



## Baltic Marine Environment Protection Commission

Making the HELCOM eutrophication assessment  
operational (EUTRO-OPER)  
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<b>Document title</b>	Two remote sensing based phytoplankton bloom indicators under development
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### Background

One task of the HELCOM EUTRO OPER project is to develop new core eutrophication indicators. EUTRO OPER 1-2014 decided that indicators for cyanobacterial blooms and spring bloom (based on chlorophyll-*a*) will be further developed under the project during 2015, SYKE being the lead institution. The document provides information on the progress and proposes next steps in the development of these two indicators.

### Action required

The Meeting is invited to take note of the progress in indicator development and discuss next steps.

Two remote sensing based phytoplankton bloom indicators that characterize the annual spring and cyanobacteria blooms in the Baltic Sea are under development at SYKE. Data for both of the indicators are supplemented with ferrybox (ship-of-opportunity, Alg@line) fluorometer measurements.

### **Spring bloom, based on chlorophyll-*a***

For the spring bloom indicator, we applied a method developed by Platt et al. (2003, 2008) and Fleming and Kaitala (2006) in which the peak amplitude, timing of peak, timing of initiation and duration were derived from the remote sensed, or in latter case, from the Alg@line time series of chl-*a*. This information was used to derive the spring bloom intensity index used the indicator. The spring bloom indicator is currently trend based, thus the current status is derived from the trend observed in time series of bloom intensity.

The trend based spring bloom indicator is now ready for the operative test and will be applied for the majority of HELCOM open sea areas during the coming autumn. At the same time, possibilities to model specific target values for each assessment areas will be investigated.

### **Frequency and intensity of cyanobacterial blooms**

For the cyanobacteria blooms we developed a new method. Here the indicator combines the annual information from the bloom characteristics, namely the duration, intensity and temporal volume of algal accumulations, into a Cyanobacterial Surface Accumulation –index (CSA-index). Bloom characteristics were estimated by using Empirical Cumulative Distribution Functions (ECDF) derived from seasonal time series of algae barometer values (Rapala et al., 2012). This indicator is also based on the remote sensing product of surface algae blooms ([www.syke.fi/surfacealgalblooms](http://www.syke.fi/surfacealgalblooms)), but supplementary information can be added with specific weights. The indicator is currently trend-based, but the time series of Fraction of Cyanobacteria Accumulations (FCA) by Kahru and Elmgren (2014) will be applied in deriving the target status for the CSA-index.

The trend based cyanobacteria surface accumulations indicator is now developed and applied in the majority of HELCOM open sea area. The setting of specific target values by using FCA-time series will be done in coming autumn and this target value based indicator will be applied for the majority of HELCOM open sea areas before end of this year.

### **References:**

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- Platt, T., & Sathyendranath, S. (2008). Ecological indicators for the pelagic zone of the ocean from remote sensing. *Remote Sensing of Environment*, 112(8), 3426-3436.
- Rapala, J., Kilponen, J., Järvinen, M., Lahti, K. (2012). FINLAND: Guidelines for monitoring of cyanobacteria and their toxins. In Chorus, I. (ed.). *Current approaches to cyanotoxin risk assessment, risk management and regulations in different countries*. Dessau-Rosslau, Germany: Federal Environment Agency (Umweltbundesamt); 2012. Available at <http://www.umweltdaten.de/publikationen/fpdf-l/4390.pdf>.