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PII: S0924-7963(16)30298-6
DOI: doi: 10.1016/j.jmarsys.2016.09.008
Reference: MARSYS 2879

To appear in: *Journal of Marine Systems*

Received date: 14 April 2016
Revised date: 7 September 2016
Accepted date: 19 September 2016

Please cite this article as: Knuuttila, Seppo, Räike, Antti, Ekholm, Petri, Kondratyev, Sergey, Nutrient inputs into the Gulf of Finland: Trends and water protection targets, *Journal of Marine Systems* (2016), doi: 10.1016/j.jmarsys.2016.09.008

Nutrient inputs into the Gulf of Finland: Trends and water protection targets

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Keywords: Gulf of Finland, nutrients, inputs, trends, reduction targets

Abstract

The catchment area of the Gulf of Finland (GOF) is nearly 14 times larger than the sea area and is home to 12 million people. The GOF is thus heavily polluted by nutrients, and eutrophication is one of the major environmental concerns. The aim of this study was to estimate trends in the nutrient input and to evaluate whether current water protection targets (national, EU, HELCOM) will be achieved. We used both national and international (HELCOM) databases to evaluate nutrient inputs from the surrounding three countries (Estonia, Finland and Russia). The average nitrogen (N) input into the GOF was 112,000 t y^{-1} for the period 2009–2013, with rivers responsible for 79%, direct point sources accounting for 10% and deposition for 11% of the input. Phosphorus (P) input was 4,270 t y^{-1}, of which rivers were responsible for 88% and point sources for 12%. The largest proportions (61% for N and 73% for P) of the inputs came from Russia, despite the specific areal inputs (input divided by land area) being smaller than in Estonia and Finland. The changes in nutrient inputs into the GOF are largely due to the changes in Russian inputs, and in particular changes in the nutrient fluxes of the River Neva. The latest available flow-normalised data showed that N export decreased slightly from 1994 to 2010, while flow-normalised P export had clearly decreased by 2010. The P input ending up in the GOF as a whole has decreased significantly over the past 10 years as a result of the re-construction of wastewater treatment infrastructure in St Petersburg and following control of a P leak at the Phosphorit factory in 2012. This measure also explains the steep decrease in riverine P export during recent years. Further reduction of inputs to meet the ambitious nutrient reduction goals of HELCOM and of WFD seems to be a challenge for Finland and Estonia in particular. Russia appears to have already reached approximately 90% of the BSAP's reduction target, with fulfilment of the remainder of the P target appearing a fairly realistic aim as well.