Wadden Sea tidal basin inventory and analysis- a pre-study
Preliminary results

dedicated for the PRW
"Programme towards a Rich Wadden sea"

D. Kraft, E. Folmer, T. Stiehl, J. Meyerdirks et al. 2010
Supervision:
Justus van Beusekom (AWI Sylt), Norbert Dankers (Imares), Morten Pejrup (Univ Copenhagen)

backing by Bruno Ens, Katja Philippart, Albert Oost

Objectives

- Comparison of tidal basins with regard to differences in
  - abiotic features,
  - ecological developments and
  - applied policy and management,

  with the aim of better understanding cause-effect relationships between them.
- A database and digital atlas shall contain
  - the most important physical and biological parameters,
  - human interference and applied management,

  as a reference for research and policy.

goals of the pre-study

- To get a idea of:
  - Which tidal basin are there?
  - What are their characteristics?
  - What cause-effect relationships dominate?
  - What are the research & policy questions?
  - Where are they located?
  - What data do we need to answer this questions?
  - What data are existing? How accessible are they?
- Asking experts!

tidal basins

1 Graadyb
2 Knude Dyb
3 Jyvre Dyb
4 Lister Tief
5 Hörnum Tief
6 Norderaue
7 Süderaue
8 Hoogeloch
9 Rummeloch West
10 Norderhever-Heverstrom
11 Tümlauer Bucht
12 Eidermündung
13 Wesselburener Loch
14 Piep/Meldorfer Bucht
15 Flackstrom
16 Neufahrwasser
17 Schatzkammer
18 Elbe
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34 Zoutkamperlaag
35 Pinkegat
36 Amelander Zeegat
37 Vlie
38 Eierlandse Gat
39 Marsdiep

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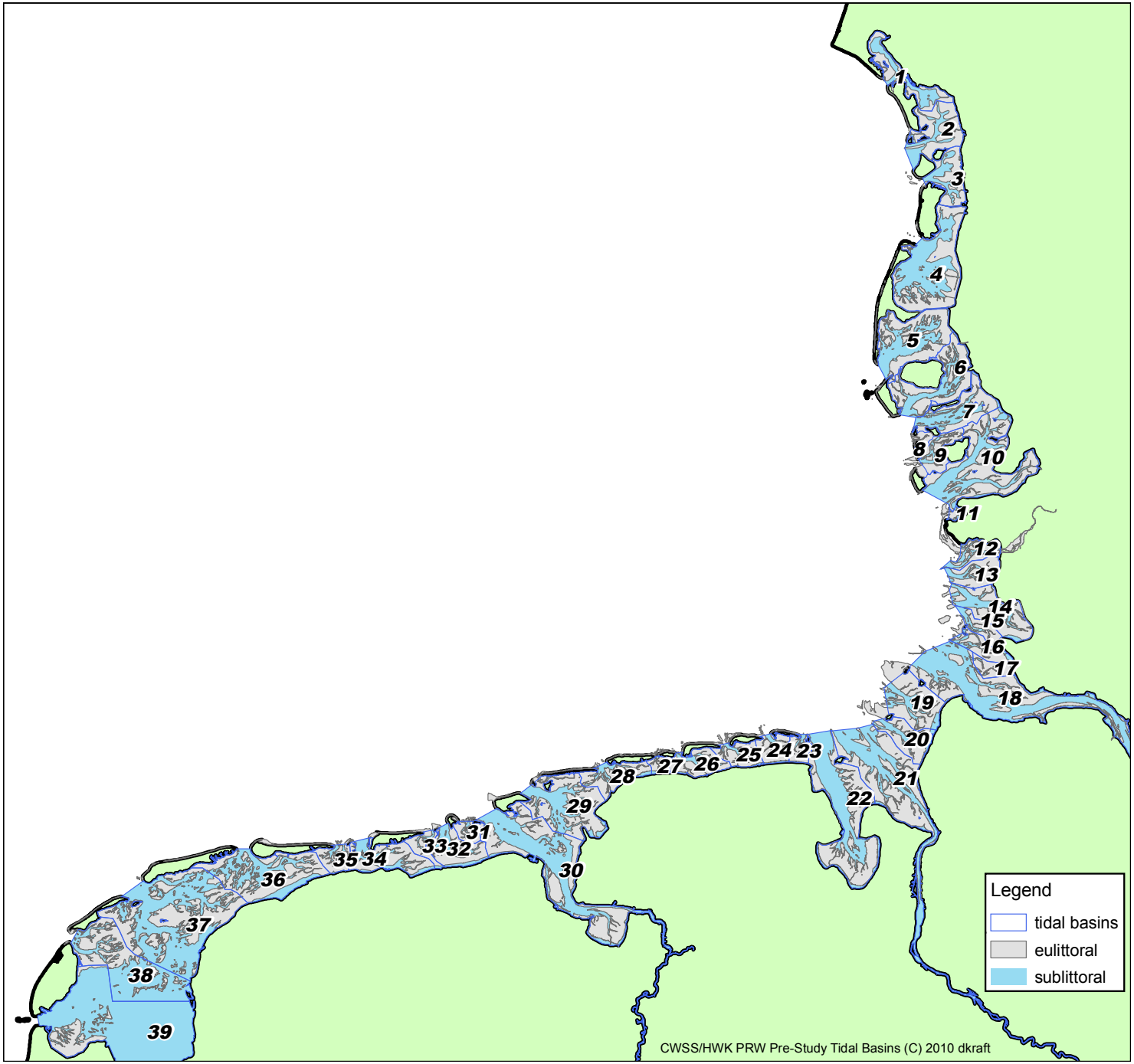

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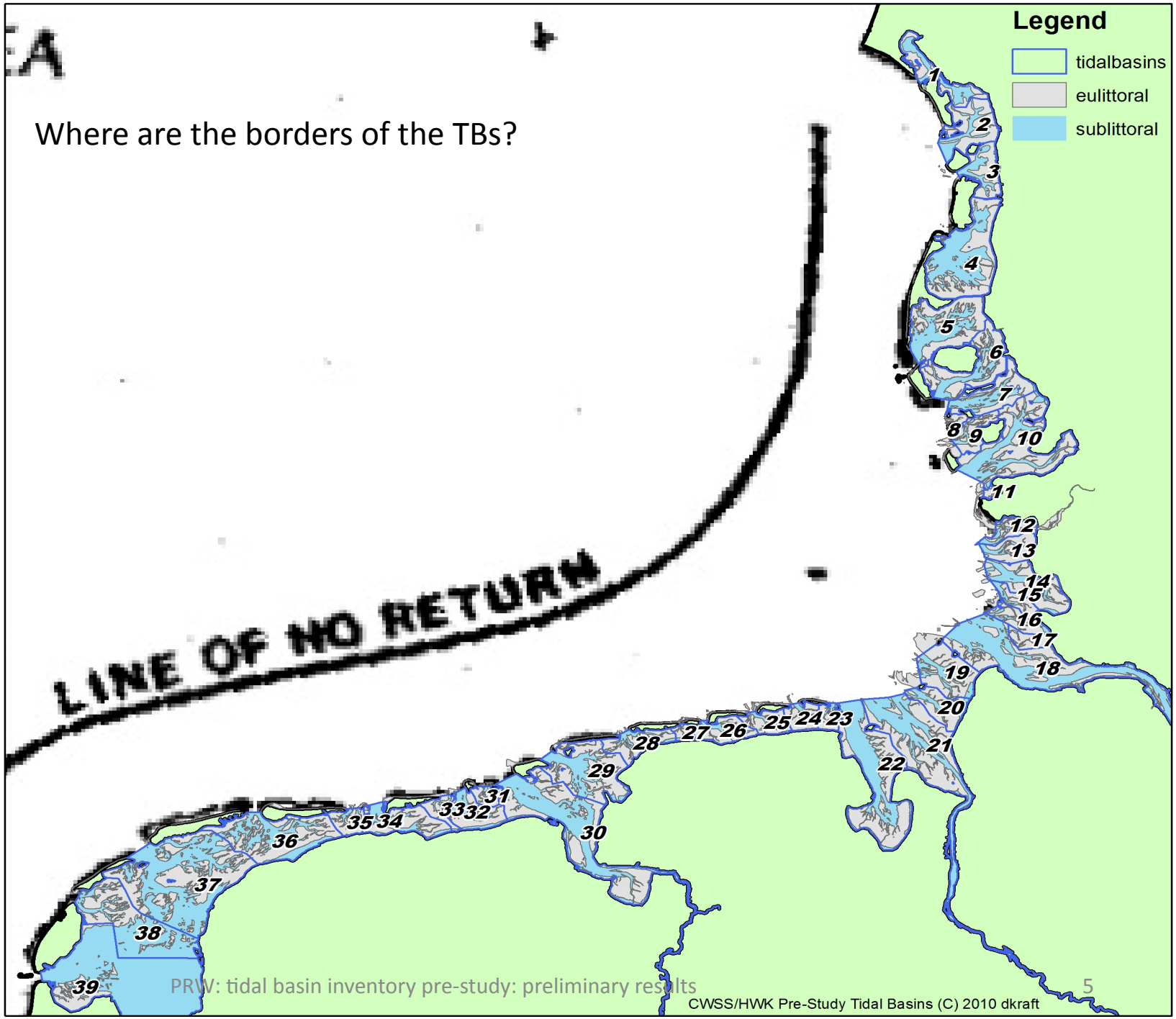
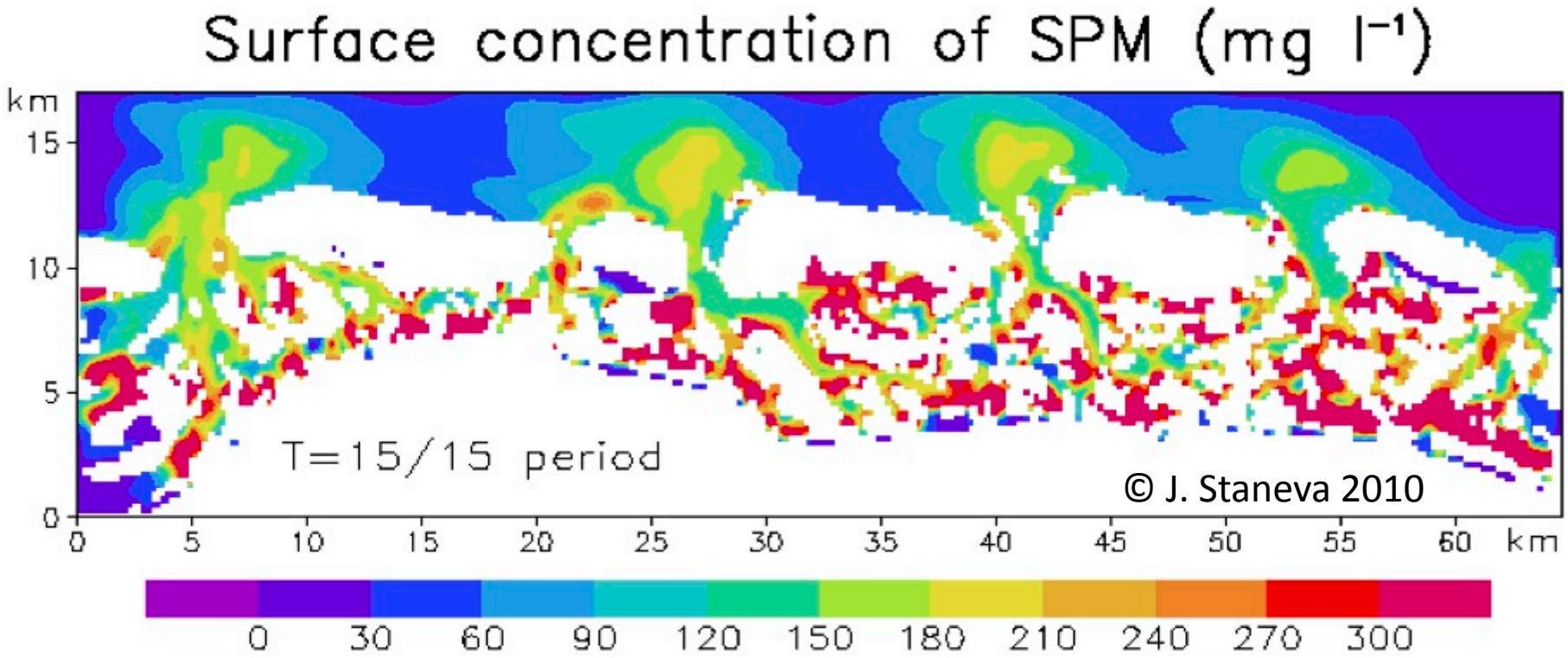


Where are borders of the TBs?



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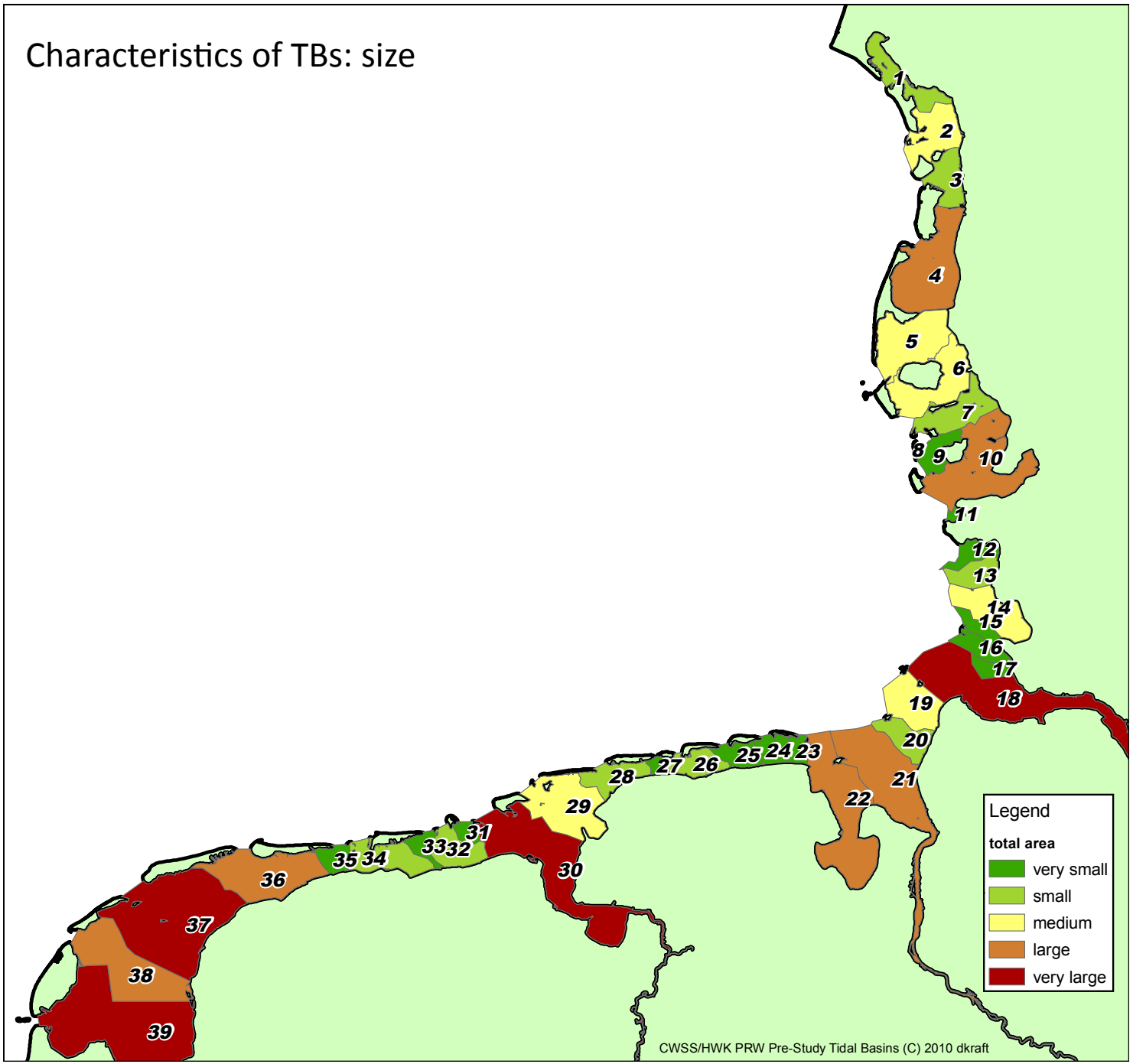

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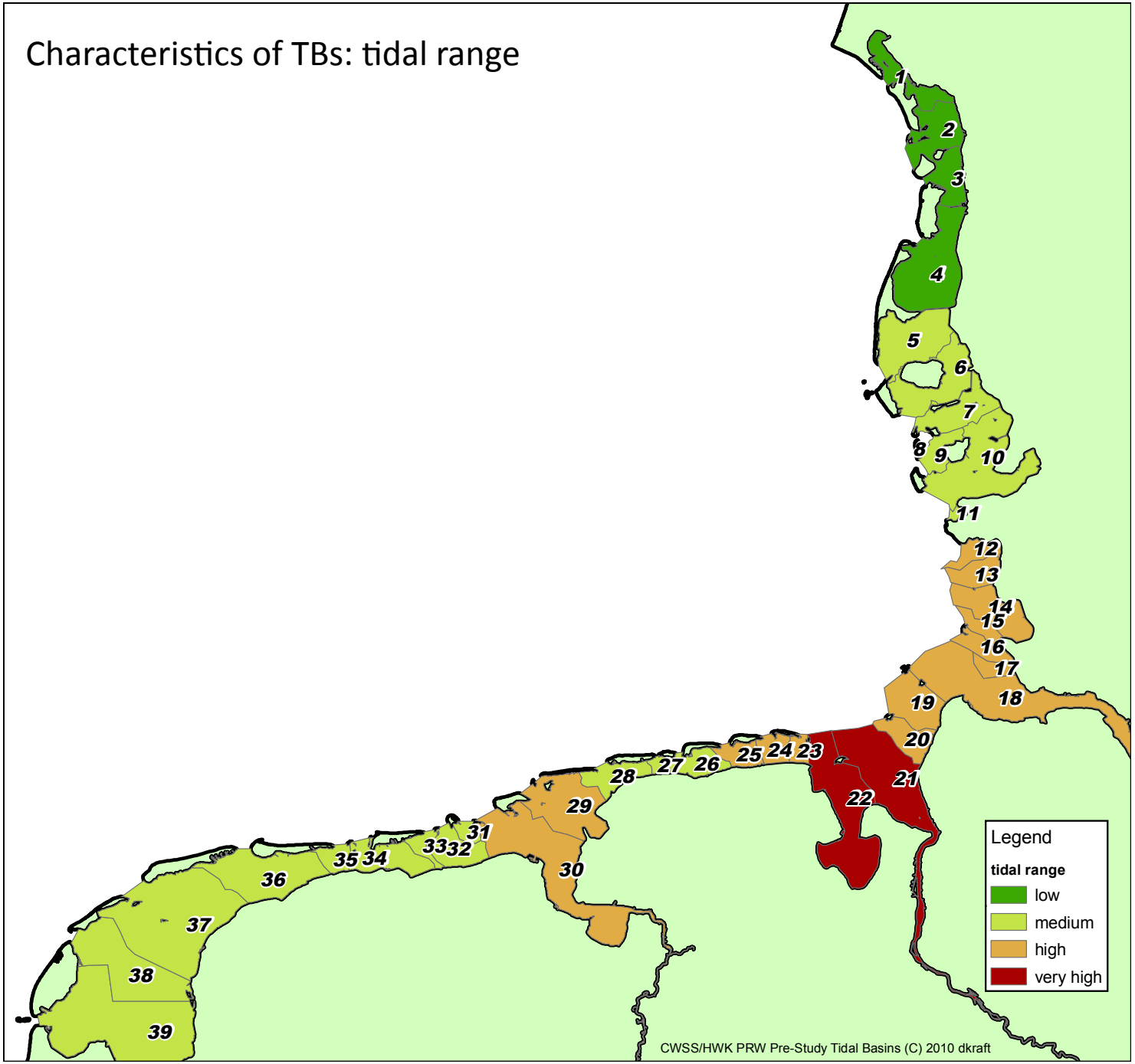

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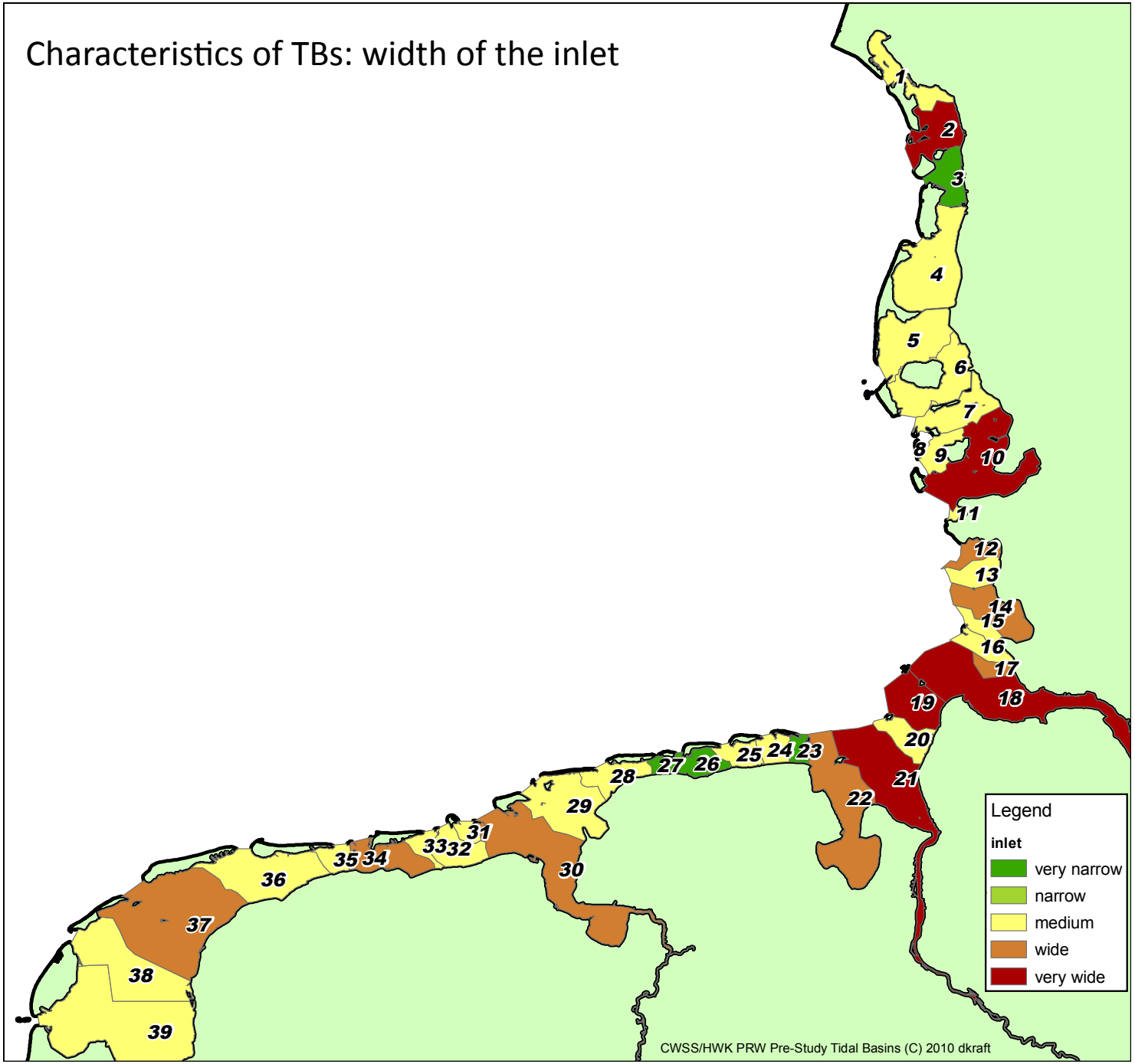

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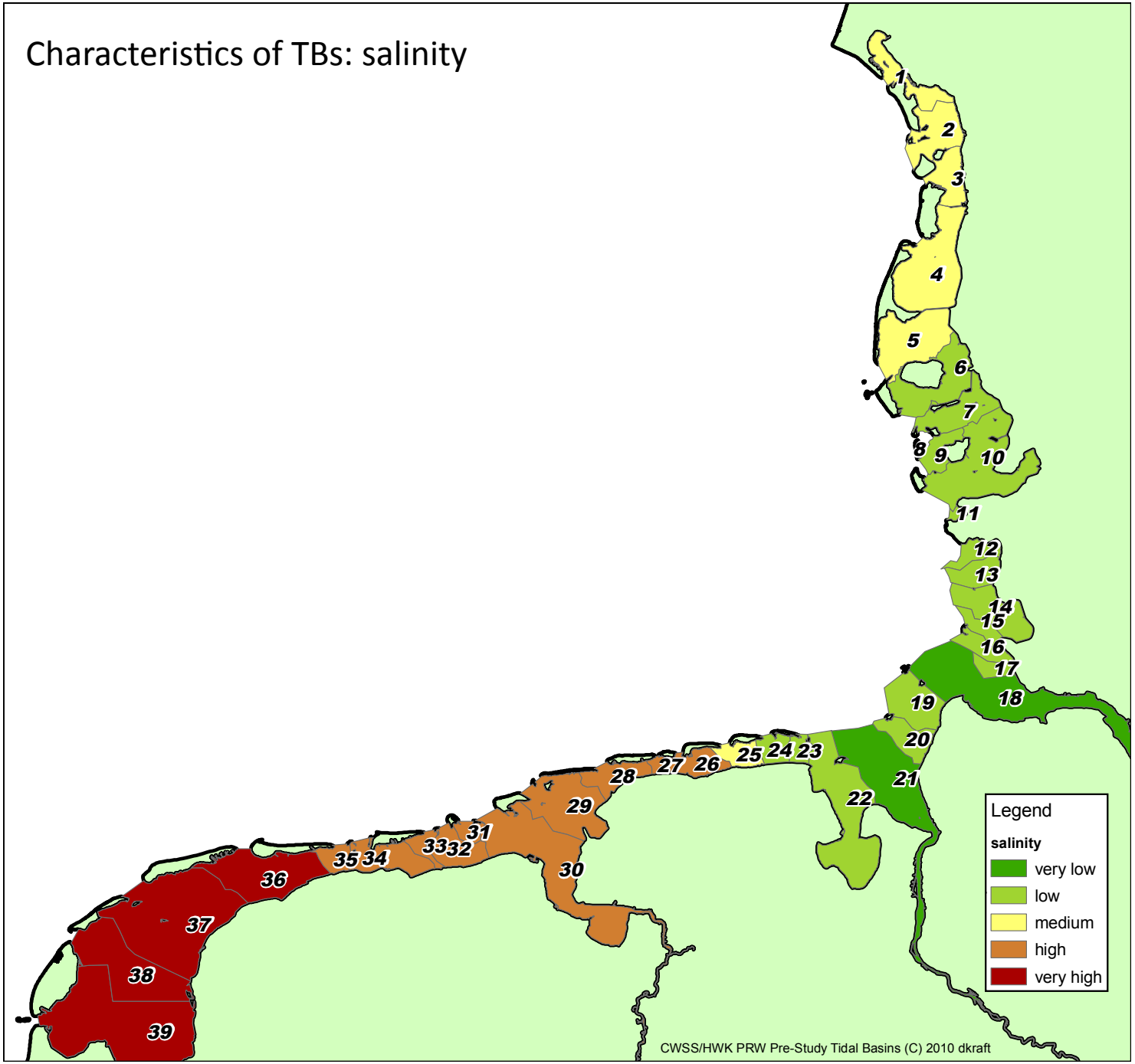

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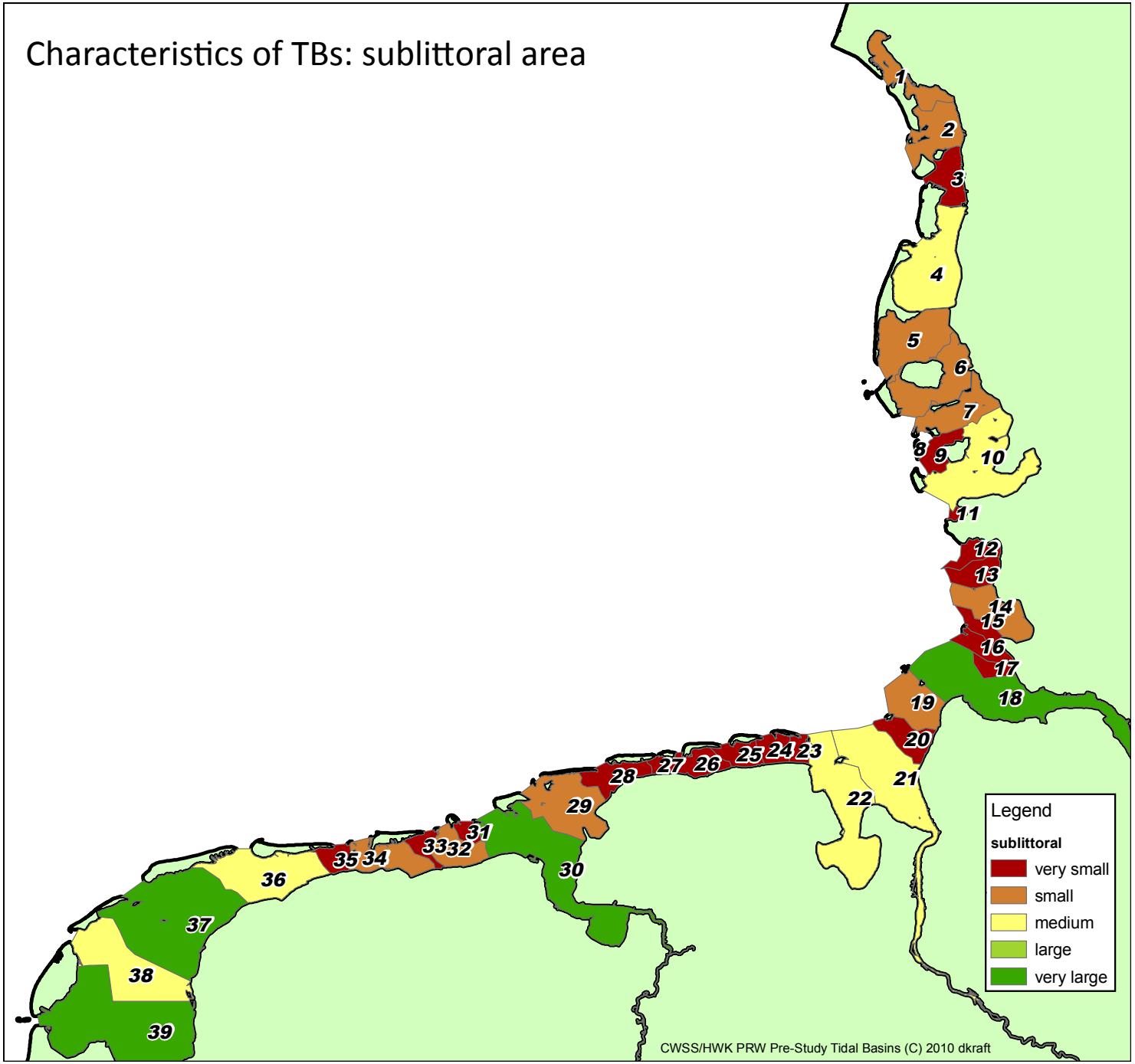

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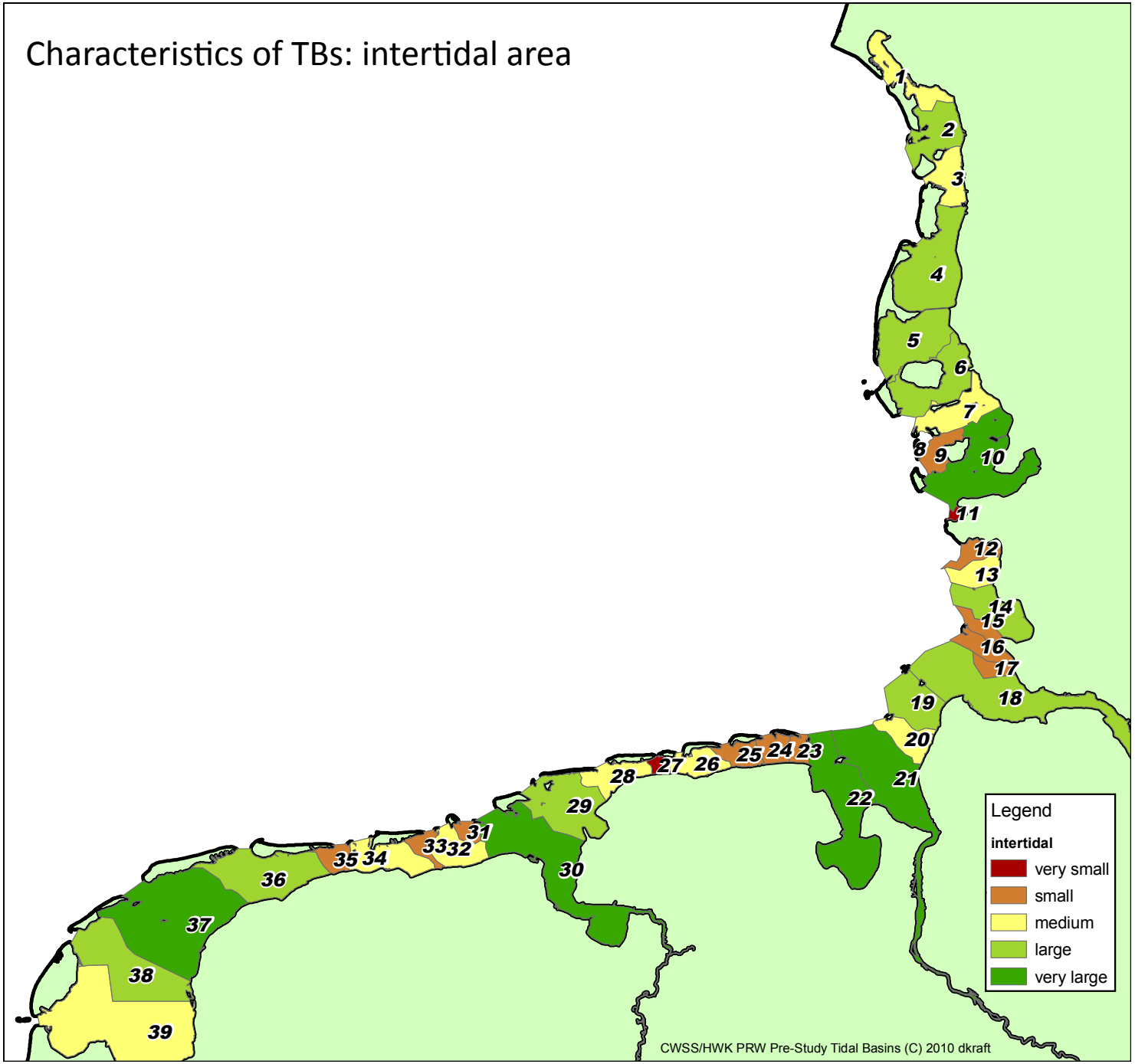

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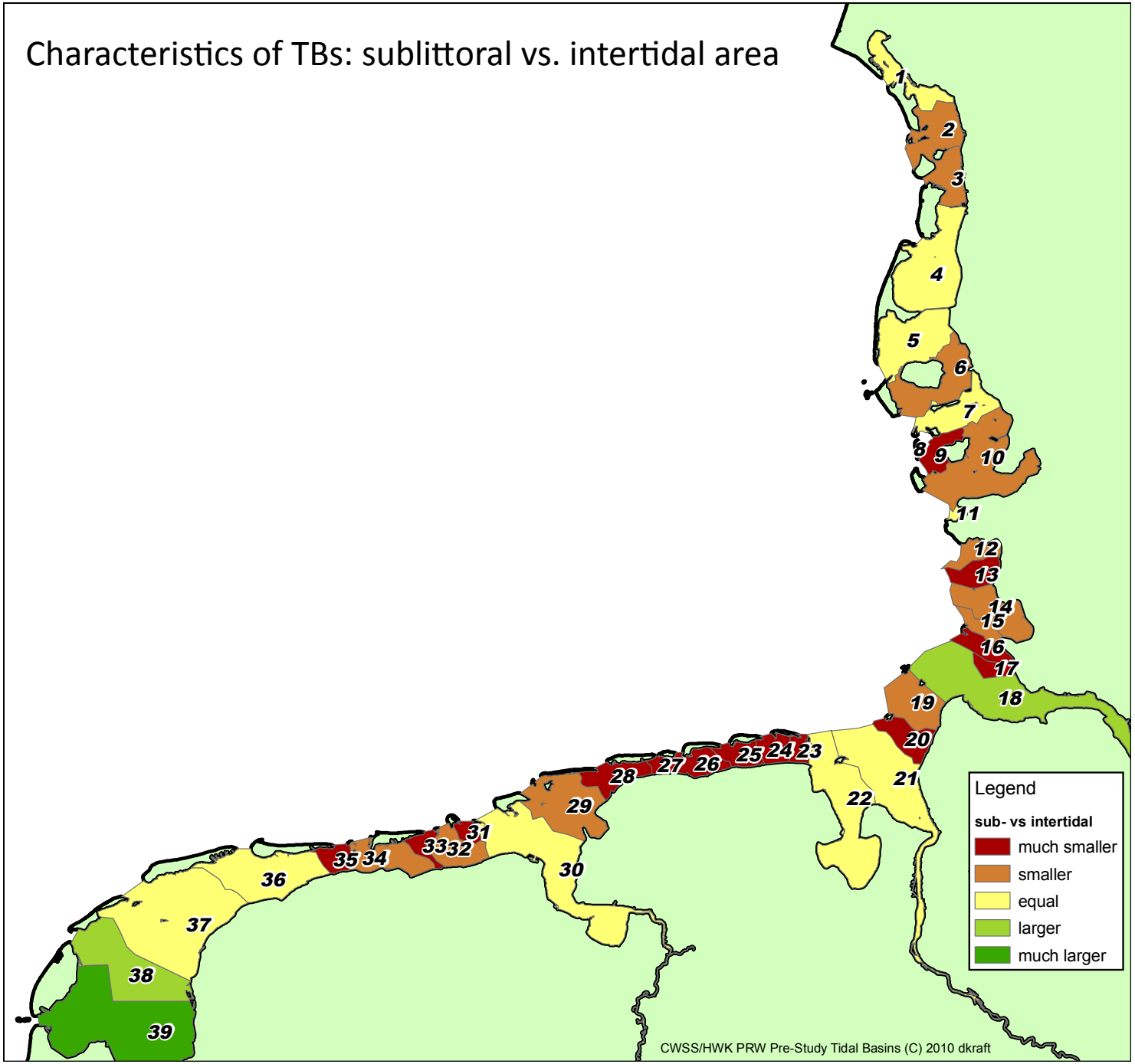
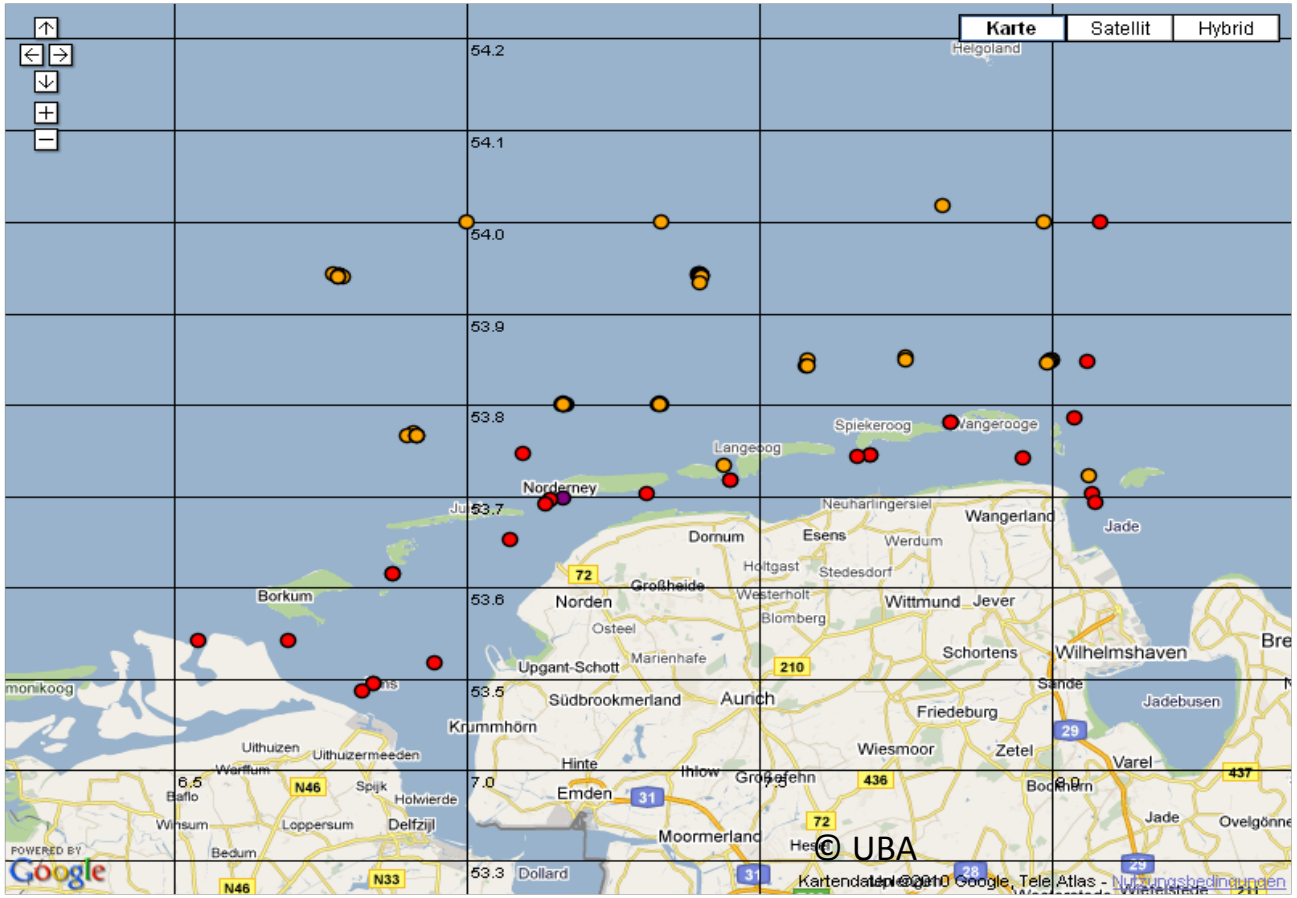


What data are existing?
Examples:

Official monitoring data:

- Germany
    - MUDAB

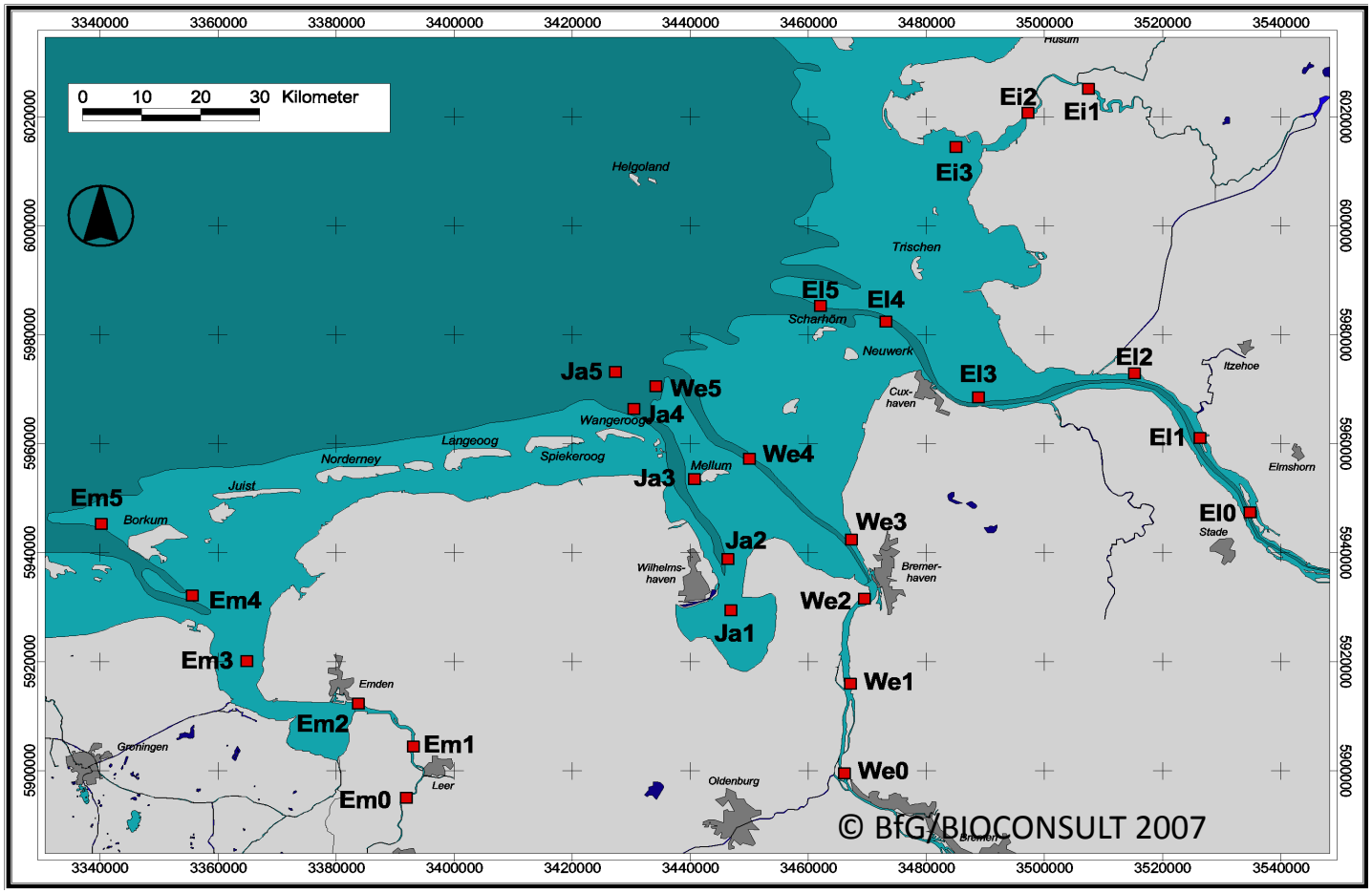


What data are existing?

Examples:

Official monitoring data:

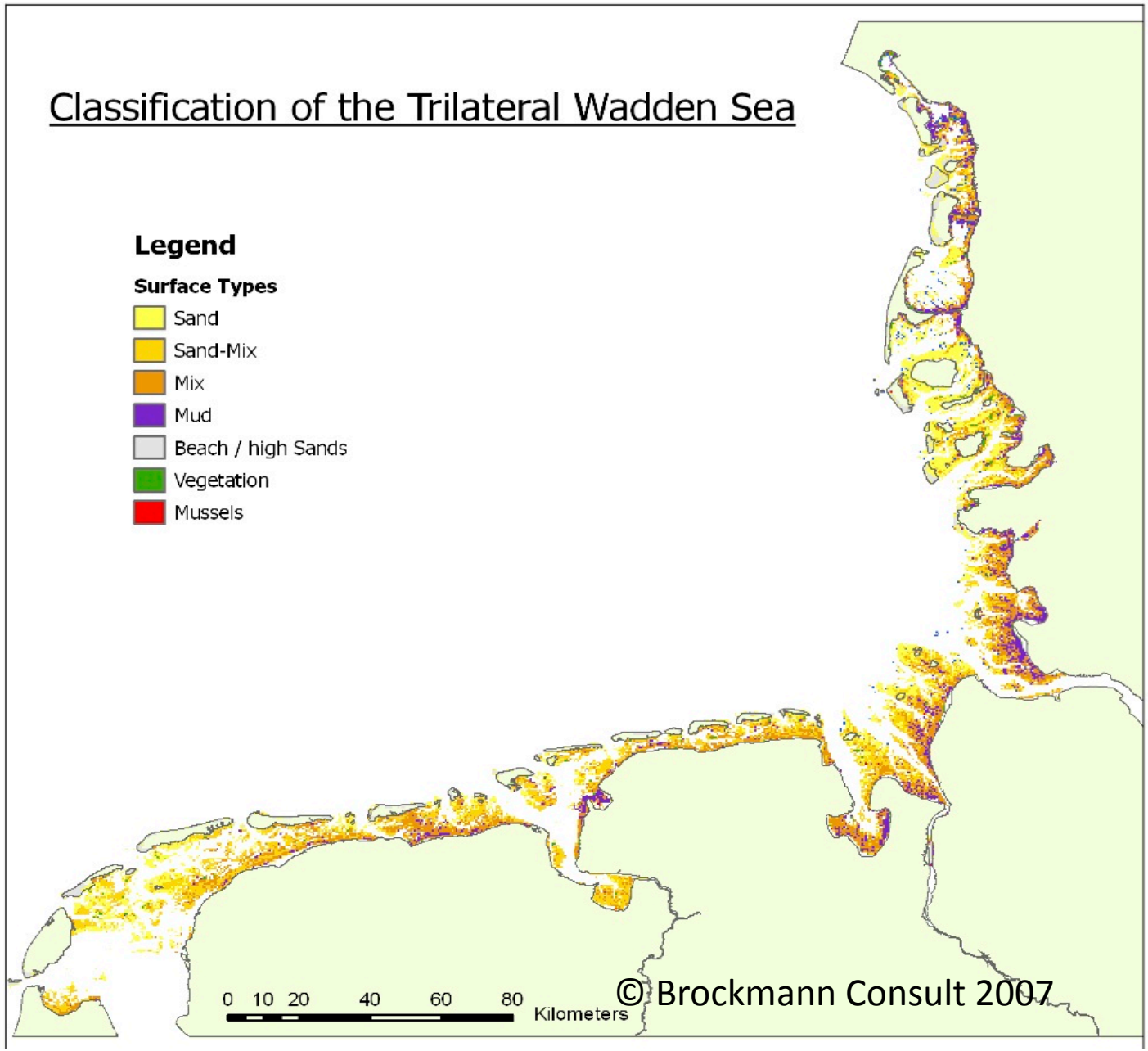
- Germany
  - MUDAB
  - BfG: Estuaries



What data are existing? Examples:

Official monitoring data:

- Germany
  - MUDAB
  - BfG: Estuaries
  - Surface types



Creating a database on the availability, quality and accessibility of data

Parameters	Content	Graadyb	Knude Dyb	Jyvre Dyb	Lister Tief	Hörnum Tief	Norderaue	Süderaue	Hoogeloch	Rummeloch West	Norderhever-Heverstrom	Tümlauer Bucht	Eidermündung	Wesselburener Loch	Piep/Meldorfer Bucht	Flackstrom	Neufahrwasser	Schatzkammer	Elbe	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep
Biological	Biotoptypes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Birds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Eelgrass	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fish	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Macroalgae	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Macrozoobenthos	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Mammals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Mussels	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Phytoplankton	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chemical	Chlorophyll	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Contaminants	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Nutrients	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Organic detritus	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Oxygen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Suspended matter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Toxins	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
General	Bathymetrie	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Flooding/hydrology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Geomorphology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Land cover	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Weather	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	2
Habitat	Beaches and Dunes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Blue Mussel beds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Salt marshes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Human Use	Agriculture	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Coastal protection	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fishery	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Land use	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Recreation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Physical	Basic	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Currents	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Physical	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Salinity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Temperature	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Waves	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

parameters

Parameters	Content
Biological	Biotoptypes
	Birds
	Eelgrass
	Fish
	Macroalgae
	Macrozoobenthos
	Mammals
	Mussels
	Phytoplankton
Chemical	Chlorophyll
	Contaminants
	Nutrients
	Organic detritus
	Oxygen
	Suspended matter
	Toxins
General	Bathymetrie
	Flooding/hydrology
	Geomorphology
	Land cover
	Sediment
	Weather
Habitat	Beaches and Dunes
	Blue Mussel beds
	Salt marshes
Human Use	Agriculture
	Coastal protection
	Fishery
	Land use
	Recreation
Physical	Basic
	Currents
	Physical
	Salinity
	Temperature
	Waves

Parameters	Content	Graadyb	Knude Dyb	Jyvre Dyb	Lister Tief	Hörnum Tief	Norderaue	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep
Biological	Biotoptypes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Birds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Eelgrass	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fish	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Macroalgae	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Macrozoobenthos	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Mammals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Mussels	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Phytoplankton	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chemical	Chlorophyll	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Contaminants	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Nutrients	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Organic detritus	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Oxygen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Suspended matter	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Toxins	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
General	Bathymetrie	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Flooding/hydrology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Geomorphology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Land cover	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Sediment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Weather	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	2
Habitat	Beaches and Dunes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Blue Mussel beds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Salt marshes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Human Use	Agriculture	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Coastal protection	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fishery	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Land use	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Recreation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Physical	Basic	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Currents	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Physical	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Salinity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Temperature	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Waves	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

details

Parameters	Content
Biological	Biotoptypes
	Birds
	Eelgrass
	Fish
	Macroalgae
	Macrozoobenthos
	Mammals
	Mussels
	Phytoplankton
Chemical	Chlorophyll
	Contaminants
	Nutrients
	Organic detritus
	Oxygen
	Suspended matter
	Toxins
General	Bathymetrie
	Flooding/hydrology
	Geomorphology
	Land cover
	Sediment
	Weather
Habitat	Beaches and Dunes
	Blue Mussel beds
	Salt marshes
Human Use	Agriculture
	Coastal protection
	Fishery
	Land use
	Recreation
Physical	Basic
	Currents
	Physical
	Salinity
	Temperature
	Waves

Parameters	Content	Graadyb	Knude Dyb	Jyvre Dyb	Lister Tief	Hörnum Tief	Norderaue	Sudfraue	Hoogsloch	Rummelloch Wi	Norderhever-H	Trümauer Buch	Eidermündung	Wesselburener Loch	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep
Biological	Biotoptypes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Birds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Eelgrass	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fish	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Macroalgae																				1	1	1	1	1	1	1	1	1
	Macrozoobenthos																				1	1	1	1	1	1	1	1	1
	Mammals																				1	1	1	1	1	1	1	1	1
	Mussels																				1	1	1	1	1	1	1	1	1
	Phytoplankton																				1	1	1	1	1	1	1	1	1
Chemical	Chlorophyll																				1	1	1	1	1	1	1	1	1
	Contaminants																				1	1	1	1	1	1	1	1	1
	Nutrients																				1	2	1	2	1	2	2	1	2
	Organic detritus																				1	1	1	1	1	1	1	1	1
	Oxygen																				1	1	1	1	1	1	1	1	1
	Suspended matter																				1	2	1	2	1	2	2	1	2
	Toxins																				1	2	1	2	1	2	2	1	2
General	Bathymetrie																				1	1	1	1	1	1	1	1	1
	Flooding/hydrology																				1	1	1	1	1	1	1	1	1
	Geomorphology																				1	1	1	1	1	1	1	1	1
	Land cover																				1	1	1	1	1	1	1	1	1
	Sediment																				1	1	1	1	1	1	1	1	1
	Weather																				1	1	1	2	1	1	2	1	2
Habitat	Beaches and Dunes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Blue Mussel beds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Salt marshes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Human Use	Agriculture	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Coastal protection	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fishery	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Land use	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Recreation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Physical	Basic	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Currents	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Physical	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	1	2
	Salinity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Temperature	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Waves	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Birds
Birds
Breeding birds
Breeding success (in prep.)
Migratory birds
Sea ducks
Shorebirds
Beached Birds Survey

e.g. data from monitoring

	Niedersachsen													The Netherlands											
					Eastfrisia									Westfrisia											
Parameter	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eastfrisia	German Wadden	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep	Westfrisia (dutch)	Complete Wadden Sea
Monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biological	1	1	2	1	1	1	2	1	1	1	1	8	1	2	1	1	1	1	1	1	1	1	1	5	11
Chemical														3		3		3		3	3		3	5	3
General				12								1						1			1		1	2	4
Habitat																									3
Human Use																									5
Physical			2	3			1							2		2		2		2	2		2	3	2

e.g. TMAP

	Niedersachsen													The Netherlands											
					Eastfrisia									Westfrisia											
Parameter	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eastfrisia	German Wadden	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep	Westfrisia (dutch)	Complete Wadden Sea
Monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biological	1	1	2	1	1	1	2	1	1	1	1	8	1	2	1	1	1	1	1	1	1	1	1	5	11
Chemical														3		3		3		3	3		3	5	3
General				12								1						1			1		1	2	4
Habitat																									3
Human Use																									5
Physical			2	3			1							2		2		2		2	2		2	3	2

in this case: TMAP

going into details: gaps?

	Niedersachsen													The Netherlands											
					Eastfrisia									Westfrisia											
Parameter	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eastfrisia	German Wadden	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep	Westfrisia (dutch)	Complete Wadden Sea
Monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biological	1	1	2	1	1	1	2	1	1	1	1	8	1	2	1	1	1	1	1	1	1	1	1	5	11
Chemical														3		3		3		3	3		3	5	3
General				12								1						1					1	2	4
Habitat																									3
Human Use																									5
Physical			2	3			1							2		2		2		2			2	3	2

some TB not included

going into details: additional monitoring!

	Niedersachsen													The Netherlands											
					Eastfrisia									Westfrisia											
Parameter	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eastfrisia	German Wadden	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep	Westfrisia (dutch)	Complete Wadden Sea
Monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biological	1	1	2	1	1	1	2	1	1	1	1	8	1	2	1	1	1	1	1	1	1	1	1	5	11
Chemical														3		3		3		3	3		3	5	3
General				12								1						1			1		1	2	4
Habitat																									3
Human Use																									5
Physical			2	3			1							2		2		2			2		2	3	2

estuary monitoring

research

	Niedersachsen													The Netherlands											
					Eastfrisia									Westfrisia											
Parameter	Westertill/Nordertill	Robinbalje	Weser	Jade/Jadebusen	Blaue Balje	Harle	Otzumer Balje	Accumer Ee	Wichter Ee	Norderneyer Seegat	Osterems	Eastfrisia	German Wadden	Eems-Dollard	Schild	Lauwers	Eijerlanderbalg	Zoutkamperlaag	Pinkegat	Amelander Zeegat	Vlie	Eierlandse Gat	Marsdiep	Westfrisia (dutch)	Complete Wadden Sea
Monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Biological	1	1	2	1	1	1	2	1	1	1	1	8	1	2	1	1	1	1	1	1	1	1	1	5	11
Chemical														3		3		3		3	3		3	5	3
General				12								1						1			1		1	2	4
Habitat																									3
Human Use																									5
Physical			2	3			1							2		2		2		2	2		2	3	2

intensive research

data evaluation in detail

quantity:

➢ **density of sampling**

Quantity	**extensive**	**all over the area**
	representativ	**more than 12 gauges**
	punctual	**4 to 12 gauges**
	single	**1 to 3 gauges**
	one	
Intensity	very often	quarterly
	often	yearly
	seldom	6 to 10 times
	very seldom	2 to 5 times
	once	
Quality	very rich	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	perfect	free and open for everyone
	easy	login and link
	common	login and download
	hard	permission needed
	closed	no direkt access
	unknown	
Vote	perfect	
	rich	
	medium	
	poor	
	absent	

data evaluation in detail

quantity:

➢density of sampling

intensity:

➢**frequency of sampling**

Quantity	extensive	all over the area
	representativ	more than 12 gauges
	punctual	4 to 12 gauges
	single	1 to 3 gauges
	one	
Intensity	**very often**	**quarterly**
	often	**yearly**
	seldom	**6 to 10 times**
	very seldom	**2 to 5 times**
	once	
Quality	very rich	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	perfect	free and open for everyone
	easy	login and link
	common	login and download
	hard	permission needed
	closed	no direkt access
	unknown	
Vote	perfect	
	rich	
	medium	
	poor	
	absent	

data evaluation in detail

quantity:

➢density of sampling

intensity:

➢frequency of sampling

quality:

➢**over all estimate**

Quantity	extensive	all over the area
	representativ	more than 12 gauges
	punctual	4 to 12 gauges
	single	1 to 3 gauges
	one	
Intensity	very often	quarterly
	often	yearly
	seldom	6 to 10 times
	very seldom	2 to 5 times
	once	
Quality	**very rich**	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	perfect	free and open for everyone
	easy	login and link
	common	login and download
	hard	permission needed
	closed	no direkt access
	unknown	
Vote	perfect	
	rich	
	medium	
	poor	
	absent	

data evaluation in detail

quantity:

➢density of sampling

intensity:

➢frequency of sampling

quality:

➢over all estimate

accessibility:

➢**open to (online) access**

Quantity	extensive	all over the area
	representativ	more than 12 gauges
	punctual	4 to 12 gauges
	single	1 to 3 gauges
	one	
Intensity	very often	quarterly
	often	yearly
	seldom	6 to 10 times
	very seldom	2 to 5 times
	once	
Quality	very rich	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	**perfect**	**free and open for everyone**
	easy	**login and link**
	common	**login and download**
	hard	**permission needed**
	closed	**no direct access**
	unknown	
Vote	perfect	
	rich	
	medium	
	poor	
	absent	

data evaluation in detail

quantity:

➢density of sampling

intensity:

➢frequency of sampling

quality:

➢over all estimate

accessibility:

➢open to (online) access

vote:

➢**overall "suitability"**

Quantity	extensive	all over the area
	representativ	more than 12 gauges
	punctual	4 to 12 gauges
	single	1 to 3 gauges
	one	
Intensity	very often	quarterly
	often	yearly
	seldom	6 to 10 times
	very seldom	2 to 5 times
	once	
Quality	very rich	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	perfect	free and open for everyone
	easy	login and link
	common	login and download
	hard	permission needed
	closed	no direct access
	unknown	
Vote	**perfect**	
	rich	
	medium	
	poor	
	absent	

data evaluation in detail

quantity:

- density of sampling
- **representative**

intensity:

- frequency of sampling
- **often**

quality:

- over all estimate
- **rich/sufficient**

accessibility:

- open to (online) access
- **common/hard**

vote:

- overall “suitability”
- **rich/medium**

Quantity	extensive	all over the area
	representativ	more than 12 gauges
	punctual	4 to 12 gauges
	single	1 to 3 gauges
	one	
Intensity	very often	quarterly
	often	yearly
	seldom	6 to 10 times
	very seldom	2 to 5 times
	once	
Quality	very rich	
	rich	
	sufficient	
	pour	
	absent	
Accessibility	perfect	free and open for everyone
	easy	login and link
	common	login and download
	hard	permission needed
	closed	no direct access
	unknown	
Vote	perfect	
	rich	
	medium	
	poor	
	absent	

What are the research and policy questions?

1. What are the **fluxes of energy and matter** between trophic levels?
2. What are the relationships between **bioengineers** and **environmental** conditions?
3. What are the **effects of exploitation and anthropogenic** disturbance?
4. What do we want the WSA to be like?
5. What is the relationship between **geomorphology and ecosystem functioning**?
6. Is it possible to distinguish between **naturally** driven and **anthropogenically** driven population dynamics?
7. How will **exotic species** affect ecosystem functioning?

preliminary Resume

- A lot of data is available!
  - Quality: *sufficient/rich*
  - Accessibility: *hard/common*
  - Vote: *medium/rich*
- A lot of knowledge exists, but **we need an intelligent combination of data with remote sensing and models!**

Outlook

- What exactly is needed:
  - digital atlas of the Wadden? *Yes!*
  - a database? *Not necessarily!*
  - information system? *Might be an option!*
  - online platform? *Should be the over-all goal!*
  - more research *is needed on software architecture to integrate data, models and remote-sensing!*