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# First results of confidence test assessment in HEAT 3.0

Birgit Heyden, Wera Leujak,

AquaEcology, Consultant of the German Federal  
Environment Agency

# Confidence assessment

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- Test assessment with general temporal, specific temporal and specific spatial confidence aspects
- Recommended changes:
  - specific temporal confidence based on missing months per year, not per assessment period to be consistent with the other confidence aspects
  - Specific spatial confidence based on 30K instead of 20K/60K
- Addition of further statistical parameters in HEAT 3.0: standard error, 95% confidence interval
- Suggestion to implement Monte Carlo simulation similar to BEAT for probability of correct classification

# Confidence proposal

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- **General temporal** confidence related to annual minimal number of observations in the assessment period (used in HEAT as ES-Score)
- **Specific temporal** confidence based on temporal coverage in the different assessment periods (winter, growing season), class boundaries defined by the number of missing months
- **Specific spatial** confidence based on percentage of sampled grid cells in relation to total number of grid cells in the area (sampled area/total area)

# Confidence proposal

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- the different confidence aspects are classified as high (100), moderate (50) or low (0)
- General and specific temporal confidence aspects currently combined by averaging before averaging temporal and spatial confidence
- For combined confidence aspects the following ranges were used for the classification:
  - high > 75
  - moderate 50-75
  - low < 50

# Temporal confidence test assessment – DIN (annually) in selected sub-basins

Code	Description	Period	GTC	STC	TTC	class
SEA-001	Opensea Kattegat	2011	100	100	100	H
SEA-001	Opensea Kattegat	2012	100	100	100	H
SEA-001	Opensea Kattegat	2013	100	100	100	H
SEA-001	Opensea Kattegat	2014	100	100	100	H
SEA-001	Opensea Kattegat	2015	100	100	100	H
SEA-001	Opensea Kattegat	2016	100	100	100	H
SEA-004	Opensea Kiel Bay	2011	50	50	50	M
SEA-004	Opensea Kiel Bay	2012	50	100	75	M
SEA-004	Opensea Kiel Bay	2013	50	100	75	M
SEA-004	Opensea Kiel Bay	2014	100	100	100	H
SEA-004	Opensea Kiel Bay	2015	100	100	100	H
SEA-004	Opensea Kiel Bay	2016	100	100	100	H
SEA-010	Opensea Western Gotland Basin	2011	0	0	0	L
SEA-010	Opensea Western Gotland Basin	2012	0	0	0	L
SEA-010	Opensea Western Gotland Basin	2013	50	50	50	M
SEA-010	Opensea Western Gotland Basin	2014	50	50	50	M
SEA-010	Opensea Western Gotland Basin	2015	50	100	75	M
SEA-010	Opensea Western Gotland Basin	2016	50	100	75	M
SEA-013	Opensea Gulf of Finland	2011	100	50	75	M
SEA-013	Opensea Gulf of Finland	2012	100	50	75	M
SEA-013	Opensea Gulf of Finland	2013	100	50	75	M
SEA-013	Opensea Gulf of Finland	2014	100	0	50	M
SEA-013	Opensea Gulf of Finland	2015	100	0	50	M
SEA-013	Opensea Gulf of Finland	2016	100	100	100	H

GTC: General temporal confidence  
STC: Specific temporal confidence  
TTC: Total temporal confidence

Consideration of annual differences

Score	Evaluation criteria for winter nutrients (XII-II)
<b>HIGH</b>	> 15 annual observations during the given assessment period
<b>MODERATE</b>	minimum of 5 annual observations
<b>LOW</b>	< 5 annual observations

Score	Evaluation criteria for winter nutrients (XII-II)
<b>HIGH</b>	0 missing months (maximum of 3 in total related to 6-year period)
<b>MODERATE</b>	1 missing months
<b>LOW</b>	2 missing months

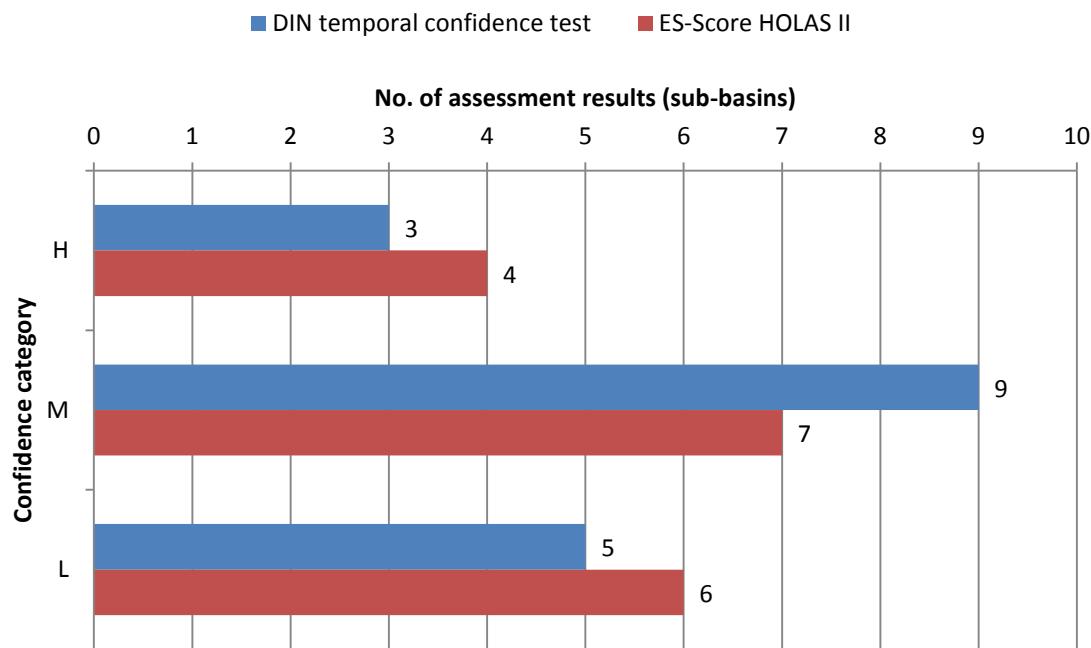
# Temporal confidence test assessment - DIN (2011-2016) in all sub-basins

Code	Description	GTC	STC	TTC	class	ES-Score HOLAS II	class	Diff
SEA-001	Opensea Kattegat	100	100	100	H	100	H	
SEA-002	Opensea Great Belt	50	100	75	M	50	M	
SEA-003	Opensea The Sound	50	100	75	M	0	L	1
SEA-004	Opensea Kiel Bay	50	100	75	M	50	M	
SEA-005	Opensea Bay of Mecklenburg	50	100	75	M	50	M	
SEA-006	Opensea Arkona Basin	100	100	100	H	100	H	
SEA-007	Opensea Bornholm Basin	100	100	100	H	100	H	
SEA-008	Opensea Gulf of Gdansk	0	0	0	L	0	L	
SEA-009	Opensea Eastern Gotland Basin	50	100	75	M	50	M	
SEA-010	Opensea Western Gotland Basin	0	50	25	L	0	L	
SEA-011	Opensea Gulf of Riga	0	0	0	L	0	L	
SEA-012	Opensea Northern Baltic Proper	50	100	75	M	50	M	
SEA-013	Opensea Gulf of Finland	100	0	50	M	100	H	-1
SEA-014	Opensea Åland Sea	0	0	0	L	0	L	
SEA-015	Opensea Bothnian Sea	50	100	75	M	50	M	
SEA-016	Opensea The Quark	0	0	0	L	0	L	
SEA-017	Opensea Bothnian Bay	50	100	75	M	50	M	

Comparison of TTC and HOLAS II ES-Score:

- 2 deviating classifications

# Temporal confidence test assessment – Comparison HOLAS II results



# Spatial confidence test assessment – DIN (annually) in selected sub-basins

Code	Description	Period	SSC	class
SEA-001	Opensea Kattegat	2011	0	L
SEA-001	Opensea Kattegat	2012	50	M
SEA-001	Opensea Kattegat	2013	50	M
SEA-001	Opensea Kattegat	2014	50	M
SEA-001	Opensea Kattegat	2015	100	H
SEA-001	Opensea Kattegat	2016	100	H
SEA-004	Opensea Kiel Bay	2011	50	M
SEA-004	Opensea Kiel Bay	2012	100	H
SEA-004	Opensea Kiel Bay	2013	100	H
SEA-004	Opensea Kiel Bay	2014	100	H
SEA-004	Opensea Kiel Bay	2015	100	H
SEA-004	Opensea Kiel Bay	2016	100	H
SEA-010	Opensea Western Gotland Basin	2011	0	L
SEA-010	Opensea Western Gotland Basin	2012	0	L
SEA-010	Opensea Western Gotland Basin	2013	0	L
SEA-010	Opensea Western Gotland Basin	2014	0	L
SEA-010	Opensea Western Gotland Basin	2015	0	L
SEA-010	Opensea Western Gotland Basin	2016	0	L
SEA-013	Opensea Gulf of Finland	2011	50	M
SEA-013	Opensea Gulf of Finland	2012	50	M
SEA-013	Opensea Gulf of Finland	2013	50	M
SEA-013	Opensea Gulf of Finland	2014	50	M
SEA-013	Opensea Gulf of Finland	2015	50	M
SEA-013	Opensea Gulf of Finland	2016	0	L

SSC: Specific spatial confidence

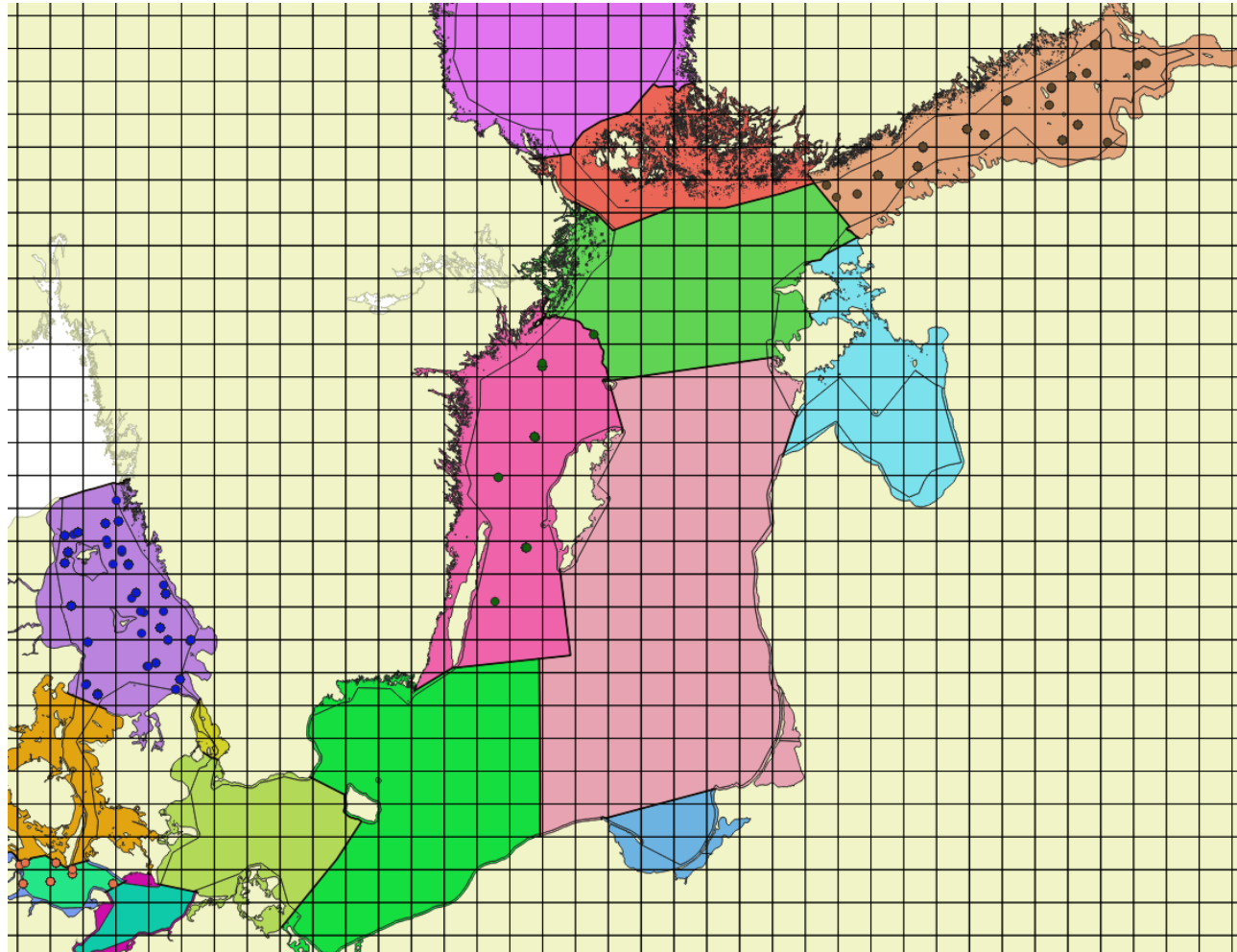
- Consideration of annual differences
- Range of variability in selected examples:
  - SEA-001: 49 – 72%
  - SEA-004: 59 – 92%
  - SEA-010: 10 – 14%
  - SEA-013: 43 – 59%

Score	Evaluation criteria for specific spatial confidence - % of sampled grid cells	
Parameter	Winter nutrients	Chlorophyll
HIGH	> 70 %	> 80 %
MODERATE	50 – 70 %	60 – 80 %
LOW	< 50 %	< 60 %

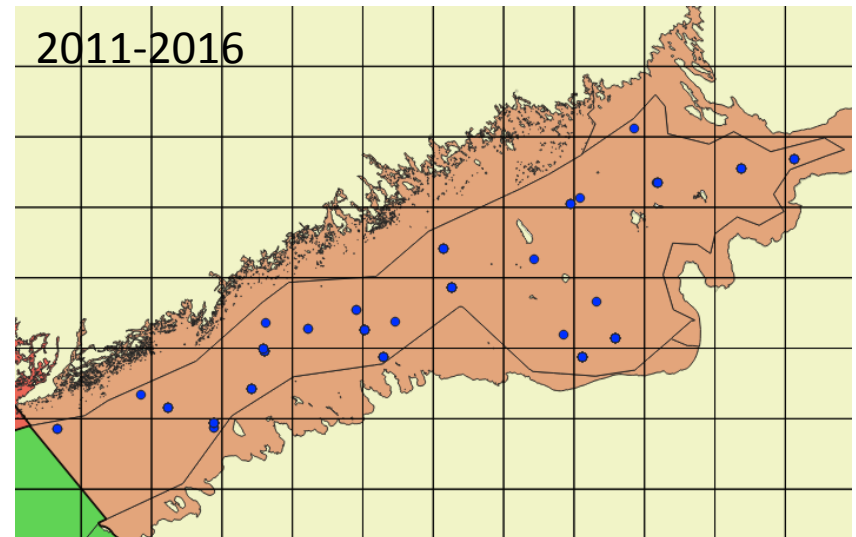
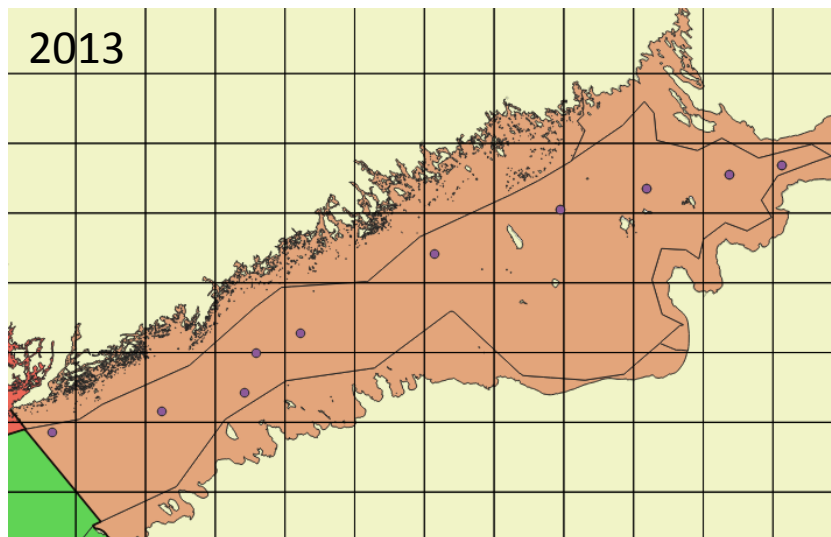
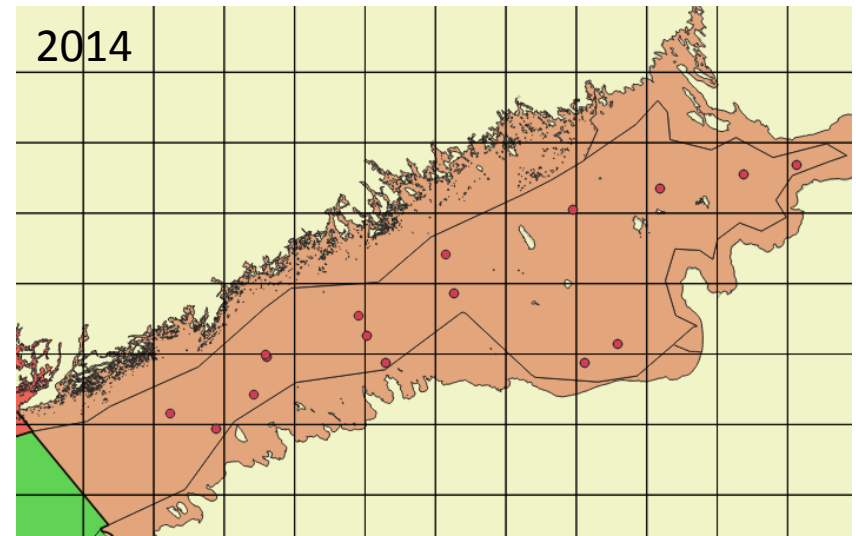
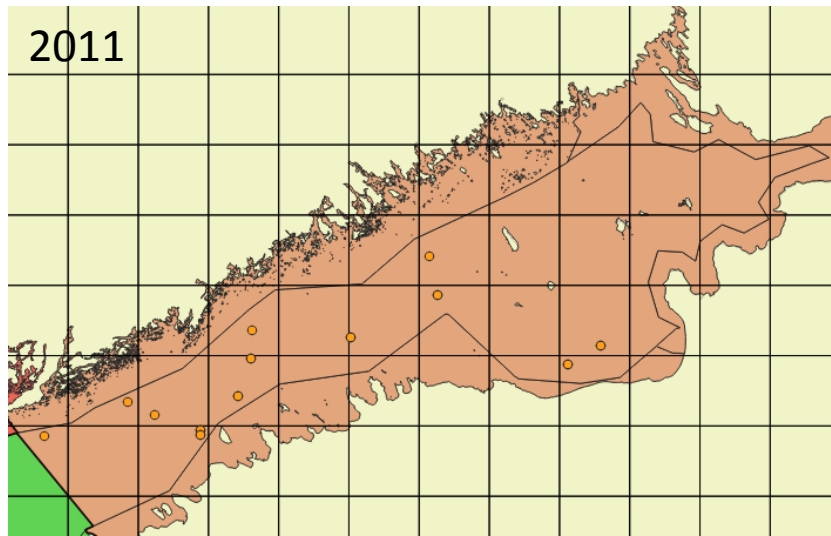


# Spatial confidence test assessment – Distribution in selected sub-basins

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# Spatial confidence test assessment – Gulf of Finland



# Spatial confidence test assessment - DIN (2011-2016) in all sub-basins

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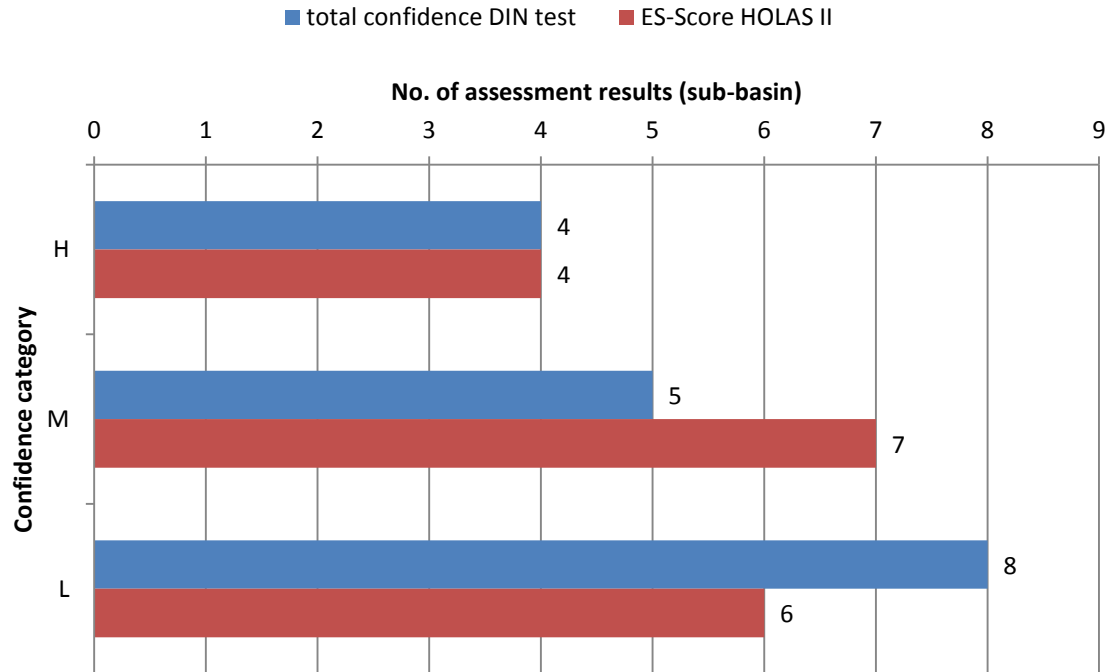
Code	Description	SSC	class
SEA-001	Opensea Kattegat	50	M
SEA-002	Opensea Great Belt	0	L
SEA-003	Opensea The Sound	0	L
SEA-004	Opensea Kiel Bay	100	H
SEA-005	Opensea Bay of Mecklenburg	100	H
SEA-006	Opensea Arkona Basin	50	M
SEA-007	Opensea Bornholm Basin	0	L
SEA-008	Opensea Gulf of Gdansk	50	M
SEA-009	Opensea Eastern Gotland Basin	0	L
SEA-010	Opensea Western Gotland Basin	0	L
SEA-011	Opensea Gulf of Riga	50	M
SEA-012	Opensea Northern Baltic Proper	0	L
SEA-013	Opensea Gulf of Finland	50	M
SEA-014	Opensea Åland Sea	0	L
SEA-015	Opensea Bothnian Sea	0	L
SEA-016	Opensea The Quark	50	M
SEA-017	Opensea Bothnian Bay	0	L

17 sub-basins:

- H: 2
- M: 6
- L: 9

Low spatial confidence mainly in large assessment units, could be an indication for not suitable grid cell sizes besides insufficient distribution of monitoring stations

# Confidence test assessment - Comparison HOLAS II results

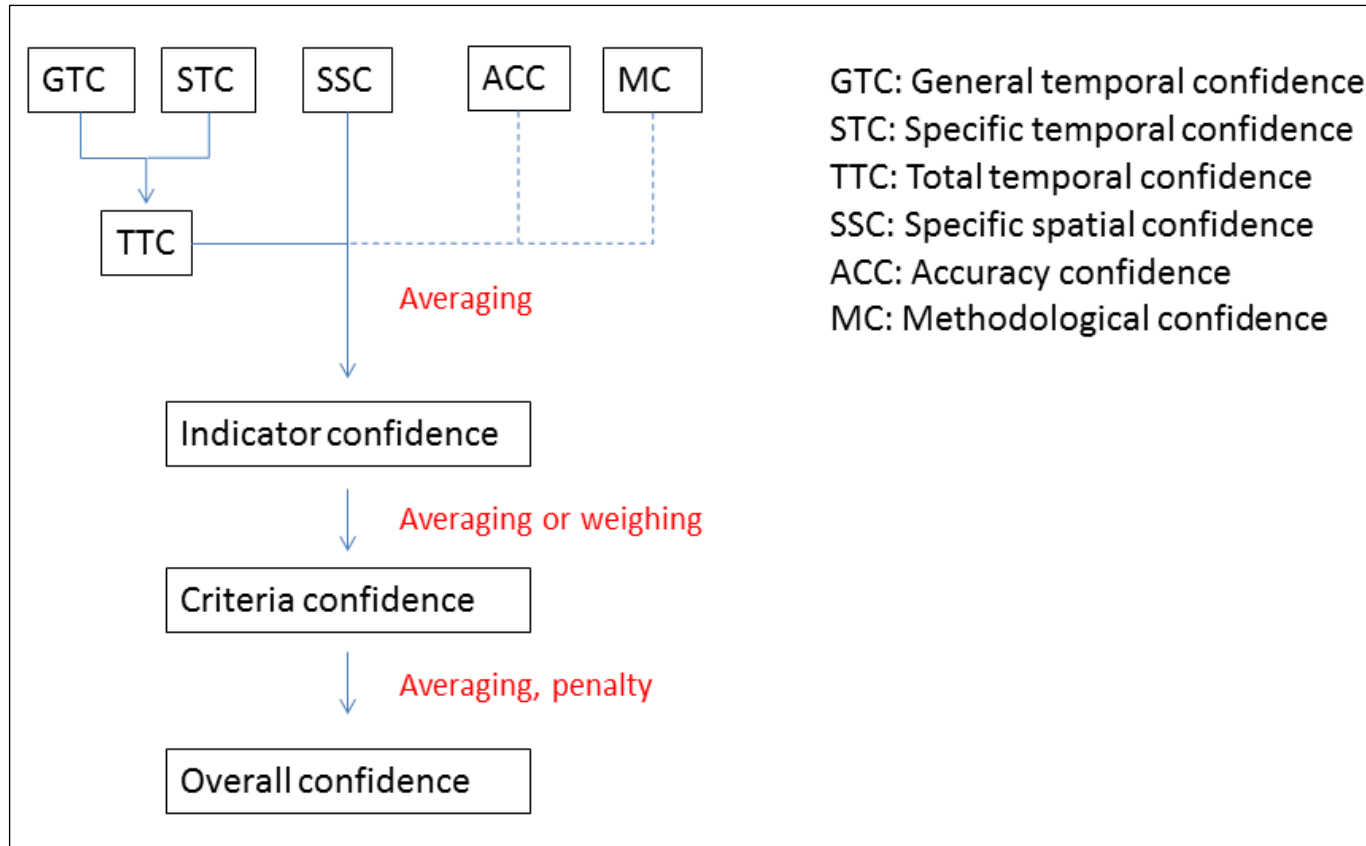


# Recommendations and further steps

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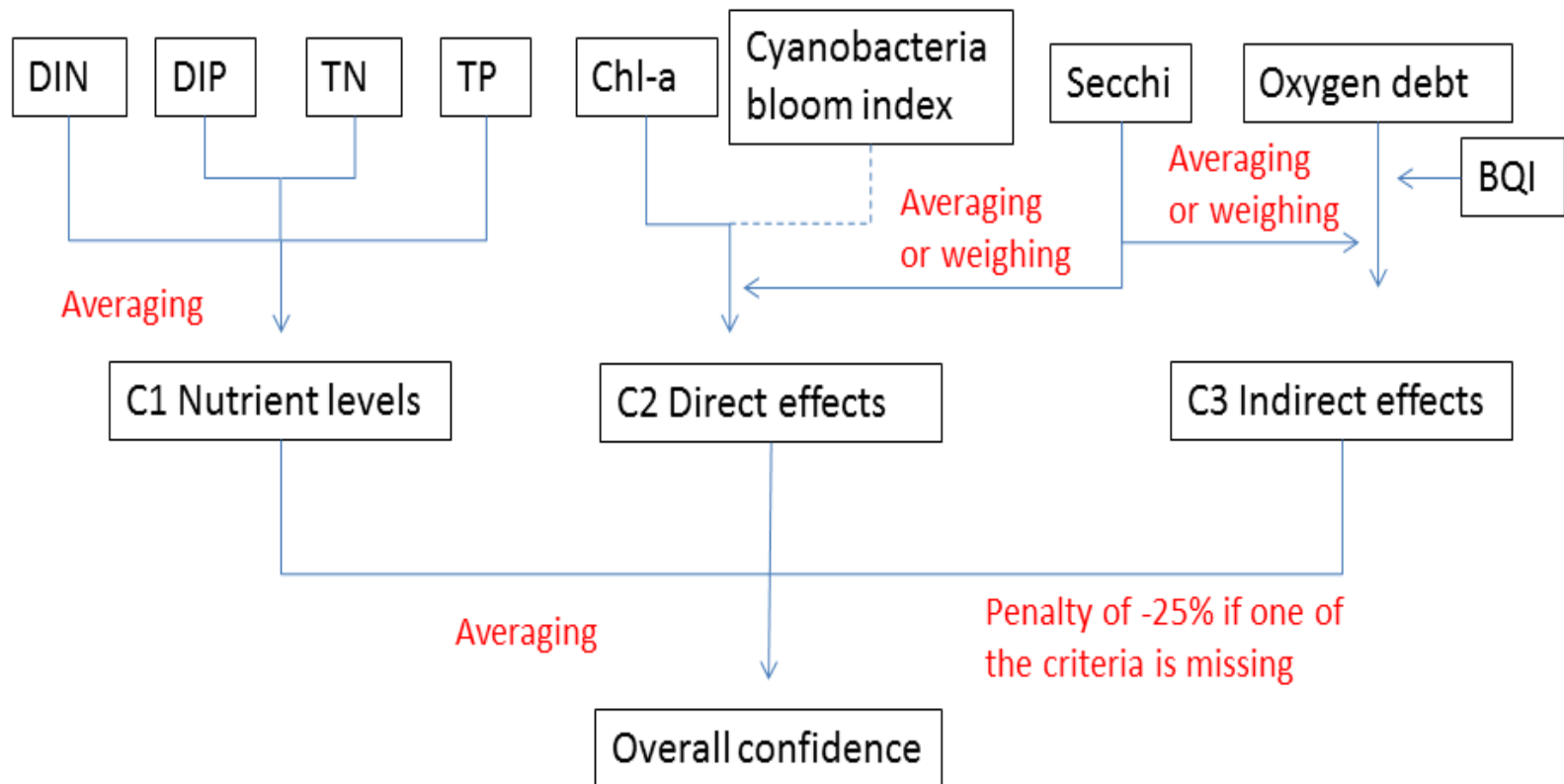
- Finalising test assessment with all indicators
- Subsequent refinement and possible adaptation of grid cell sizes and confidence class boundaries, area- and indicator-specific
- Test implementation of accuracy confidence aspect

# Aggregation of confidence – level of confidence aspects



- Aggregation of different confidence aspects separately for each indicator for the assessment period based on annual results to consider annual variations

# Aggregation of confidence – indicator, criteria and overall level



- Averaging or weighing according to status assessment
- Penalty of -25% only for a completely missing criterion (focussed on C2 and C3), but not for criteria represented by only one indicator