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Disproportionate cost assessment according to the WFD:

Comparison of applications of two approaches in the catchment of the Stanovice reservoir (Czech Republic)

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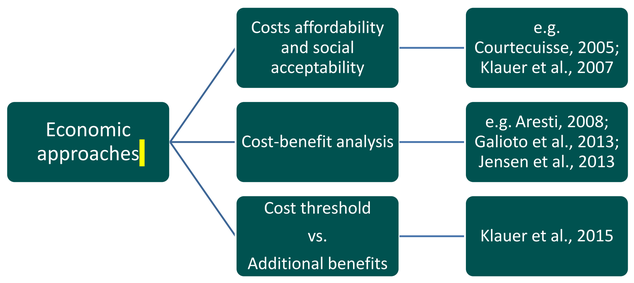
I. INTRODUCTION

The EU Water Framework Directive (WFD) has instituted a number of requirements, including achievement of a "good status" of all water bodies. The initial state of almost all the water bodies in 2000 was far from the "good status" required by the directive. Beside the pressure to improve the water quality rapidly, achieving the "good status" has had a major impact on water management and national economies. Achieving the "good status" is often impossible for many objective reasons. In justified cases, member states may request an extension of the deadline or less stringent objectives. Large investments compared to benefits may be one of the reasons.

The WFD does not provide a clear explanation of how the cost proportionality should be assessed. This has led to development of many approaches across Europe. There are three basic groups of approaches (see the scheme on the right). Among others, the Czech official methodology based on cost-benefit analysis and the German "new Leipzig approach" based on cost thresholds were introduced in 2015. Both approaches estimate costs of achieving the "good status", but differ significantly in evaluating benefits.



Source: Own analysis

The purpose of this poster is to compare two of the existing approaches: the official Czech methodology and the "new Leipzig approach". Both approaches were used to evaluate cost proportionality of reaching the "good status" at Stanovice water reservoir.

II. METHODOLOGY

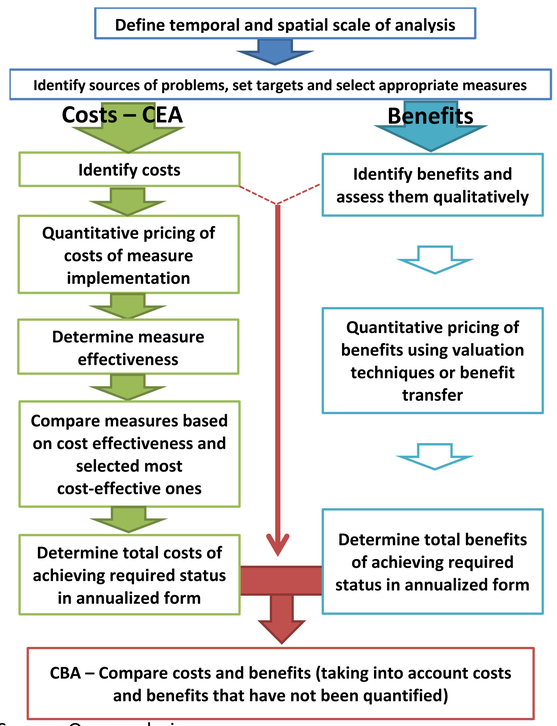
As mentioned above, countless approaches and methodologies have been developed to evaluate cost proportionality of reaching the "good status". For the purposes of this poster, the Czech and German methodologies were chosen, as they were both used to test proportionality of achieving the "good status" at Stanovice water reservoir and can therefore be compared easily. Moreover, each methodology assesses proportionality in a significantly different way. The basic characteristics are summarized in the table.

Both approaches quantify costs associated with implementation of each measure that is available to decision makers. Combination of the measures is chosen to achieve the "good status". Cost-effectiveness analysis may be used for optimisation and selecting the most efficient measures to reach the target.

Characteristics	Czech approach	New Leipzig approach
Based on	Cost-Benefit Analysis	Criteria (costs vs. cost threshold)
Measure selection	Cost-Effectiveness Analysis	Cost-Effectiveness Analysis
Benefits	WTP/WTA	Based on a scale
Uncertainty	Sensitivity analysis	Not tackled
Costs compared with	Benefits	Cost threshold
Timescale of comparison	Annual (annualized value)	Total value by the deadline of the achieving "good status"

Czech approach

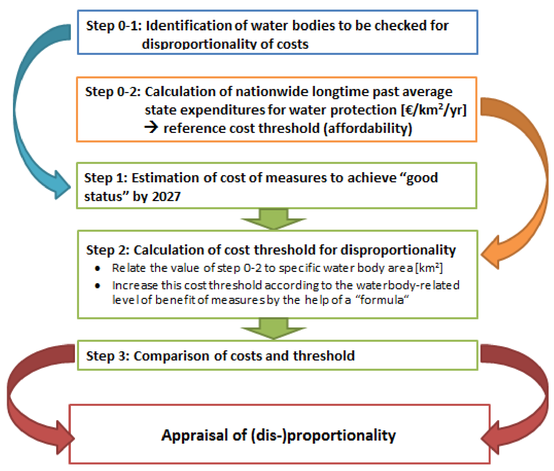
- Slavíková et al. (2015)



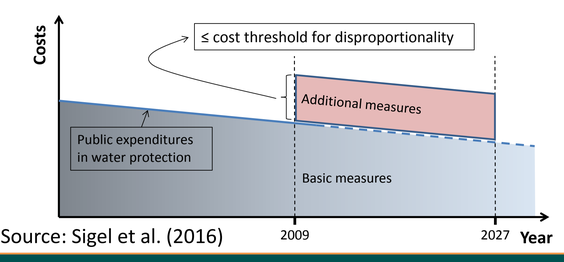
Source: Own analysis

New Leipzig approach

- Klauer et al. (2015)



Source: Sigel et al. (2015)



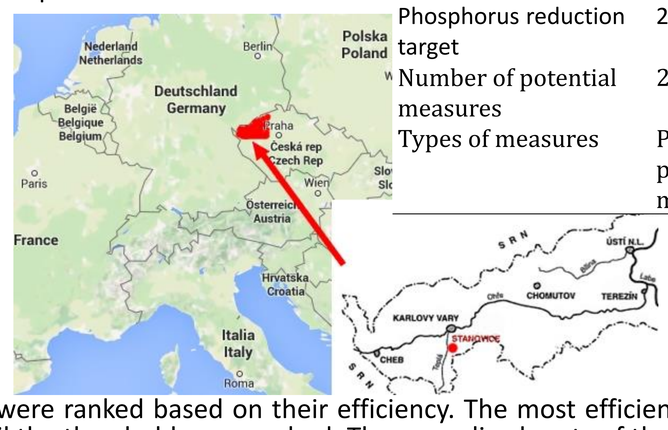
Source: Sigel et al. (2016)

III. CASE STUDY OF STANOVICE CATCHMENT

According to Povodí Ohře (2009), Stanovice reservoir currently fails to reach the "good status" required by the WFD. The water quality is unsatisfactory mainly as a result of anthropogenic effects in the catchment area such as population and agriculture. Specifically, excessive phosphorus inflows are responsible for most of the damage.

The main purpose of the reservoir is supplying drinking water for the Karlovy Vary region. Minor functions include electricity generation, fishery and flood protection for Karlovy Vary. Phosphorus contamination is divided evenly between point sources (wastewater) and diffused sources (mainly agriculture).

Characteristics	Stanovice reservoir catchment
Area	92 km²
Location	Western Bohemia
Natural and other conditions	Homogeneous
Phosphorus reduction target	200 kg/year
Number of potential measures	243
Types of measures	Point and Agricultural phosphorus inflow measures



All the possible measures were ranked based on their efficiency. The most efficient ones (99 in total) were then summed up until the threshold was reached. The annualized costs of the selected measures were calculated at EUR 42,200.

IV. RESULT: Czech methodology

The Czech methodology recognizes three distinct main categories of benefits: recreational benefits, lower costs of drinking water treatment, and benefits of ecosystem services. Recreational benefits are usually the most important category. However, swimming is prohibited in the reservoir, which means only aesthetic benefits are generated. Another important source of benefits is reduction in costs of drinking water treatment. Monetizing these two groups gives EUR 282,758 a year. This number is not final as authors were not able to evaluate several groups of benefits such as the increase in property values near the reservoir. Unfortunately, no data are available. Additionally, minor benefits are generated by ecosystems, specifically flood protection, soil protection and higher biodiversity.

V. RESULT: New Leipzig approach

The average past long-term state expenditures from 1994 to 2009 were adjusted for inflation and averaged out to give annual spending of EUR 527 million in the Czech Republic. The annual spending on Stanovice was determined - EUR 614,889. "Effort factor", which gives us information by how much we can afford to increase costs compared to the past, was calculated based on the objective distance (distance to the "good status") and additional benefits.

$$effort\ factor = \frac{2}{18} * objective\ distance + \frac{1}{18} * additional\ benefits$$

Despite struggles with data availability (half of the values are unknown), authors determined the objective distance to be 0.2.

The effort factor suggests additional costs can increase by 10% in each year compared to the past long-term average expenditures. Although the time period starts in 2009, no measures were implemented prior to 2016. It is therefore reasonable to accumulate the costs for the twelve remaining years only, yielding EUR 506,402. Reaching the "good status" at Stanovice water reservoir is possible for EUR 506,402. However, according to the "new Leipzig approach", it is proportionate to spend EUR 1,106,853 to reach the goal by 2027.

Ecology and nature protection	Freshwater provision and treatment	Flood protection	Soil protection	Tourism, recreation, cultural heritage, landscape	**Total additional benefit (average)**
1	2	1	2	1	**1.4**

VI. CONCLUSION

Results from both studies show that the methodologies are not in contradiction. They both recommend implementing measures to reach the "good status" as the costs seem to be proportionate. Also, the gap between the costs and benefits/allowed increase in spending is quite large. However, there are some considerable differences between the methodologies, each having its pros and cons.

First, the "new Leipzig approach" uses public expenditures to determine a cost threshold. This is questionable, since the expenditures do not necessarily relate to water quality improvement. Therefore, large projects with no real impact on water quality might skew the results. Another possibly problematic area of the "new Leipzig approach" is evaluation of benefits. While monetizing different benefits in the Czech methodology is certainly challenging, assigning an integer value to all preselected groups in the "new Leipzig approach" might be even trickier.

Among other positives, the "new Leipzig approach" has an advantage of not being too time and cost - intensive.

Literature (selected)

[1] Klauer B et al. (2015) Unverhältnismäßige Kosten nach EG-Wasserrahmenrichtlinie – Ein Verfahren zur Begründung weniger strenger Umweltziele. Helmholtz-Zentrum für Umweltforschung – UFZ Department Ökonomie, Leipzig

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[4] Slavíková L et el. (2015) Methodology of Exemption Application in Case of Cost-disporoportionality of achieving the "Good Status" on water bodies. Výzkumný ústav vodohospodářský T. G. Masaryka, v.v.i., Prague

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