RBMP for the North Baltic river basin district in Sweden location of hot spot areas, mitigation options and effects

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As many as 50 % of the 1120 surface water bodies in the North Baltic river basin district in Sweden are not reaching Good ecological status due to eutrophication, mainly caused by diffuse losses from arable land. For agricultural dominated rivers the reduction goals for phosphorus will be up to 80 % of the anthropogenic load and about 40 % for nitrogen and a wide range of measures is therefore necessary.

To locate heavily eutrophied areas and hot spots, direct measurements of water quality for the classification of ecological status were the primary source. In addition, loads from arable land and other diffuse and point sources were quantified with simulation models. Leaching coefficients for arable land was calculated with the field-scale models ICECREAMDB and SOILNDB for phosphorus and nitrogen, respectively, while nitrogen and phosphorus transport, retention and source apportionment was calculated with the hydrological water quality model HBV-NP.

The part of the draft RBMP declaring the legally binding measures addresses national-, county- and municipal authorities. It has a broad spectrum and only exceptionally are specific physical measures mentioned:

- The Board of Agriculture need to prioritize environmental extension, change the subsidiary program and regulate the diffuse losses from agricultural land. The regulation should especially consider appropriate buffer zones and purification of drainage water.
- The County Boards need to revise the authorizations for activities under licence requirement, need to sanction mandatory environmental control programs, and prioritize measures in areas where Good ecological status is not achieved.
- The municipalities need to prioritize their surveillance to businesses affecting the water status.

The estimation of effect and cost is based on three specific measures: vegetated buffer zones, small constructed wetlands for sedimentation of particles and ‘normal’ wetlands. These measures are selected due to their cost efficiency, potential, and practicability. The calculated reductions based on these measures are estimated from measurements in Sweden or neighbouring countries. Vegetated buffer zones are estimated to reduce anthropogenic P losses with 2-6 % and N losses with 1 %. Small constructed wetlands encompassing drainage water from 80 % of the agricultural land will reduce the P losses with 10-20 % and N losses with 3 %. Finally, ‘normal’ wetlands encompassing drainage water from 80 % of the agricultural land will reduce the P losses with 12 % and N losses with 16 %. About 2.5 % of the arable land will be taken out of production and designated to physical measures resulting in a total reduction of up to 20-40 % for phosphorus and 20 % for nitrogen in relation to the anthropogenic gross load.

The estimated effect of the proposed measures is uncertain due to a number of reasons. Reasons, which also partly impedes us from proposing a more detailed mitigation program containing a wider range of specific physical measures. Examples of uncertainties are missing data, uncertain effect of measures and deficiencies in the applied models. Examples of missing data are a poor statistics on when the farmers apply manure (e.g. quantities under less favourable conditions), poor mapping of soil properties such as texture, soil phosphorus and slope. Missing data for calibration of models is also one of the mayor drawbacks.

Important research funding organizations have launched special campaigns directed to the area of phosphorus losses from arable land and national authorities have started to collect appropriate data. This will most likely result in additional cost-efficient mitigation options in the years to come.

References:

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