



**Wadden Sea Forum**

**11<sup>th</sup> Meeting**

**Wilhelmshaven, 26-27 November 2007**

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**Agenda Item:** 8  
**Subject:** Sustainability indicators  
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Attached is the report by the consultant COWI on the work carried out for the preparation of sustainability indicators for the Wadden Sea Region.  
The product developed by COWI, i.e. an excel tool, is attached as separate file (COWI\_WSF\_sustainable-indicator-tool1.xls). The manual how to use the tool is in document WSF11-8-2.

**PROPOSAL:** The meeting is invited to take note of the information

Wadden Sea Forum

Development of Wadden Sea Region-specific Indicators

Reporting on the outcome of the COWI study

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## Table of Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Deliverables</b>	<b>1</b>
<b>3</b>	<b>Status for development of Wadden Sea region-specific indicators</b>	<b>3</b>
<b>4</b>	<b>Advice on target groups and recommendations for future developments</b>	<b>10</b>

### **1 Introduction**

ToR, COWI proposal and meetings with WSF

COWI has on the basis the Terms of Reference - provided by the Wadden Sea Forum Secretariat 14 February 2007 - and COWI's proposal submitted 5 March 2007, developed a set of Wadden Sea region-specific indicators that has been incorporated into an indicator tool programmed in Excel.

The outcome of the study has also been steered by comments provided by WSF participants - in writing and during three meetings: 24 April in Hamburg, 29-30 May in Groningen, and 26 September in Bremen.

Purpose of reporting

The purpose of this reporting is threefold. Firstly, it introduces in Section 2 the study deliverables of which the indicator tool with accompanying manual is the main one. Secondly, it presents in Section 3 the status for the development of the Wadden Sea region-specific indicators - i.e. the indicators included in the first version of the tool provided by COWI. Thirdly, it contains advice on reaching the target groups of the sustainable development information, and a few recommendations for future developments of the indicator tool.

### **2 Deliverables**

Indicator tool and manual

The main deliverable from the study is an electronic indicator tool programmed in Excel comprising a three-level system of sustainability indicators. It is important here to underline that the outset for the development the system was the WSF objectives presented in "breaking the ice". However, it has since shown not to be appropriate to conform completely to the structure of these objectives. This is partly because not all objectives can satisfactory be monitored, and partly because the WSF expressed a need for a better balance between the three dimensions of sustainability: social, economic and ecological:

[COWI\\_WSF\\_sustainable-indicator-tool.xls](#)

Although the tool is programmed with the purpose of being self-documenting, it is accompanied by a concise manual:

[COWI\\_WSF\\_Manual.DOC](#)

#### Other notes

In addition three notes and a hand-out have been produced during the study:

The first note comprised an input to the WG ICZM 3<sup>rd</sup> meeting in Hamburg 24 April 2007 where COWI presented:

[COWI\\_WSF\\_Note-1.DOC](#)

- Interpretations of the formulations of the 25 WSF objectives presented in "breaking the ice" - interpretations that are necessary for specifying the Level 2 measurements and Level 3 indicators in the indicator system.
- The three aspects of sustainability in a Wadden Sea context in pursuance of the sustainability model which best illustrates the Wadden Sea situation.
- How to aggregate from Level 3 indicators to Level 2 measurements.

The second note comprised also an input to the WG ICZM 3<sup>rd</sup> meeting and comprised a review of existing sustainable development indicator systems:

[COWI\\_WSF\\_Note-2.DOC](#)

The review covers the European-wide approaches of EUROSTAT and the European Environmental Agency (EEA), indicators used within the three Wadden Sea countries - i.e. Denmark, Germany, and the Netherlands, as well as the good experiences with sustainability indicators found in the UK and in Sweden.

The purpose of carrying out the review was to ensure that the WSF indicator system build on national and international experiences - hereunder that these might inspire the design and content of the WSF system.

The third note contains the final interpretations of the WSF objectives elaborated on the basis of the received comments to the 1<sup>st</sup> and 2<sup>nd</sup> draft interpretations:

[COWI\\_WSF\\_Note-3.DOC](#)

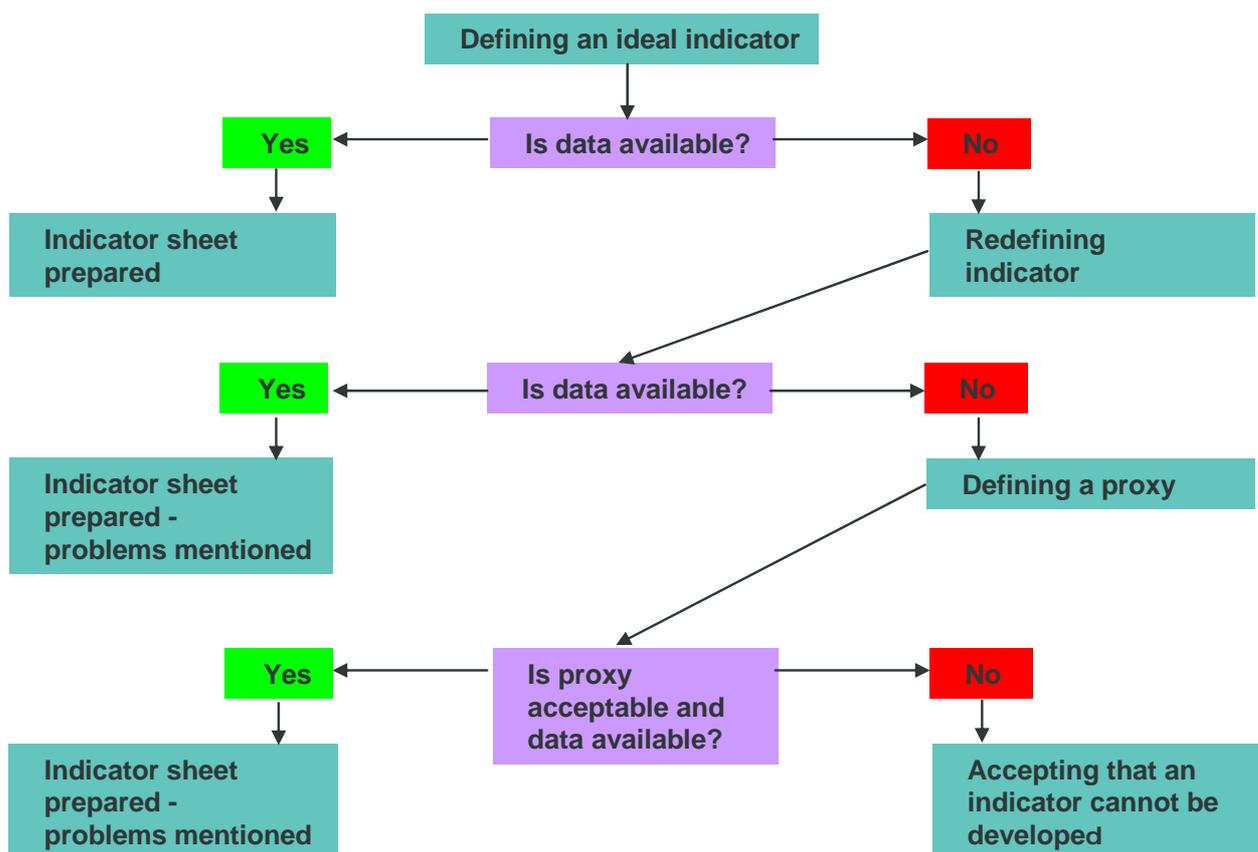
Finally, a hand-out presenting the study was made for the tenth meeting of the Wadden Sea Forum, 29-30 May 2007 in Groningen:

[COWI\\_WSF\\_Hand-out\\_Groningen.DOC](#)

### 3 Status for development of Wadden Sea region-specific indicators

Process of defining and developing indicators

The below figure illustrates via a decision tree how the process of defining and developing the different indicators in practice has taken place.



The figure shows that there in practice are four possible end-situations:

First, if data are available for an ideal indicator - i.e. the indicator which directly can be derived from the formulation of a given sustainability objective - it is included into the indicator tool.

*Example:* The objective (1) of a balanced population structure means, for example, that the age composition in the Wadden Sea region is similar to the national average. This can directly be measured via the indicator 1.1 *Relative share of young persons (15-24 years)* - for which data are directly available.

Second, if the ideal indicator cannot be measured, a slightly refined indicator might be possible to calculate - i.e. an indicator which is in line with the objective formulation but cannot directly be derived from it.

*Example:* The WSF education objective (4) of keeping the younger generation is for example addressed by trying to monitor the *2.1 Relative share of young persons (15-29 years) with vocational education*. However, data for calculating this indicator for the Wadden Sea area is only available for the Danish part, it for the German part is based on data for the number of students in vocational education institutions is used. And, the Dutch data are too insufficient to be included - as yet. Hence, the Wadden Sea area is represented by the Danish and German parts only.

Third, if a redefined indicator cannot be measured either, we are on the outlook for a proxy indicator - i.e. an indicator which is relevant for the given issue, but cannot be derived directly from the objective formulation.

Fourth, a even a proxy indicator might not be acceptable or might suffer from a lack of data - and so we must accept that an indicator cannot be developed.

Included indicators  
in electronic tool

The below table provides an account of the Level 3 indicators included in the first version of the electronic tool - organised according to the Level 2 measurements they address. Hence, the users of the tool will not be bewildered by any empty indicator sheet.

Each indicator in the table is presented via its number and title, definition and the rationale for addressing the indicator. For indicators included in the first version of the tool, the descriptions correspond to the description provided within the tool.

LEVEL 2		LEVEL 3	
ISSUE	No and title	Definition	Rationale
<b>SOCIAL</b>			
1. Demography	1.1 Relative share of young persons (15-24 years)	Share of 15-24 years olds in the total population in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively - January 1st.	Provides - together with "3.2: Relative share of old persons (65+ years)" - a measure for assessing the target of a balanced age structure of the population in the Wadden Sea region.
	1.2 Relative share of old persons (65+ years)	Share of 65+ years olds in the total population in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively - January 1st.	Provides - together with "3.1: Relative share of young persons (15-24 years)" - a measure for assessing the target of a balanced age structure of the population in the Wadden Sea region.
	1.3 Relative population growth	Population growth in a Wadden Sea geographical area compared with the relevant national average growth rate - i.e. Danish, German and Dutch national figures, respectively - January 1st to January 1st.	Measure for assessing the target of a balanced population structure in the Wadden Sea region - i.e. that regional population growth is similar to the national population growth.
	1.4 Population growth	Population growth in a Wadden Sea geographical area - January 1st to January 1st.	Measure for assessing the target of a balanced population structure in the Wadden Sea region - i.e. that regional population growth is positive.
2. Education, research & development	2.1 Relative share of young persons (15-24 years) with vocational education	Share of 15-24 years olds with vocational education as the highest education level in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	Measure for assessing the target of keeping younger, educated persons in the Wadden Sea region.
	2.2 Relative share of young persons (15-24 years) with higher education	Share of 15-24 years olds with higher education in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	Measure for assessing the target of keeping younger, educated persons in the Wadden Sea region.
	2.3 Growth in number of persons (15-24 years) with vocational or higher education	Annual growth in the number of young persons having a vocational or higher education.	Measure for assessing the target of keeping younger, educated persons in the Wadden Sea region.
3. Employment	3.1 Relative employment growth	Annual employment growth compared with the national average - i.e. Danish, German and Dutch national figures respectively.	Indicates whether employment development out-performs, under-performs or follows the national situations.
	3.2 Employment growth	Annual employment growth.	Indicates whether employment develops in a positive or negative direction.
	3.3 Relative share of high-quality jobs	Share of employees with higher education in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	Measure for assessing the extent of high-quality jobs in both traditional and in growing, innovative branches in the Wadden Sea region.

LEVEL 2	LEVEL 3		
ISSUE	No and title	Definition	Rationale
4. Health (physical + mental)	4.1 Relative admissions to hospitals	Admissions to hospitals per capita in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	The higher the number of admissions to hospitals per capita the weaker the health situation. Note: that the supply of health services is covered by indicator 12.2 "Relative number of hospital beds".
	4.2 Growth in admissions to hospitals	Annual change in admissions to hospitals per capita in the Wadden Sea region.	A growth in the number of admissions to hospitals implies a weakening in the health situation. Note: that the supply of health services is covered by indicator 12.2 "Relative number of hospital beds".
5. Housing	5.1 Relative residential properties being owned by resident	Share of residential properties in a Wadden Sea geographical area being owned by the resident - compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	A high share of residential property owners is considered positive due to the presence of a stable housing situation that is being cared for by the resident.
	5.2 Relative growth in house prices	Growth in house prices in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	Measures the change in the attractiveness of moving to the Wadden Sea region in the sense of the price developments of the available houses - i.e. lower prices developments are in this context a positive situation. (However, lower price developments mean relatively lower welfare increases - but this is another objective).
	5.3 Growth in house prices	Annual growth in house prices in the Wadden Sea region.	Rising house prices make it difficult for new (young) households to enter to the house owners market in the Wadden Sea region - and might thus be a barrier for moving to the region.
6. Local engagement	6.1 Relative turn-out at local elections	Share of voters actually voting at local elections in a Wadden Sea geographical area compared with the relevant national averages - i.e. Danish, German and Dutch national figures, respectively.	Voter turn-out at local/regional elections is an indication for local engagement.
7. Recreation / attractions for citizens	7.1 Relative share of land being recreation or natural resorts	Share of land area being designated for recreational purposed or being categorised as march, moor, hatch and water area (but excluding forests) - compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	Measure of access to semi-natural and natural habitat.

LEVEL 2	LEVEL 3		
ISSUE	No and title	Definition	Rationale
8. Welfare	8.1 Relative Gross Domestic Product per capita	Gross Domestic Product (GDP) per capita in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	GDP reflects the total value added of all goods and services produced less the value of goods and services used for intermediate consumption in their production. It is a commonly accepted indicator for economic development and therefore relevant to measure welfare in the WS area and compare it with the national welfare levels.
	8.2 Relative share of households on low income	Share of persons in WS area receiving cash benefits compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	The relative share of persons on cash benefits is a good indication of the share of low income households in the WS area - in the light of only scarce regional income distribution data.
	8.3 Growth in share of households on low income	Annual change in the share of persons in WS area receiving cash benefits.	The growth in the share of persons on cash benefits is a good indication of the development of low income households in the WS area - in the light of only scarce regional income distribution data.
<b>ECONOMIC</b>			
9. Economic resilience	9.1 Relative value added growth	Growth in value added in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	An indicator for the progress of economic activities of the Wadden Sea region.
	9.2 Relative share of R&D expenditure	Share of R&D expenditure out of GDP in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	An indicator for innovative activities in the Wadden Sea region.
10. Harbour	10.1 Level of specialisation - goods vs passengers	Difference in the share of a Wadden Sea harbour's goods transport and passenger transport.	An increase in the difference in the shares of goods transport and passenger transport is an indication of increased specialisation - and thus cooperation - of Wadden Sea harbours.
	10.2 Level of specialisation - within goods transport	Difference in the share of a Wadden Sea harbour's bulk goods transport and transport and container/Ro-Ro goods transport.	An increase in the difference in the shares of the different types of goods transport is an indication of increased specialisation - and thus cooperation - of Wadden Sea harbours.
11. Infrastructure	11.1 Relative length of motorway network	Length of motorway network per ha in a Wadden Sea geographical area compared with the relevant national average share - i.e. Danish, German and Dutch national figures, respectively.	An indicator for accessibility for production and transport.

LEVEL 2	LEVEL 3		
ISSUE	No and title	Definition	Rationale
12. Rural development	12.1 Net-inmigration of people	Net in-migration (people settling - people leaving) as a share of population.	Measure of people finding the Wadden Sea region attractive.
	12.2 Settlements of businesses	Ratio of new enterprises to terminated enterprises the WS area.	Measure of businesses finding the Wadden Sea region attractive.
	12.3 Diversification of income-generating activities	Shannon index for employment by branch.	The higher value of the shannon diversity index, the more diverse the income-generating activities.
13. Sea traffic	13.1 Growth in passenger transport	Annual change in the number of passengers leaving or arriving at main ports in the Wadden Sea region.	Indicator for the efficiency of sea traffic.
	13.2 Growth in goods transport	Annual change in the amount of incoming and outgoing goods at main ports in the Wadden Sea region.	Indicator for the efficiency of sea traffic.
14. Tourism	14.1 Growth in number of nights spent in hotels and similar establishments	Annual change in the number of night spent.	Measure of the development of the tourism sector in the Wadden Sea region.
<b>ECOLOGIC</b>			
15. Breeding birds in Wadden Sea	15.1 Number and reproductive success of breeding birds	Number of breeding pairs and their reproductive success (eggs hatched/young fledged) of selected bird species (max. 5 species) representing Wadden Sea biotopes.	Number of breeding birds and the long-term trends in their population levels are excellent and well-known indicators on the health of the Wadden Sea ecosystems and biotopes. Breeding birds are sensitive to habitat alterations and selective in their breeding habitat choice.
16. Migratory birds in Wadden Sea	16.1 Number of staging water birds	Total numbers of selected migratory birds (max. 10 species) which pass through the Wadden Sea or spend the winter in the Wadden Sea, and which utilise various Wadden Sea feeding habitats.	Number of staging birds and the long-term trends in their population levels are excellent and well-known indicators on the health of the Wadden Sea ecosystems and biotopes. Staging waterbirds feed on other resources than the breeding birds - and in far greater numbers, yielding a better picture of the Wadden Sea productivity also in areas not favoured by breeding birds.
17. Mammals in Wadden Sea	17.1 Populations of marine mammals	Number of harbour seals counted by annual seal WS seal counts.	Feeding mainly on fish in and near the Wadden Sea the seals and porpoise yield good indications of the ecological health of the marine environment in and off the Wadden Sea. In addition the mammals have an internationally important occurrence in the Wadden Sea and constitute significant conservation values as well as tourism attractions.
18. Meadow birds in Wadden Sea region	18.1 Number of meadow birds	Number of breeding pairs and their reproductive success (eggs hatched/young fledged) of selected bird species (max. 5 species) representing Wadden Sea biotopes.	Number of meadow birds and the long-term trends in their population levels are excellent and well-known indicators on the health of the Wadden Sea ecosystems and biotopes.

LEVEL 2	LEVEL 3		
ISSUE	No and title	Definition	Rationale
19. Water quality Wadden Sea	19.1 Metal loads in sediments	Amount of metal compounds in the sediments in tidal areas near human settlements and outlets of streams.	Metal loads in the sediments make up a constant source of pollution in the marine environment. Metal compounds are discharged from sewage and are persistent in the marine environment. An indication of their presence and distribution can provide a picture the sources (types, location, magnitude etc) and the efforts to control the discharge from the sources.
	19.2 Metal loads in sediments	Amount of metal compounds in the sediments in tidal areas near human settlements and outlets of streams.	Metal loads in the sediments make up a constant source of pollution in the marine environment. Metal compounds are discharged from sewage and are persistent in the marine environment. An indication of their presence and distribution can provide a picture the sources (types, location, magnitude etc) and the efforts to control the discharge from the sources.
	19.3 Occurrence of eelgrass	Coverage of eelgrass vegetation.	Eelgrass plays a significant role in the Wadden Sea ecosystem as a place for fish spawning, invertebrate reproduction, as well as for sediment deposition and substrate stabilization. Eelgrass serves as an important food for the waterfowl brent goose and wigeon.
	19.4 Observed oil spills	Estimated volume of confirmed/observes of oil spills observed by aerial surveillance.	Indicator for the negative effects of ship transport/accidents on coastal environment.
20. Contaminants in bird egg	20.1 Contaminants in bird eggs	Amount and types of environmentally hazardous compounds aggregated in the shells of selected bird species' eggs.	Persistent and environmentally hazardous substances may appear in nature in very low amounts yet still be found in high concentrations in the shells of birds' eggs. Trends in the types and amounts found in egg shells may yield a good picture of the effects of combating hazardous substances at the sources.
21. Air quality	21.1 Air quality indicator	"Air quality indicator" (to be developed).	Central ecological measure.

#### 4 Advice on target groups and recommendations for future developments

##### Target groups

The indicator set is the first step for the WSF in being able to communicate its messages to various target groups, of which we see the following as the key target groups:

- Target group 1 - the Wadden Sea Forum. It is highly relevant that the annual forum meetings are used for discussions on developments, as the indicator set exactly monitors to what degree the WSF objectives are being met. Recommendation:
  - To produce a note to the Forum members before the annual meeting showing the main developments since last years annual meeting and probably also providing recommendations as to follow-up actions.
- Target group 2 - politicians and decision-makers in the Wadden Sea area regions and municipalities. The ongoing sustainability monitoring is a good tool for the WSF to attract interest and prestige to its work, and it is therefore important that the main decision-makers in the region Wadden Sea area come to know about the sustainability development trends. Recommendation:
  - Every year the WSF Secretariat jointly with relevant committees produces a brief 'Sustainability Update' which is submitted to majors, politicians and senior officials. This could include an invitation from the WSF Secretariat to present the sustainability developments in more detail - which in turn would improve the profile of the WSF.
- Target group 3 - the general public. Development trends are highly interesting focus areas for local and regional media, and it is therefore important to use the annual updating of the sustainability indicators as an opportunity to profile the Wadden Sea Forum. Recommendation:
  - Following the annual updating, press releases should be prepared (incl. brief explanatory notes, references to the indicator set, possibility to interview WSF spokesmen, etc.).
  - Prior to press releases the WSF-homepage should be updated with perspectives, news/stories and comments on the 'new' sustainability temperature of the region.

##### Recommendations for future developments

The following is recommended regarding future developments of the tool:

- To develop data enabling the use of even more indicators - in particular the indicators based upon the TMAP data framework. In this context, a data extraction module should be developed to allow easy an easy extraction for this specific purpose.
- To consider developing the tool into an even more user-friendly variant, suitable for web-side presentation - including GIS features.