because a higher implementation effort is needed (B- and C parameters).

If only the A-parameters are being implemented, the TMAG indicated the following main gaps concerning the assessment of the ecotargets and the TMAP hypotheses. For details see Appendix 1 and 2.

I. RELATION BETWEEN ECOTARGETS AND TMAP PARAMETERS

1 Targets on Habitats

1.1 Targets on salt marshes

The A-parameter are sufficient for evaluating locations and areas of salt marshes of the whole area at a larger scale (e.g. 1:10,000, every 5 years, by remote sensing techniques). A more detailed monitoring (natural morphology, dynamics, vegetation structure) requires additional B- and C-parameters, e.g. mapping of vegetation (and invertebrate fauna) at selected transects with a higher frequency (e.g. once per year).

1.2 Targets on the tidal areas

1.2.1 Targets on natural dynamics and morphology

The A-parameters will give information on the morphology of the whole area (obtained by remote sensing), whereas zoobenthos communities and fish key species will be monitored only in selected areas. Information on human impact will cover coastal protection measures, selected fishery parameters and recreational activities. Additional parameters for benthos (B- and C-parameters) will provide information on the distribution of biotopes in the whole area .

A main gap is that important parameters regarding fish communities (demersal and pelagic) and fisheries (fishing areas and periods, shrimping by-catch composition and discard) have not been included in the A-parameters yet

The TMAG also stressed that there are no biological parameters which are monitored covering the total area (except for the B-parameter location and area of biotopes" on intertidal flats, by remote sensing).

1.2.2 Targets on mussel beds, *Sabellaria* and *Zostera*

Location and area of key species can be derived from the A-parameters (e.g. for mussels and seagrass by remote sensing). To get more detailed information about the development of the *Sabellaria* reefs, additional surveys are required.

The information quality of the A-parameters covers the area and the distribution of the target species. Additionally, for *Mytilus*, the stock size can be estimated and the development of *Zostera* can be followed. The TMAP parameters (A+B) will allow the assessment of the targets on natural mussel beds, *Sabellaria* reefs and *Zostera* fields.

1.3 Targets on estuaries

The A-parameters obtain the basic information for the assessment of the targets. However, not all estuaries are covered by the proposed monitoring stations. The A-parameter geomorphology and salt marshes (every 5 years, remote sensing techniques) will give an overview about all estuaries.

Additional important parameters like shipping intensity and dredging are not included in the TMAP. The information has to be gathered by other programs.

1.4 Targets on beaches and dunes

The A-parameters were regarded to give sufficient information on the targets on beaches and dunes (every 5 years, remote sensing techniques). More detailed information concerning favorable conditions for birds has to be gathered by additional surveys (Trilateral Bird Expert Group, TWG 1/96/6.4).

1.5 Targets on the off-shore zone

The parameters of the TMAP do not cover the off-shore zone and consequently do not provide enough information to assess relevant targets especially concerning birds (food availability), common seal, grey seal and

harbor porpoise (see also 2.2). Further data is needed with regard to the zoobenthos in the subtidal areas (*Spisula*, dog whelk) and relevant human activities (fishery, sand extraction, beach nourishment).

1.6 Target on rural areas

The proposed monitoring by remote sensing techniques will provide sufficient information on rural areas and can be used to assess their relevance for flora and fauna especially for migrating and breeding birds. For selected areas, bird counts are carried out in important wetlands bordering the Wadden Sea.

2 Targets on Birds and Marine Mammals

2.1 Targets on marine mammals

(to be further elaborated: The trilateral seal expert group will be requested to assess the information quality of the A-parameter).

2.2 Targets on birds

The TMAP gives only some indication of the food supply available for birds. More detailed information on disturbances is needed for the specific area and period during the bird counts. The TMAP parameters (A-C) will allow only a very limited assessment of the targets.

Additional parameters are needed for the quantification of the target as recommended by the Trilateral Bird Expert Group (TWG 1/96/6.4). This document entails also proposals for monitoring and research.

3 Targets on the Quality of Water and Sediment

3.1 Targets on nutrients

The A-parameters give the basic information on inorganic nutrients, phytoplankton, zooplankton, macroalgae, zoobenthos. However, the important role of the microbial production and decomposition, the nutrient flux from the sediment into the water column (including benthic algae) and the organic nutrients in the system have to be taken into consideration (B- and C-parameters). This entails also sediment parameters like nutrients in pore water, organic matter and oxidized layer) which are also needed for a proper evaluation of the targets. Concerning the Black spots", a research project should be initiated with priority to implement these important parameters as soon as possible.

The ASMO ad-hoc working group on eutrophication (EUT) deals with the elaboration of general criteria for the differentiation between eutrophication problem and non-problem areas. In the framework of the necessary regional specification of such criteria, a trilateral project is envisaged.

3.2 Targets on natural micropollutants and 3.3 Targets on man-made substances

The TMAP parameters cover all relevant compartments. The A-parameter will allow an assessment of the concentrations in most important species and in the sediment. The A-parameters do not cover the concentration of micropollutants in water (except TBT) and suspended matter.

Most of the contaminant parameters are also part of the OSPAR - JAMP. The relevant JAMP guidelines (which are still under discussion) will be adapted to the TMAP. Assessment criteria like background concentrations and ecotoxicological values will be elaborated within the OSPAR / ICES.

4 Targets on Landscape and Cultural Aspects

Only limited information on landscape (e.g. salt marshes, rural areas) and socio-economic data (tourism) can be derived from the TMAP. No major contribution from the TMAP for the assessment of these targets can be expected.

II. TMAP HYPOTHESES AND PRIORITY PARAMETERS

1 Climate change

1.1 Influence of changes in climate on physical conditions, rise in sea level, and on the stability and abiotic environment of plants, animals and man.

The basic information can be derived from the A-parameters. However, information on the development of the coastline (e.g. from remote sensing) has to be included during a later phase.

2 Input of pollutants

2.1 The changes in the chemistry of soils, sediments and the water column due to the input of pollutants.

Changes in the chemical cycles in the sediment cannot be sufficiently monitored with A-parameters. Additional B-parameter will provide more information.

2.2 The response of natural processes in the ecosystem to changes in the pollutant level: Primary production, food chain fluxes, reproduction and decomposition

The A-parameters give no information for calculating the primary production of the benthic microalgae. The TMAG stated that this is a serious gap which has to be considered.

Another major gap is the fact that the decomposition parameters (also related to the black spots") could not yet be included into the A-category due to a lack of appropriate monitoring methods.

Furthermore, important species (Crangon and polychaetes: species parameters and contaminants) are not included as A-parameters so that not all parts of the food web are covered.

2.3 The response of species to changes in pollution levels

The A-parameters are not sufficient to assess the effects of inputs of pollutants on all key species. As already stated in II.2, important species (Crangon and polychaetes: species parameters and contaminants) are not included as A-parameters.

2.4 The response of community occurrence and structure to pollutant inputs

Important communities of the salt marshes (vegetation and fauna communities) and fishes (demersal and pelagic fish communities) have not been included in the A-category. Therefore, an assessment of the influence of pollutants on these communities cannot be made until the B-parameters will have been implemented.

3 Commercial fisheries

3.1 The response of species to fisheries in the Wadden Sea, and

3.2 The response of community occurrence and structure to the fisheries in the Wadden Sea

The demersal and pelagic fish communities have been regarded as parameters of the B-category. Accordingly, no assessment of the influence of fisheries on the communities can be made with the A-parameters only. To work on the Issue of Concern, reference areas for monitoring and research are needed. A representative set of tidal basins (including ebb deltas and adjacent coastal areas of the barrier islands) should be selected in which no or only little human activity is allowed.

4 Recreation

4.1 The response of species to recreational activities in the Wadden Sea

Because the general tourism parameters (socio-economic data, overnight stays, bed capacity, harbor capacity, no. of visitors) are not covered by the A-parameters, serious gaps can be detected.

5 Agricultural practice

5.1 The response of salt marsh communities to agricultural utilization

Relevant parameters like vegetation and fauna community parameters and soil parameters are not included in the A-category. The assessment will be based mainly on remote sensing methods (large spatial and temporal scales) and information on migrating and breeding birds.

III. CONCLUSIONS

It can be shown that for most of the ecotargets, the A-parameters of the TMAP give basic information which is needed for the evaluation of the targets. Some B- and C-parameters are also required, if a more detailed analysis is necessary. Additionally, for specific questions (e.g. identifying of causal relationships), specific surveys or research projects are demanded. For details see Appendix 1 of this document.

Concerning the evaluation of the TMAP hypotheses, the TMAG stated that, in principle, all parameters are necessary. However, in most cases, the A-parameters will give the basic information about the TMAP hypotheses.

When focusing only on the A-parameters, the major **gaps** which were identified are listed below:

Decomposition

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Changes in chemical cycles (chemistry of soils, sediments and water column), decomposition, microbial processes of the sediment (C-parameter), nutrients in the sediment (B-parameter)

- Necessary for the assessment of the ecotarget nutrients” and the TMAP hypotheses response of natural processes to changes in pollutant level”
- Proposal: trilateral research project on remineralization, 1997 - 1999

Benthos

Benthic microalgae: primary production (C-parameter)

- Necessary for the assessment of the ecotarget nutrients” and the TMAP hypotheses response of natural processes to changes in pollutant level”
- Proposal: elaboration of monitoring methods, expert consultations, 1998/1999

Location and area of biotopes (intertidal flats) (C-parameter)

- Necessary for the assessment of the ecotarget tidal areas” and the TMAP hypotheses response of community structure to input of pollutants”
- Proposal: trilateral project, elaboration of remote sensing methods (in combination with other parameters), 1997 - 1999 (as a basis, a trilateral concept on remote sensing in the TMAP will be elaborated by the TMAG)

Crangon (species parameters) (B-parameter)

- Necessary for the assessment of the TMAP hypotheses response of species to changes of pollutant levels”
- Proposal: harmonization of ongoing programs, expert consultations, selection of monitoring stations, after 1997

Crangon (contaminants) (C-Parameter)

- Necessary for the assessment of the ecotarget micropollutants, man-made substances” and the TMAP hypotheses response of species to changes of pollutant levels”
- Proposal: elaboration of monitoring methods, selection of monitoring stations, expert consultations, after 1997

Arenicola and Nereis (contaminants) (C-parameter)

- Necessary for the assessment of the TMAP hypotheses response of species to changes of pollutant levels”
- Proposal: elaboration of monitoring methods, selection of monitoring stations, expert consultations, after 1997

Salt marshes

vegetation communities (B-parameter)

- Necessary for the assessment of the ecotarget salt marshes” and the TMAP hypotheses response of communities to agricultural utilization and climate change”
- Proposal: elaboration of monitoring methods, selection of monitoring stations, expert consultations, after 1997

invertebrate fauna (C-parameter)

- Necessary for the assessment of the ecotarget salt marshes” and the TMAP hypotheses response of communities to agricultural utilization”
- Proposal: elaboration of monitoring methods, selection of monitoring stations, expert consultations, after 1997

Fishes

fish communities (pelagic and demersal) (C-, respectively B-parameter)

- Necessary for the assessment of the ecotarget tidal areas” and the TMAP hypotheses response of community occurrence structure to input of pollutants and fisheries”
- Proposal: harmonization of ongoing programs (demersal fishes), project for the elaboration of trilateral guidelines (pelagic fishes), after 1997

fishery (fishing areas and periods, shrimping by-catch composition and discard) (B-parameter)

- Necessary for the assessment of the ecotarget tidal areas” and the TMAP hypotheses response of community occurrence structure to the fisheries”

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- Proposal: inclusion of parameters into the A-priority parameters, expert consultations, elaboration trilateral draft guidelines, 1997

Birds

food availability, natural flight distances, moulting and roosting areas, additional parameters for breeding success

- Necessary for the assessment of the ecotarget birds, offshore zone and rural areas”
- Proposal: further elaboration of trilateral projects by the bird monitoring groups, after 1997

Mammals

viable stocks, natural reproduction capacity, including juvenile survival of common seal, grey seal; viable stocks and natural reproduction capacity of harbor porpoise (off-shore zone and other relevant habitats)

- Necessary for the assessment of the ecotargets marine mammals” and other targets on the relevant habitats
- Proposal: extension of monitoring for all above listed marine mammals

Tourism

overnight stays, bed capacity, official harbor capacity, no. of visitors, length of stay, general socioeconomic data

- Necessary for the assessment of the TMAP hypotheses “Recreational activities”
- Proposal: inventory of existing information from official statistics, project for the elaboration of standardized questionnaire (visitors) and conversions factors (overnight stays)

Estuaries

monitoring station in estuaries, human use parameters

- Necessary for the assessment of the ecotarget estuaries”
- Proposal: inclusion of additional monitoring stations, compiling of available information for human use parameters, after 1997

Off-shore zone

additional monitoring in off-shore areas (benthos, fishes, birds, mammals, human activities)

- Necessary for the assessment of the ecotargets off-shore zone”
- Proposal: spatial extension of the TMAP

RELATION BETWEEN ECOTARGETS AND TMAP PARAMETERS**Appendix 1**

For each group of targets, the relevant TMAP parameter group is listed with its priority for the implementation (A-, B- and C-parameters).

The conclusions under each chapter summarize the information quality of the TMAP parameters (of all parameters and of the A-parameters) with regard to the assessment of the ecological targets. Further steps are indicated for the development of the program in order to be able to assess the progress made in realizing the targets" (§ 67.1 Leeuwarden Declaration).

It can be shown that for most of the ecotargets, the A-parameters of the TMAP give basic information which is needed for the evaluation of the targets. Some B- and C-parameters are also required, if a more detailed analysis is necessary. Additionally, for specific questions (e.g. identifying of causal relationships), specific surveys or research projects are demanded.

1 Targets on Habitats**1.1 Targets on salt marshes**

The habitat type salt marsh includes all mainland and island salt marshes, including the pioneer zone. Also the brackish marshes in the estuaries are considered part of this habitat type.

Targets	Parameters to be monitored:	Related TMAP-parameters:
<ul style="list-style-type: none"> • an increased area of natural salt marsh; • an increased natural morphology and dynamics, including natural drainage patterns, of artificial salt marshes, under the condition that the present surface area is not reduced; • an improved natural vegetation structure, including the pioneer zone, of artificial salt marshes. • favorable conditions for migrating and breeding birds (see chapter 2.2) 	<ul style="list-style-type: none"> • area and location of all different salt marsh types in the whole cooperation area • morphology and dynamics, drainage pattern of artificial salt marshes • vegetation community of artificial salt marshes 	<p>A-Parameter:</p> <ul style="list-style-type: none"> • location and area, vegetation types • agricultural utilization • coastal protection measures (whole area, supra- and eulitoral, inventory) • geomorphology • recreational activities (human activities, aerial surveys), air traffic (landings and take offs) <p>B-Parameter:</p> <ul style="list-style-type: none"> • vegetation community parameters <p>C-Parameter:</p> <ul style="list-style-type: none"> • invertebrate fauna, community parameters

Conclusions:

The A-parameter are sufficient to evaluate locations and areas of salt marshes of the whole area at a larger scale (e.g. 1:10,000, every 5 years, by remote sensing techniques). A more detailed monitoring (natural morphology, dynamics, vegetation structure) requires additional B- and C-parameters, e.g. mapping of vegetation (and invertebrate fauna) at selected transects with a higher frequency (e.g. once per year).

Further steps:

- elaboration of common criteria for: natural salt marshes, natural morphology and dynamics, natural dynamics, natural vegetation structure
- definition of the spatial and temporal scales to be monitored
- implementation of parameter "vegetation" and "invertebrate fauna"

1.2 Targets on tidal areas

The tidal area covers all tidal flats and intertidal areas. The border to the North Sea side is determined by an artificial line between the tips of the islands. The borders to the estuaries are determined by the average 10 ‰ isohaline at high water in the winter situation. The following targets are valid:

- a natural dynamic situation in the tidal area;
- an increased area of geomorphologically and biologically undisturbed tidal flats and subtidal areas;
- an increased area of, and a more natural distribution and development of natural mussel beds, *Sabellaria* reefs and *Zostera* fields;
- (targets on birds and marine mammals see chapter 2)

1.2.1 Targets on natural dynamics and morphology

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> • a natural dynamic situation in the tidal area; • an increased area of geomorphologically and biologically undisturbed tidal flats and subtidal areas; 	<p>to be elaborated (The related parameters to be monitored for the ecotargets have to be more specified, e.g. what is meant by natural dynamic situation”).</p>	<p>A-Parameter:</p> <ul style="list-style-type: none"> • coastal protection measures • geomorphology • zoobenthos communities, intertidal • zoobenthos, subtidal (shrimping gullies) • fish key species • general fishery parameters • recreational activities, air traffic <p>B-Parameter:</p> <ul style="list-style-type: none"> • demersal and pelagic fish communities • fishing areas and periods • shrimping by-catch composition and discard <p>C-Parameter:</p> <ul style="list-style-type: none"> • location and area of biotopes, intertidal • benthos communities in tidal basins

Conclusions:

The A-parameter will give information on the morphology of the whole area (obtained by remote sensing), whereas zoobenthos communities and fish key species will be monitored only in selected areas. Information on human impact will cover coastal protection measures, selected fishery parameters and recreational activities.

Additional parameters for benthos (B- and C-parameters) will provide information on the distribution of biotopes in the whole area. A main gap is that important parameters regarding fish communities (demersal and pelagic) and fisheries (fishing areas and periods, shrimping by-catch composition and discard) have not been included in the A-parameters yet.

The TMAG also stressed that there are no biological parameters which are monitored covering the total area (except the B-parameter location and area of biotopes” on intertidal flats, by remote sensing).

Further steps:

- definition of parameters needed for the assessment of the ecotargets
- definition of common criteria for natural dynamic” and geomorphologically and biologically undisturbed areas”
- implementation of parameters regarding fish communities and fisheries

1.2.2 Targets on Mussel Beds, Sabellaria and Zostera

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> • an increased area and a more natural distribution and development of natural mussel beds, <i>Sabellaria</i> reefs and <i>Zostera</i> fields; 	<ul style="list-style-type: none"> • location and area (criteria for natural distribution” needed) • development of mussel beds, <i>Sabellaria</i> reefs and <i>Zostera</i> fields (community structure) (criteria for natural development” needed) 	<p>A-Parameter:</p> <ul style="list-style-type: none"> • location and area of mussel beds, intertidal • location of subtidal mussel beds • <i>Mytilus</i> stocks, species parameters • contaminants in <i>Mytilus</i> • <i>Sabellaria</i>: location of reefs • <i>Zostera</i>: location and coverage, biomass <p>B-Parameter:</p> <ul style="list-style-type: none"> • TBT in <i>Mytilus</i> • benthos community of mussel beds

Conclusions:

Location and area of key species can be derived from the A-parameters (e.g. for mussels and seagrass by remote sensing). To get more detailed information about the development of the *Sabellaria* reefs, additional surveys are required. The information quality of the A-parameters covers the area and the distribution of the target species. Additionally, for *Mytilus* the stock, the size can be estimated and the development of *Zostera* can be followed. The TMAP parameters (A+B) will allow the assessment of the targets on natural mussel beds, *Sabellaria* reefs and *Zostera* fields.

Further steps:

The B-parameters for *Mytilus* will give more information on the development of mussel beds. For the monitoring of the development of *Sabellaria*, more detailed surveys are needed.

1.3 Targets on estuaries

Estuaries include the estuaries of the rivers with a natural water exchange with the Wadden Sea. On the landward side, estuaries are delimited by the mean-brackish-water line. On the seaward side, the border is the average 10‰ isohaline at high water in the winter situation.

Targets	Parameters to be monitored	Related TMAP-parameters*
<ul style="list-style-type: none"> Estuaries will be protected and restored according to the conditions as agreed on in § 15 of the Leeuwarden Declaration. 	(to be specified)	A-Parameter: <ul style="list-style-type: none"> coastal protection measures geomorphology location and area of salt marshes numbers and distribution of selected breeding birds breeding success contaminants in bird eggs migratory birds recreational activities B-Parameter: <ul style="list-style-type: none"> recruitment, mortality outside the breeding season

* = other parameters to be added (dependent on the location of the monitoring areas)
e.g. salt marshes, zoobenthos communities, fish species, fishery parameters

Conclusions:

The A-parameters obtain the basic information for the assessment of the targets. However, not all estuaries are covered by the proposed monitoring stations. The A-parameter geomorphology and salt marshes (every 5 years, remote sensing) will give an overview about all estuaries. With regard to bird parameters see chapter 2.2. Additional important parameters like shipping intensity and dredging are not included in the TMAP. The information has to be gathered by other programs.

Further steps:

- monitoring parameters to be specified
- selection of additional monitoring areas covering all estuaries

1.4 Targets on beaches and dunes

Beaches and dunes include beaches, primary dunes, beach plains, primary dune valleys, secondary dunes and heathland behind the dunes.

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> increased natural dynamics of beaches, primary dunes, beach plains and primary dune valleys in connection with the offshore zone; an increased presence of a complete natural vegetation succession; favorable conditions for migrating and breeding birds (see chapter 2.2) 	<ul style="list-style-type: none"> types of dunes and beaches (to be specified: natural dynamic) vegetation succession (to be specified: natural vegetation succession) migrating and breeding birds (see chapter 1.2.3 targets on birds) 	A-Parameter: <ul style="list-style-type: none"> location and area of dunes coastal protection measures geomorphology numbers of breeding and migrating birds recreational activities <i>Zostera</i>: location and coverage, biomass

Conclusions:

The A-parameters were regarded to give sufficient information on the targets on beaches and dunes (every 5 years, remote sensing techniques). More detailed information concerning favorable conditions for birds has to be gathered by additional surveys (Trilateral Bird Expert Group, TWG 1/96/6.4), see chapter 2.2.

Further steps:

Implementation of remote sensing parameters for beaches and dunes. Further elaboration of bird parameters (see also recommendation of the Trilateral Bird Expert Group, TWG 1/96/6.4), see chapter 2.2.

1.5 Targets on the off-shore zone

The offshore zone ranges from the 3-sea-mile line to an artificial line connecting the outer tips of the islands. The border between the offshore zone and the beaches on the islands is determined by the average low-tide water mark.

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> an increased natural morphology, including the outer deltas between the islands; a favorable food availability for birds; viable stocks and a natural reproduction capacity of the common seal, grey seal and harbor porpoise. 	<ul style="list-style-type: none"> morphology (to be specified: natural morphology) food availability for birds community parameters of common seal, grey seal and harbor porpoise (further parameters to be specified) 	A-Parameter: <ul style="list-style-type: none"> geomorphology numbers and distribution of breeding and migratory birds numbers of seals

Conclusions:

The parameters of the TMAP do not cover the off-shore zone and consequently do not provide enough information to assess relevant targets especially concerning birds (food availability), common seal, grey seal and harbor porpoise. Further data is needed with regard to the zoobenthos in the subtidal areas (*Spisula*, dog whelk) and relevant human activities (fishery, sand extraction, beach nourishment). Concerning birds and marine mammals see also chapter 2.

Further steps:

Inclusion of additional parameters into the TMAP. Additional surveys and monitoring stations in the off-shore area.

1.6 Target on rural areas

The rural area includes meadows and arable land on the islands and on the mainland where there is a strong ecological relationship with the Wadden Sea.

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> favorable conditions for flora and fauna, especially migrating and breeding birds 	<ul style="list-style-type: none"> land use vegetation types migrating and breeding birds (to be specified: favorable conditions for flora and fauna) 	A-Parameter <ul style="list-style-type: none"> land use numbers and distribution of breeding and migratory birds breeding success contaminants in bird eggs B-Parameter: <ul style="list-style-type: none"> recruitment, mortality outside the breeding season C-Parameter: <ul style="list-style-type: none"> percentage of young birds of staging waterbirds

Conclusions:

The proposed monitoring by remote sensing techniques will provide sufficient information on rural areas and can be used to assess their relevance for flora and fauna especially for migrating and breeding birds (see also chapter 2.2). For selected areas, bird counts are carried out in important wetlands bordering the Wadden Sea.

Further steps:

Implementation of remote sensing techniques for monitoring or rural areas.

2 Targets on Marine Mammals and Birds

2.1 Marine Mammals

Targets	Parameters to be monitored	Related TMAP-parameters
viable stocks and a natural reproduction capacity, including juvenile survival <ul style="list-style-type: none"> • of common seal • (tidal areas, off-shore zone) • of grey seal; • (salt marshes, tidal areas, beaches and dunes, off-shore zone) • of harbor porpoise • (off-shore zone) 	<ul style="list-style-type: none"> • to be specified; the trilateral seal expert group will be requested to define the monitoring parameters of the ecotargets on seals 	A-Parameter: <ul style="list-style-type: none"> • numbers and distribution of seals (population parameters) • condition (pathology) • numbers of seals • contaminants in seals B-Parameter <ul style="list-style-type: none"> • no. of dead seals • no. of heulers

Conclusions

The parameters of the TMAP do not cover the off-shore zone and consequently do not provide enough information to assess relevant targets concerning common seal, grey seal and harbor porpoise. (to be further elaborated)

Further steps:

The trilateral seal expert group will be requested to assess the information quality of the A-parameter. The elaboration of monitoring guidelines for the seal parameters will be part of the seal management plan.

2.2 Birds

Targets	Parameters to be monitored	Related TMAP-parameters
favorable conditions for migrating and breeding birds: <ul style="list-style-type: none"> • favorable food availability (salt marshes, tidal areas, beaches and dunes, estuaries, off-shore zone, rural areas) • natural breeding success; (salt marshes, beaches and dunes, estuaries, rural areas) • sufficiently large undisturbed roosting and moulting areas; • (salt marshes, tidal areas, beaches and dunes, estuaries, off-shore zone, rural areas) • natural flight distances. • (salt marshes, tidal areas, beaches and dunes, estuaries, rural areas) 	<ul style="list-style-type: none"> • to be specified; see TWG 1/96/6.4 Quantification and evaluation of the ecotargets concerning birds” presented by the Trilateral Bird Expert Group (see Further steps”) 	A-Parameter: <ul style="list-style-type: none"> • numbers and distribution of selected breeding birds • breeding success • contaminants in bird eggs • numbers and distribution of migratory birds • Beached Bird Survey (BBS) B-Parameter: <ul style="list-style-type: none"> • recruitment, mortality outside the breeding season C-Parameter: <ul style="list-style-type: none"> • percentage of young birds of staging waterbirds

Conclusions

The TMAP gives only some indication of the food supply available for birds. More detailed information on disturbances are needed for the specific area and period during the bird counts. The TMAP parameters (A-C) will allow only a very limited assessment of the targets.

Additional, very specific parameters are needed for the quantification of the target as recommended by the Trilateral Bird Expert Group (TWG 1/96/6.4). Concerning monitoring and research, the main recommendations are listed below.

Further steps:

Implementation of A-parameters (if not already done), further elaboration of B-parameters. Additional parameters (monitoring or research) as recommended by the Trilateral Bird Expert Group in their paper on quantification of ecotargets (TWG 96/1/6.4):

food availability :	direct measurements of food availability for certain species (research program), indirect food intake parameters, identification of potential feeding areas. Some indication from monitoring of zoobenthos communities (A), mussel beds (A), fish communities (B), discard (B), fishery (A+B)
natural flight distances:	actual flight distances (applied research project), standardized measurements of flight distances (and their changes over the years) should be monitored in the TMAP, effects of air traffic (research projects). Some indication from data about coastal protection measures (A), salt marsh utilization (A), recreational activities (A)
moulting and roosting areas:	inventory of all important roosting sites, factors influencing the choice of roosting sites (research), regular evaluation of the availability of suitable roosting sites; regularly / naturally use flight routes between roosting and feeding sites; definition of a flexible protection scheme for moulting areas; continuing of seaducks and boats by aerial surveys within the TMAP
breeding success:	determination of factors for breeding success and mortality rates (long-term study), implementation of breeding success parameters into the TMAP (see recent trilateral pilot project), population monitoring of predators (small mammals) on study plots

3 Targets on the Quality of Water and Sediment

3.1. Targets on nutrients

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> a Wadden Sea which can be regarded as a eutrophication non-problem area 	<ul style="list-style-type: none"> nutrients in water and sediment (input, concentrations, fluxes) decomposition parameters phytoplankton zooplankton benthic communities (to be further specified after the definition of eutrophication criteria (trilateral project, see also OSPAR developments). 	<p>A-Parameter:</p> <ul style="list-style-type: none"> inorganic nutrients in water (incl. co-variables) phytoplankton zooplankton macroalgae zoobenthos communities <p>B-Parameter:</p> <ul style="list-style-type: none"> organic nutrients in water (incl. co-variables) nutrients in sediment nutrients-exchange with the North Sea <p>C-Parameter:</p> <ul style="list-style-type: none"> decomposition benthic microalgae

Conclusions:

The criteria for an eutrophication non-problem area will be elaborated within OSPAR. This includes assessment criteria for nutrient concentrations, primary producers (phytoplankton, macroalgae) and zoobenthos communities.

The A-parameters give the basic information on inorganic nutrients, phytoplankton, zooplankton, macroalgae, zoobenthos. However, the important role of the microbial production and decomposition, the nutrient flux from the sediment into the water column (including benthic algae) and the organic nutrients in the system have to be regarded (B- and C-parameters).

Further steps:

The ASMO ad-hoc working group on eutrophication (EUT) deals with the elaboration of general criteria for the differentiation between eutrophication problem and non-problem areas. In the framework of the necessary regional specification of such criteria, a trilateral project is envisaged. A proposal for such a project will be discussed in the September-TWG meeting.

Also, sediment parameters (nutrients, organic matter, oxidized layer) and the parameters to monitor the important microbial processes (decomposition of organic matter in water and sediment) are also needed for a proper evaluation of the targets. Concerning the Black spots", a research project should be initiated with priority to implement these important parameters as soon as possible.

3.2 Targets on natural micropollutants and 3.3 Targets on man-made substances

Targets	Parameters to be monitored	Related TMAP-parameters
Natural micropollutants: <ul style="list-style-type: none"> background concentrations in water, sediment and indicator species Man-made substances: <ul style="list-style-type: none"> concentrations as resulting from zero discharges 	<ul style="list-style-type: none"> concentrations (and trends) in water sediment and selected species (to be specified which substances and compartments, see also OSPAR - JAMP) 	A-Parameter: <ul style="list-style-type: none"> water (TBT) sediment (metals, PCB, PAH, TBT) Mytilus (metals, organochlorines, PAH) Eelpout and Flounder (metals, organochlorines, PAH) bird eggs (organochlorines, Hg) Seals (metals, organochlorines) beached bird survey B-Parameter: <ul style="list-style-type: none"> suspended matter (metals, PAH) water (lindane, triazines) Mytilus (TBT) C-Parameter: <ul style="list-style-type: none"> Nereis, Arenicola (metals) Crangon (metals)

Conclusions:

The TMAP parameters cover all relevant compartments. The A-parameter will allow an assessment of the concentrations in most important species and in the sediment. TMAP parameters do not cover concentration of natural micropollutants in water (dissolved phase) but in the suspended matter. Data from discharges and inputs in the maritime area are gathered by OSPAR. Only an estimation can be made which amount of the inputs will directly influence the Wadden Sea area.

Further steps:

Most of the relevant parameters of the TMAP are also part of the OSPAR - JAMP. The relevant JAMP guidelines (which are still under discussion) will be adapted to the TMAP. Assessment criteria like background concentrations and ecotoxicological values will be elaborated within OSPAR / ICES.

4 Targets on Landscape and Cultural Aspects

Firstly, the Wadden Sea landscape with its special natural and characteristic impressions has to be conserved or developed as far as possible. Secondly, the typical features that remind us of its cultural and historic past should be maintained:

Targets	Parameters to be monitored	Related TMAP-parameters
<ul style="list-style-type: none"> Identity: to preserve, restore and develop the elements that contribute to the character, or identity, of the landscape Variety: to maintain the full variety of cultural landscapes, typical for the Wadden Sea landscape History: to conserve the cultural-historical heritage Scenery: to pay the special attention to the environmental perception of the landscape and the cultural-historical contributions in the context of management and planning. 	(to be specified)	A-Parameter: <ul style="list-style-type: none"> salt marshes beaches and dunes geomorphology recreational activities C-Parameter: <ul style="list-style-type: none"> tourism general (socio-economics)

Related TMAP-parameters:

Only limited information on landscape (e.g. salt marshes, rural areas) and socio-economic data (tourism) can be derived from the TMAP.

Conclusions:

No major contribution from the TMAP for the assessment of these targets.

APPENDIX 2

TMAP HYPOTHESES AND PRIORITY PARAMETERS

I Climate change

Hypotheses		TMAP-parameters
<ul style="list-style-type: none"> • effects on physical and morphological boundary conditions • changes of the zonation of salt marsh vegetation. 	A	<ul style="list-style-type: none"> • coastal protection measures • geomorphology • hydrology / flooding • weather conditions • breeding birds (numbers and distribution) • salt marshes (zonation)
	C	<ul style="list-style-type: none"> • coastline
<p><u>Conclusion:</u> The basic information can be derived from the A-parameters. However, information on the development of the coastline (e.g. from remote sensing) have to be included during a later phase.</p>		

II Input of pollutants

(nutrients, heavy metals and organic micro-pollutants, and solid wastes)

II.1 The changes in the chemistry of soils, sediments and the water column due to the input of pollutants		
Hypotheses		TMAP-parameters
<ul style="list-style-type: none"> • effects on the chemistry of the soil, sediments and the water column. • changes of geochemical processes (e.g. oxidation, reduction, precipitation and chemical complex formation, resuspension and solution). 	A	<ul style="list-style-type: none"> • inorganic nutrients in water (incl. co-variables) • metals in sediment (incl. normalization variables) • TBT in water, SPM and sediment
	B	<ul style="list-style-type: none"> • sediment net sedimentation • sediment characteristics • atmospheric inputs and precipitation • organic nutrients • PCB and PAH in suspended matter and sediment • metals in suspended matter • pesticides (lindane, triazines) in water
<p><u>Conclusions:</u> Changes in the chemical cycles cannot be sufficiently monitored with A-parameters only. Additional B-parameter will provide more information. Estimation of inputs from the open North Sea has to be included (e.g. by modeling).</p>		

II.2 The response of natural processes in the ecosystem to changes in the pollutant level: Primary production, food chain fluxes, reproduction and decomposition			
Hypotheses		TMAP-parameters	
<ul style="list-style-type: none"> • effects on the natural biological processes (e.g primary and secondary production, decomposition, reproduction and recruitment of key species) • accumulation of heavy metals and organic micropollutants in the food chain may effect population levels and may be a hazardous to human life by consumption of sea food • increased nutrient concentrations may lead to increased seasonal primary production, increase of biomass and production of the herbivorous and omnivorous zooplankton, increase of biomass and production, in suspension and filter feeding species in the benthos due to enhanced growth rates and better conditions, resulting in increased reproduction and recruitment. 	A	<ul style="list-style-type: none"> • phytoplankton (species, biomass, primary production) • global radiation, UV-B • macroalgae (coverage) • zooplankton (species, biomass) • Mytilus (species parameters) • contaminants in Mytilus • Eelpout, Flounder, Plaice (species parameters) • contaminants in Eelpout and Flounder • breeding birds: numbers and distribution • breeding birds: breeding success • contaminants in bird eggs • seals (numbers and distribution) • contaminants in seals 	
	<ul style="list-style-type: none"> • decrease of biomass at the various trophic levels due to a reduction of nutrient inputs 	B	<ul style="list-style-type: none"> • salt marshes (vegetation, biomass) • Crangon (species parameters) • breeding birds: recruitment and mortality outside the breeding season
		C	<ul style="list-style-type: none"> • contaminants in phytoplankton • contaminants in zooplankton • benthic microalgae • contaminants in Crangon • contaminants in Nereis and Arenicola • decomposition processes
<p>Conclusions: The A-parameters give no information for calculating the primary production of the benthic microalgae which is a serious gap and has to be considered in future. Another major gap is the fact that the decomposition parameters (also related to the black spots”) could not yet be included into the A-category due to a lack of appropriate monitoring methods. Furthermore, important species (<i>Crangon</i> and polychaetes: species parameters and contaminants) are not included as A-parameters so that not all parts of the food web are covered.</p>			

II.3 The response of species to changes in pollution levels		
Hypotheses		TMAP-parameters
<ul style="list-style-type: none"> input of nutrients, heavy metals, and organic micro-pollutants affects growth and reproduction, recruitment and natural mortality of species, leading to changes in the abundance and distribution of species. increase of micropollutants in the water column and sediment may lead to increased concentrations of these in biological tissues at the various food web levels. A reduced condition and viability, resulting in reduced reproduction rates and recruitment levels of certain species, such as top predators which may accumulate micropollutants via the food web, are possible responses. an indicator for the quality of the system is the resettlement of species after catastrophic events mass occurrence of green algae due to an increased nutrient level (in water and sediment) and synergistic effects of an increase of the bottom fauna abundance 	A	<ul style="list-style-type: none"> macroalgae (coverage) eelgrass (coverage) zooplankton (species, biomass) Mytilus (species parameters) contaminants in Mytilus Eelpout, Flounder, Plaice (species parameters) contaminants in Eelpout and Flounder breeding birds (numbers and distribution) breeding birds: breeding success contaminants in bird eggs migratory birds (numbers and distribution) seals (number and distribution) contaminants in seals Beached (oiled) Birds Survey
	B	<ul style="list-style-type: none"> Crangon (species parameters)
	C	<ul style="list-style-type: none"> contaminants in zooplankton contaminants in Crangon contaminants in Arenicola and Nereis breeding success: recruitment, mortality outside the breeding season migratory birds: percentage of young birds of staging waterbirds
<p>Conclusions: The A-parameters are not sufficient to assess the effects of inputs of pollutants on all key species. As already stated in II.2, important species (<i>Crangon</i> and polychaetes: species parameters and contaminants) are not included as A-parameters.</p>		

II.4 The response of community occurrence and structure to pollutant inputs		
Hypotheses		TMAP-parameters
<p>Changes in the occurrence, dominance structure and distribution patterns of ecological communities are sensitive indicators of changes in the environmental conditions. The occurrence of communities is linked to the demands and vulnerability of the individual key species (e.g. phytoplankton, blue mussels, eelgrass). The structure is linked to shifts in the food web dynamics.</p>	A	<ul style="list-style-type: none"> phytoplankton (community parameters) eelgrass (coverage) macroalgae (coverage) zooplankton (community parameters) zoobenthos communities blue mussel beds (location and area, community parameters) salt marshes (location and area, vegetation types) breeding birds (numbers and distribution) migratory birds (numbers and distribution)
	B	<ul style="list-style-type: none"> fish communities salt marsh vegetation (community parameters) migratory birds (percentage of young birds of staging waterbirds)
	C	<ul style="list-style-type: none"> salt marsh invertebrate fauna zoobenthos: location and area of biotopes
<p>Conclusions: Important salt marsh communities (vegetation and fauna communities) and fishes (demersal and pelagic fish communities) were not included in the A-category. Therefore, an assessment of the influence of pollutants on these communities cannot be made until the B- respectively C-parameters have been implemented.</p>		

III Commercial fisheries

III.1 The response of species to fisheries in the Wadden Sea		
Hypotheses		TMAP-parameters
The cockle and mussel fishery on natural beds and establishment of blue mussel culture lots changes the benthic habitat and affects the occurrence and abundance of individual species and especially top predators (e.g. birds).	A	<ul style="list-style-type: none"> • general fishery parameters • Blue Mussel stocks (species parameter) • Cockles stocks (species parameter) • Crangon recruitment • fishes (key species: pathology)
	B	<ul style="list-style-type: none"> • Crangon stock size • breeding birds (recruitment, mortality outside the breeding season)
III.2 The response of community occurrence and structure to the fisheries in the Wadden Sea		
Hypotheses		TMAP-parameters
Fisheries can affect the occurrence and structure of communities. This includes indirect effects through gear activity (sediments, disturbance) as well as resource depletion (food web links).	A	<ul style="list-style-type: none"> • Blue Mussel beds (fished and unfished, intertidal and subtidal) (location and area, community parameters) • Cockle areas (exploited and unexploited beds) (community parameters) • Sabellaria reefs (location and development) • breeding birds (numbers and distribution) • migratory birds (numbers and distribution)
	B	<ul style="list-style-type: none"> • zoobenthos (subtidal, with and without shrimping) (community parameters) • fish communities (demersal and pelagic) • migratory birds (percentage of young birds of staging waterbirds)
	C	<ul style="list-style-type: none"> • zoobenthos (location and area of biotopes)
<p><u>Conclusions:</u> The demersal and pelagic fish communities were regarded as parameters of the B-category. Accordingly, no assessment of the influence of fisheries on the communities can be made with the A-parameters only.</p>		

IV Recreation

IV.1 The response of species to recreational activities in the Wadden Sea		
Hypotheses		TMAP-parameters
Recreational activities can affect the occurrence and abundance of species. This includes the population size, growth and reproduction of species. The main impact of recreational activities may be related to the presence of visitors in the Wadden Sea area and their activities.	A	<ul style="list-style-type: none"> • human activities on tidal flats, beaches, salt marshes • boats at sea, ships in marinas • air traffic (airports) • groundwater level (on islands) • breeding birds (numbers and distribution) • breeding success
	B	<ul style="list-style-type: none"> • breeding success: recruitment, mortality outside the breeding season • migratory birds (percentage of young birds of staging waterbirds) • no. of heulers and released seals
	C	<ul style="list-style-type: none"> • tourism general (socio-economic data)
<p><u>Conclusions:</u> The A-parameters give sufficient information about the recreational activities in the Wadden Sea. However, general tourism parameters (socio-economic data, overnight stays, bed capacity, harbor capacity, no. of visitors) are not covered by the A-parameters.</p>		

V Agricultural practice

V.1 The response of salt marsh communities to agricultural utilization		
Hypotheses		TMAP-parameters
<ul style="list-style-type: none"> • effects of grazing on salt marshes on the natural occurrence and structure of plant and animal communities especially natural breeding and roosting habitats of birds. • a reduction of grazing in conjunction with the restoration of tidal processes on salt marshes will lead to the re-establishment of the natural biotic communities. • natural salt marshes exposed to the tides function as natural filters of suspended solids and hence as a sink for adsorbed pollutants. 	A	<ul style="list-style-type: none"> • salt marshes (location and area, vegetation types) • no. of domestic animals (salt marshes, utilized) • flooding of salt marshes • soil parameters (e.g. sedimentation, organic matter) • land use (rural areas) • breeding birds (numbers and distribution) • migratory birds (numbers and distribution)
	B	<ul style="list-style-type: none"> • salt marsh vegetation (community parameters) • migratory birds (percentage of young birds of staging waterbirds)
	C	<ul style="list-style-type: none"> • salt marsh invertebrate fauna (community parameters) • tourism general (socio-economic data)
<p><u>Conclusions:</u> Important parameters like vegetation and fauna community parameters as well as soil parameters are not included in the A-category. Therefore the assessment will be based mainly on information from remote sensing methods (large spatial and temporal scales) and on migrating and breeding birds.</p>		

Cost Estimation and Information Quality of A-Parameter Groups

Costs: Additional yearly costs for the harmonized running program
Info quality: High or low for Ecotargets (E), Issue of Concern (IoC), general information power (InfoP)
Assessment: Scoring: low (1) or high (2)
Shaded: parameter group is **not** part of the starting package (P = postponed parameter)

	A-Parameter group	Status	Costs (yearly) in DM					Info quality			Assessment Scoring
			Running programs	NL	Nds	SH	DK	Total	E	IoC	
	1) CONTAMINANTS										
1	TBT in water	NL ongoing, DK planned in 1998, D: single surveys	-	8000	8000	8000	24,000	L	H	H	2
2	Metals in sediment	NL, D, DK	11,000	3000	3000	3000	20,000	H	H	H	2
	2) NUTRIENTS										
3	Inorganic nutrients in water	inputs:NL, D, DK transects: NL, SH selected stations: NL, D, DK	-	31,000	11,000	60,000	102,000	H	H	H	2
	4) SALT MARSHES										
4	Spatial extension (whole area)	NL, D; DK: no remote sensing	-	32,000 (incl. dunes + land use)	8000	7000	47,000	H	L	H	2
5	agricultural utilization: grazing	NL, D, DK	5000	-	-	5000	10,000	H	L	H	2
	5) BENTHOS										
	Phytobenthos:										
6	Macroalgae	D, DK NL: single surveys	25,000 (incl. eelgrass)	-	-	-	25,000	H	H	H	2
7	Eelgrass	NL, D, DK	-	11,000	-	5000	16,000	H	H	H	2
	Zoobenthos:										
8	Macrozoobenthos communities, intertidal	NL, D, DK	-	-	-	-	-				2
9	Sabellaria (reefs)	single projects	20,000	20,000	20,000	20,000	80,000	H	H	L	1 P
	Blue Mussels										
10	a. intertidal: location / area of beds	NL, D, DK: single projects / surveys	40,000	160,000 (from 2000 on)	-	13,000	213,000	H	H	H	2
	b. subtidal		-	-	-	-	-				2
11	Mytilus stocks (species parameters)	SH	100,000	60,000	-	80,000	240,000	L	H	(H)	1 P
12	- metals in mussels	NL, D, DK	5000	30,000	30,000	40,000	105,000	H	H	H	2
13	- organochlorines in mussels	NL, D, DK	2000	10,000	10,000	20,000	42,000				
14	- PAH in mussels	NL, DK	1000	10,000	10,000	5000	26,000				
	6) PLANKTON										
15	Phytoplankton	NL, D, DK	50,000 (excl. C14)	43,000 (excl. C14)	0 (excl. C14)	-	93,000	H	H	H	2
16	Zooplankton	(SH), DK	25,000	87,000	80,000	25,000	217,000	L	H	L	1 P
	7) FISH										
17	Key species (Eelpout, Flounder, Plaice)	DYFS: NL, D, DK: plaice	100,000	170,000	100,000	50,000	420,000	L	H	(H)	1 P
18	Contaminants										
	a. Eelpout	D	10,000	-	-	20,000	30,000	H	H	H	2
	b. Flounder	NL, D, (DK)	15,000	15,000	15,000	15,000	60,000	H	H	H	2
	Mussel/ Cockle/ Shrimp fishery										
19	Fishing effort per area	NL, D, DK	-	-	-	-	-				2
20	Hours of fishing	(NL, D)	?	?	?	?	?				1 P
21	Fishery statistics	NL, D, DK: official statistics	-	-	-	-	-				2
	8) DUNES										
22	Spatial extension (beaches and dunes)	NL, D	-	- (see salt marshes)	4000	15000	19,000	H	L	L	1

	Status	Costs (yearly) in DM					Info quality			Assessment Scoring	
		NL	Nds	SH	DK	Total	E	IoC	InfoP		
A-Parameter group	Running programs										
9) BIRDS											
	Breeding Birds										
23	Numbers and distribution of breeding birds	trilateral program since 1990	-	-	-	-	-				2
24	Breeding success	testing trilateral guidelines trilateral pilotphase 96/97	50,000	40,000	50,000	25,000	165,000	H	L	L	1 P
25	Contaminants in bird eggs	testing guidelines trilateral pilotphase 96/97	25,000	25,000	25,000	15,000	90,000	H	H	H	2
	Migratory Birds										
26	Numbers of waterbirds in counting units	trilateral program since 1992	-	-	-	-	-				2
27	Beached Bird Survey (BBS): a. beached birds	NL, D, DK (Bird surveys are carried out mostly by volunteers, but not harmonized. Oil analysis are not carried out)	15,000	-	-	15,000	30,000	H	H	H	2
	b. oil analysis	D: BBS project until 2002	25,000	20,000	20,000	25,000	90,000	L	L	L	1 P
	10) SEALS										
28	Population parameters by aerial survey	trilaterally coordinated program since 1989	-	-	-	-	-				2
29	Population parameters: Immunological status	irregular sampling	?	?	?	?	Financial implication cannot be given at the moment	L	L	L	1 P
30	Pollutants in tissue: Toxicological status	irregular sampling	?	?	?	?		H	H	H	2
	11) RECREATIONAL ACTIVITIES										
31	Boats at sea (boats, selected areas)	(NL), D, DK	32,000	-	12,000	-	44,000	H	H	(H)	2
32	Human activities	-	32,000	30,000	32,000	25,000	119,000	H	H	H	2
33	No. of guided tours	NL, SH, DK	-	5000	-	5000	10,000	L	L	L	2
34	Air traffics	NL, D, DK	1000	-	-	4000	5,000	H	L	L	1
	12) GENERAL PARAMETERS										
35	Coastal protection measures	(NL, D, DK)	-	5000	-	4000	9,000	H	H	H	2
36	Geomorphology	single surveys	-	10,000	-	4000	14,000	H	H	H	2
37	Flooding	(NL, D, DK)	-	5000	-	4000	9,000	L	H	H	2
38	Groundwater level (islands)	NL, Nds.	5000	5000	15,000	15,000	40,000	H	L	L	1 P
39	Land use	single surveys	5000	- see salt-marshes	15,000	15,000	35,000	H	H	H	2
40	Weather conditions	NL, D, DK	5000	-	-	50,000	55,000	L	H	H	2
41	Hydrology	NL, D, DK	-	-	-	25,000	25,000	H	H	H	2
	TOTAL		604,000	835,000	468,000	622,000	2,529,000				