

THE DANISH CONCEPT TO MITIGATE NUTRIENTS IN DRAINAGE DISCHARGE: FOUR NEW OPTIONS

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Pollution of surface waters and shallow groundwater with nitrogen (N) and phosphorus (P) is an urgent problem in most regions of Europe and in many other parts of the world. A significant pollution source is the nutrient runoff from intensively farmed agricultural land either via tile drainage, ditches, soil leaching and/or surface runoff. For the improvement of water quality both the restoration of wetlands but also the establishment of constructed wetlands are two important strategies. In Denmark, a new era of targeted agro-environmental nutrient regulation has been accepted as part of the Agricultural Package adopted by the Danish Parliament in 2016. Thereafter farmers were allowed to increase their fertilization to the economic optimum in exchange of implementing collective and targeted measures mitigating nutrient losses from fields. In areas where groundwater or estuaries are threatened by excess N and where natural N removal in groundwater is presumable low have targeted adoption of supplementary catch crops been implemented as open calls for farmers. The collective measures include large schemes for wetland restoration, surface flow constructed wetlands targeting drainage losses, afforestation and taking organic soils out of production. To this end a new national program with catchment officers have been established with the aim to bridge farmers, municipalities and national agencies. Finally, an improved sub-catchment based targeted nutrient regulation will be adapted from 2019 and include new mitigation measures such as integrated buffer zones (IBZ), subsurface flow constructed wetlands with biofilters (SSCW), saturated buffer zones (SBZ) and controlled drainage (CD) which are all currently being tested in several larger innovation and research projects (BIOWATER, BUFFERTECH, MMM, InnoDrain). For these research efforts it is essential to know the processes that control the local N and P removal efficiencies of the measures, the performance over time, the need for management and the cost-efficiency. The paper will provide basic information on four new mitigation strategies (IBZ, SSCW, SBZ and CD) and compiles important aspects on their implementation in the landscape.

BIO: Dr. Zak has over 15 years' experience in freshwater and wetland-related environmental research, land use change, conservation, restoration and worked on several freshwater-related projects. His work is dedicated to interdisciplinary research integrating biology, ecology, microbiology and biogeochemistry across aquatic and terrestrial systems.

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