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Publication date:
2013

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Jensen, C. L., Jacobsen, B. H., Olsen, S. B., Dubgaard, A., & Hasler, B. (2013). *When is improving water quality too costly ?* Global Water Forum. GWF Discussion Paper, No. 1336



When is improving water quality too costly?

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Discussion Paper 1336

September 2013

Improving water quality is good for society in general, but there can be places where this improvement is too costly from a societal perspective. This paper describes a screening process used on Danish catchments, which can help to assess whether improvements needed in order to fulfill WFD requirements may be too costly.

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Keywords: WFD, costs, benefits, water quality, Denmark

The EU's Water Framework Directive (WFD) is implemented as an instrument to obtain good ecological status in the water bodies of Europe. The Directive recognises the need to accommodate social and economic considerations to obtain cost-effective implementation of the Directive. In particular, EU member states can apply for various exemptions from the objectives if costs are considered disproportionate when compared to potential benefits.

Lack of data, however, and probably to some extent lack of trust in Cost-Benefit Analysis (CBA), have prevented member states from carrying out proper analyses of the relationship between costs and benefits as

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guidance for the evaluation of disproportionate costs. From a welfare-economic cost-benefit analysis point of view, an exemption will be justified if the costs exceed the benefits. However, since benefit estimates are most often considered more uncertain than costs, the costs should be somewhat higher than the benefits before exemptions are justified. How much higher is undefined.

In a recent paper produced by researchers from the University of Copenhagen and the University of Aarhus in Denmark¹, a suggestion is put forward on how to deal with calculations of costs and benefits for disproportionate cost assessment at the national scale. This paper addresses the costs and benefits of achieving good ecological status and demonstrates a methodology designed to investigate disproportionate costs at the national level. While many analyses have been conducted at the local level trying to estimate local costs and benefits, few have tried to assess this at the national level.

The paper's aim is to provide a practical screening approach for the identification of catchments where the costs appear to exceed the benefits. In these catchments further, more precise assessments of both costs and benefits might be required for the final

assessment of disproportionate costs and thus potential exemption from the WFD.

In the suggested screening approach, the costs estimates are based on the costs of the required measures to reach the target of Good Ecological status, which in a Danish context has been translated into a required reduction in nitrogen losses to the environment. This includes both measures already decided and further measures required to reach the nutrient load reduction target.

The measures included in the first River Basin Management Plans from 2011 build on measures that reduce emissions from urban wastewater and non-point agricultural pollution. Urban wastewater pollution is reduced through investments in wastewater treatment plants, sanitation treatment, and establishment of delay pools for rain water discharges. The measures aimed at reducing non-point agricultural pollution include catch crops, riparian zones along streams, establishment of wetlands, and reduced cutting of water weeds in streams. Other measures include investments in the reopening of culverted watercourses, removal of stream obstructions, and stream restoration. Further proposed, but not yet implemented, measures include planting additional catch crops, wetland restoration on agricultural land, higher utilisation of animal manure, planting

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energy crops, or simply taking land out of production. It is calculated that with a cost-effective mix of measures in each of the 23 catchments in Denmark the nutrient load reduction targets will be reached.^{2,3}

The benefit estimations in the study are based on the Benefit Transfer method which draws from a primary valuation stated preference survey conducted for the Odense Fjord basin as part of the AquaMoney project. The valuation study in the AquaMoney project was performed as a choice experiment concerning the benefits of WFD related improvements of the Odense River catchment, comprising Odense river, the 10 largest lakes on Funen, and Odense Fjord.⁴ Benefit transfer between countries and areas was tested in Bateman et al. (2011),⁵ and similar analyses were also conducted between Danish areas in Källström et al. (2011). The conclusions from both studies were that the design of the Odense river basin study is recommendable for benefit transfer.⁵ In light of these findings, an estimate of the benefits to each person for a given water quality improvement was calculated. Then, based on the quality improvement required for streams, lakes, and coastal waters in each of the 23 catchments, an overall benefit estimate was calculated.

The screening procedure is based on a relatively conservative CBA, as a first step

towards identifying areas where costs may be disproportionate. The authors provide an empirical example by applying the proposed screening procedure to a total of 23 river basin areas in Denmark where costs and benefits are estimated for each of the areas.

A potential issue with this approach is that the data required needs to be at a level which is likely to be found in many countries. This might increase the uncertainty in relation to specific catchments, but does, on the other hand, allow for a general CBA of water quality which no EU countries have performed so far. Due to the uncertainty related to both the benefit and the cost estimates, a precautionary approach is used to ensure that all catchments where the costs might be higher than the benefits are selected for further analysis.

The results of the research suggest that costs could be disproportionate in several Danish river basins. A sensitivity analysis further helps to pinpoint two or three basins where we suggest that much more detailed and elaborate CBAs should be targeted in order to properly ascertain whether costs are indeed disproportionate.

EU countries are currently implementing the measures decided in the first WFD planning period focusing on improving the water quality in 2015. However, work has already

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begun on the preparation for the 2nd planning period which aims to have plans for implementation towards 2021. As such, the screening method described could inform EU member states as to how a CBA analysis can

be undertaken with the available data, and may therefore help to focus on where the costs of achieving a high water quality might be too high in the second planning period.

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<http://www.tandfonline.com/doi/abs/10.1080/21606544.2013.785676#preview>

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