

Name of indicator	4.7 Distribution of wintering waterbirds (multi-species)
Type of Indicator	State indicator
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Description of the indicator	<p>This is a multispecies indicator that reflects distribution pattern of wintering waterfowl in the Baltic Sea, national waters or region of interest. The indicator is expressed as spatial grid with cell values expressing abundance or density of wintering waterbirds.</p> <p>For the calculation of the indicator all counts of divers, grebes, cormorants, swans, geese, ducks, mergansers, coots and auks are pooled.</p>
Relationship of the indicator to marine biodiversity	The indicator reflects health of marine ecosystem and importance of its different parts for the marine biodiversity in spatially explicit way.
Relevance of the indicator to different policy instruments	MSFD descriptor 1 (habitat level/condition of the typical species and communities ecosystem level/composition and relative proportions of ecosystem components)
Relevance to commission decision criteria and indicator	<p>1.6.1. Condition of the typical species and communities</p> <p>1.7. Ecosystem structure</p> <p>1.7.1. Composition and relative proportions of ecosystem components (habitats and species)</p>
Method(s) for obtaining indicator values	<p>Field data collection: using any of the standard methods designed for offshore counts using ships or planes (Komdeur <i>et al.</i> 1992, Petersen <i>et al.</i> 2005, Camphuysen <i>et al.</i> 2006, Nilsson 2012).</p> <p>Indicator calculation: using density surface modelling approach – GAM or machine learning models based on count data from line transects and spatial covariates (Hedley, Buckland 2004, Elith <i>et al.</i> 2011, Drew <i>et al.</i> 2011). Counts of all species included in this indicator (divers, grebes, cormorants, ducks, geese, swans, mergansers, coots, auks) are pooled. The result of the computation is a grid where each cell value represents estimated abundance/density of all wintering waterbirds in the particular location.</p>
Documentation of relationship between indicator and pressure	<p>Being a multi-species indicator it accumulates the impacts of pressures affecting each of the species used in indicator calculation. The indicator responds to an ensemble consisting of combinations of the following pressures:</p> <ul style="list-style-type: none"> eutrophication oil pollution/shipping by-catch hazardous substances fishing pressure hunting fisheries discards coastal development wind energy sand and gravel extraction climate change <p>The most pronounced are effects of eutrophication, bycatch and oil pollution. Indicator is able to show local effects of these impacts. The indicator might be scale sensitive in this regard.</p> <p>Latest knowledge and summary of related studies are given in Skov <i>et al.</i> 2011</p> <p>Contribution of each particular pressure on the indicator can be assessed by including additional explanatory variables characterising the level of the pressure as covariates in the statistical model used for the indicator calculation.</p>
Geographical relevance of indicator	<ol style="list-style-type: none"> 1. Local 2. Regional 3. National waters 4. Baltic Sea wide

How Reference Conditions (target values/thresholds) for the indicator were obtained?	Reference conditions are based on proportion of occupied ecogeographically suitable grid cells. Target level is 100%. The actual GES threshold for each species still needs to be defined.
Method for determining GES	Currently GES levels have not been set. The method itself is based on proportion of ecologically, climatically and geographically suitable grid cells that are occupied by wintering waterbirds. More ecological studies are needed to set GES threshold.
References	<p>Aunins A., Kuresoo A., Luigujõe L. 2012. Distribution and numbers of birds in the Gulf of Riga 2011. Deliverable 3.3. Gulf of Riga as a resource for wind energy –GORWIND. Riga and Tartu, Latvian Fund for Nature and Estonian University of Life Sciences.</p> <p>Camphuysen C.J., Fox A.D., Leopold M.F. & Petersen I.K. 2004. Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K.. Report commissioned by COWRIE for the Crown Estate, London. Royal Netherlands Institute for Sea Research, Texel, 38 pp.</p> <p>Drew C.A., Wiersma Y.F., Huettmann (eds.) F. 2011. Predictive Species and Habitat Modeling in Landscape Ecology. Concepts and applications. 1st edition. Springer, 314 p.</p> <p>Elith. J., Phillips S.J., Hastie T., Dudik M., Chee Y.E., Yates C.J. 2011. A statistical explanation of MaxEnt for ecologists. Diversity and Distributions 17: 43 – 57.</p> <p>Komdeur, J., Bertelsen, J. & Cracknell, G. (Eds.). 1992. Manual for Aeroplane and Ship Surveys of Waterfowl and Seabirds. IWRB Special Publication No. 1, Slimbridge, UK, 37 p.</p> <p>Petersen, I.K, Fox, A.D. 2005. An aerial survey technique for sampling and mapping distributions of waterbirds at sea. Department of Wildlife Ecology and Biodiversity, National Environmental Research Institute. 24 pp.</p> <p>Skov. H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J.J., Kube J., Kuresoo A., Larsson K., Luigujõe L., Meissner W., Nehls H.W., Nilsson L., Petersen I.K., Roos M.M., Pihl S., Sonntag N., Stock A., Stipniece A., Wahl J. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers, Copenhagen, 201 pp.</p>

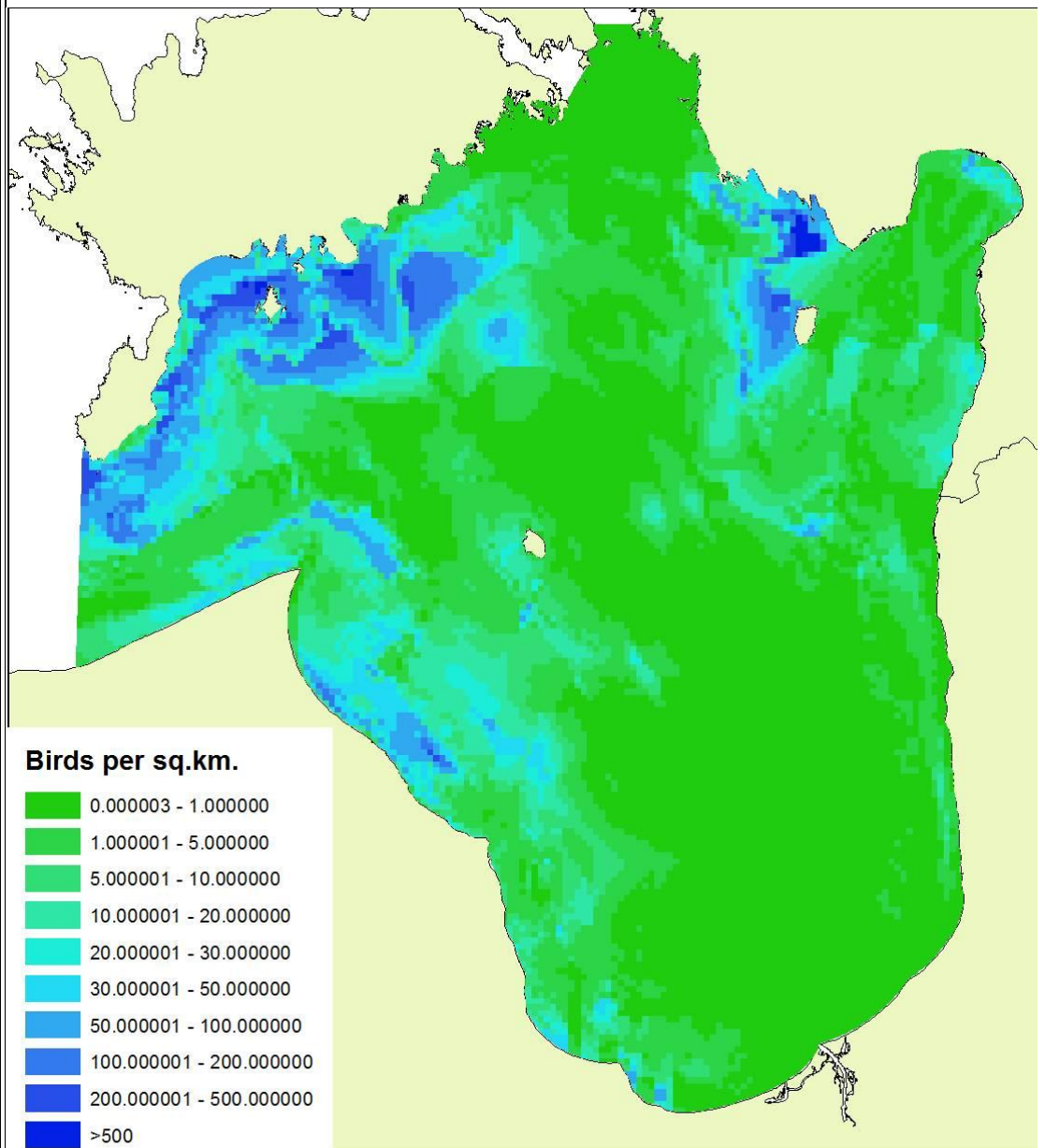


Figure 1. Example draft indicator for the Gulf of Riga in 2012 (from Aunins *et al.* 2012): All waterbirds (divers, grebes, cormorants, swans, geese, ducks, mergansers, coots, auks) in winter 2012.