Department of Environmental Science
AARHUS UNIVERSITY

Results and findings from the BONUS GO4BALTIC project –

Inputs for BSAP update with focus on COST EFFECTIVENESS

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Berit Hasler

BONUS
SCIENCE FOR A BETTER FUTURE OF THE BALTIC SEA REGION

Go4 Baltic

Outline

- **Introduction to BONUS GO4BALTIC related to BSAP update**
- **Introduction to Cost-effectiveness analysis**
- **Cost-effective measures to reduce eutrophication in the Baltic Sea – and policy implementation**
- **Cost-effective instruments to achieve the nutrient load reductions**
- **What can be learnt for other descriptors and pollutants?**
- **GO4BALTIC relevant results for the BAU**
- **Sum up**

BONUS GO4BALTIC has studied:

- Policies for cost-effecient nutrient load reductions in the BS region - at present, in the past and the future
- Dealt with ”Baltic sea unaffected by eutrophication” BSAP target
- Coherence and synergies with climate policies

Photo: Colourbox

The update of the BSAP – what can be learnt from GO4BALTIC and other economic projects?

- **The costs of the implementation of the BSAP can be explained.**
- **One reason: Country-wise reductions of nutrient loading are not informed by economic and policy analysis.**
- **Allocation not cost-efficient – unnecessarily expensive (Ollikainen and Honkatukia 2001, Gren 2008, Elofsson 2010, Hasler et al 2014, Nainggolan et al 2018 and Reusch et al., 2018).**
- **Lagging behind implementation also explainable: Since the first BSAP research on policy instruments, incentives and mechanisms has developed hugely – not much use in practice. Gap between economic knowledge and the command-and-control-based approaches used for the protection of the Baltic Sea.**

Cost-effectiveness
Approach as proposed by HELCOM secretariat

1. Identification of measures – and implementation approaches
2. Assessing effectiveness in terms of achiving the target, e.g. nutrient load reductions to the Baltic Sea
3. Estimating joint effect of measures – how implementation of one measure influences the effect of another (e.g. upstream/downstream linkages). How implementation affect both intended (nutrients) and side effects, e.g. climate.
4. Estimating the costs per unit, including lost profits, investment and maintenance costs- and control for society
5. Identification of the optimal cost-effective set of measures and instruments to implement them

Cost-effective reallocation of abatement between countries- GO4BALTIC Analysis

- Ex-post cost-effectiveness analysis of nitrogen load reductions to the Baltic Sea (Counterfactual) made between 1996 and 2010 made in GO4BALTIC
- Results: the net nitrogen reductions achieved could have been obtained at 12% of the realized costs, had there been a reallocation of abatement between countries. (analysis by cost minimization model)
- The total abatement budget could, if had been used cost-effectively, have doubled the net nitrogen load reduction.
- How? Compensation between countries can provide a better allocation. Create a market.

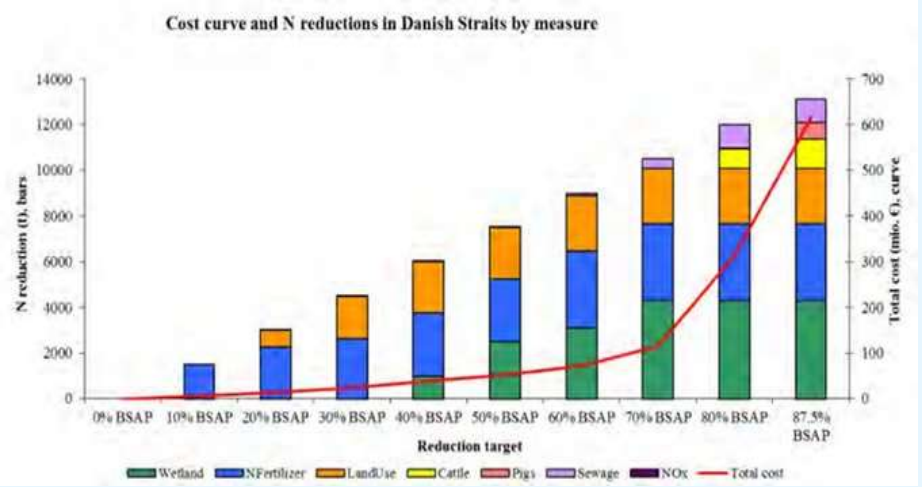
So, what is an cost-effectiveness analysis?

Cost-effectiveness analysis

- Improving water quality in the Baltic sea is an externality problem – the water quality and water pollution do not have a price
- Economic analyses are important – to allocate scarce resources to conflicting and ambitious demands, e.g. the BSAP targets
- The externality problem – no price – means that we have market failure that have to be adressed by policy
- And as economists, we advocate that policy should be guided by economic analyses of how to use resources most cost-effecient.

Cost-effectiveness analysis – what?

- Allocate smallest amount of resources to the pollution abatement, to achieve the target (e.g. BSAP targets on nutrient load reductions).
- Many abaters, spread around the Baltic sea. How should the target be shared?
- Cost-effeciency theorem: To
- achieve least cost solutions the marginal costs equalised over all abaters.
- When it is more costly for abater X than abater Y at the margin – it is effecient to move abatement from X to Y until the marginal abatement cost is equal.

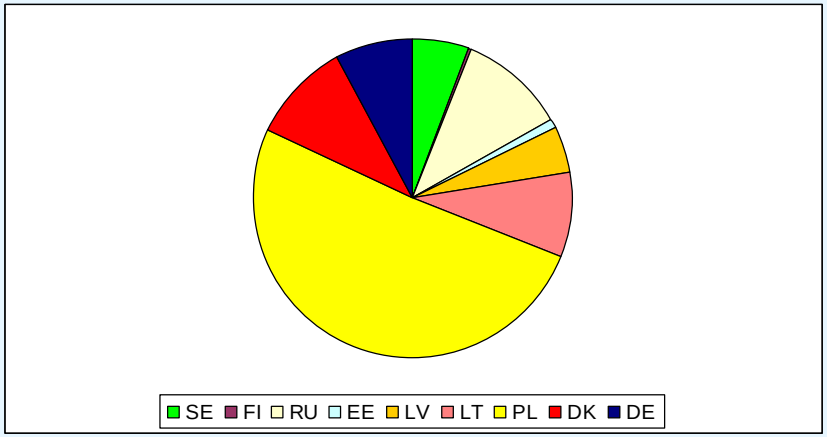


Least cost solutions and distribution of effort

- Least costs solutions means that the abatement efforts will not be equal across abaters
- When abatement costs differ low cost abaters will undertake more of the effort, but not all of it.

- Perman et al: natural ressource and environmental economics 2003

Figure 3: Distribution between countries of the total annual costs of delivering the nutrient reduction targets of Table 5 using the lowest cost combination of drainage basin-specific abatement measures.



Cost-effectiveness analysis – how?

Ideally, cost-effectiveness analysis should be done by

- Development and use of cost-minimisation models to identify least-costs combination of measures
- Inclusion of an as large as possible set of measures
- If pollutants cause different harm at different locations, such as nutrient loads do, spatial scale should be taken into account as far as possible
- When the cost-effecient set of measures and the allocation of them is found, assessment of implementation by policy instruments is important. How to achieve the cost-effecient combination and allocation of measures

Other pollutants than nutrients, other descriptors, other SDG's…

- For pollutants where there is a lack of knowledge more pragmatic solutions and less datadriven might be necessary, comparing average cost/effect ratios
- But remember to compare cost/effect ratios for the same level of target, always
- Effects are important as well
- Also important to consider implementation, not only cost of measures in terms of lost income/profits.

Nutrients – what can be done?

- New measures and/or look at policy implementation?
- Eco-innovation and technological development
- Results from BONUS GO4BALTIC points at the policy implementation and that large gains can be made by more cost-effecient implementation as well as by eco-innovations and technological developmend

Implementation of measures nutrients and climate

- Tax or quantitative limits on non-point runoff from fields is impossible,
- Main approach in most countries: use of restrictions on fertilizer and/or land-use, and voluntary participation to agri-environmental schemes.
- GO4BALTIC has studied both approaches
- **Focus on technological development and**
- **Focus on the voluntary contrats/subsidies, as these findings might be important for the CAP2020 and revison f the RDP**

Regulation and incentives for innovation, fostering smarter and less costly abatement

- **Three questions must be asked:**
- **(1) Do current policies and markets provide sufficient incentives for innovation?**
- **(2) If not, how can the incentives be improved?, and**
- **(3) Will the novel technologies be adopted by the intended users?**

Regulation and the effect on innovation – a Swedish example

- In GO4BALTIC we examined the effects of environmental regulations on innovations in nitrogen and phosphorus management technology in the wastewater treatment sector and the agricultural sector.
- Results: increased regulation induced innovation in the wastewater treatment sector, both in the short and long run.
- Short-run effect: 40-70% , immediately after introduction of new environmental regulations.
- A corresponding effect not identified in the agricultural sector.
- Difference: Policy design! Performance standards, setting limits on emissions, are applied in the wastewater sector, Design standards-specific technologies required or subsidized in the agricultural sector.

Further results

The Danish regulation of fertilisers has resulted in large changes in manure handling and fertliser application, technological development

Farmers' propensity to adopt manure handling technologies: BONUS GO4BALTIC Farm Survey: the drivers for investing in and using manure spreading equipment, slurry tanks, and precision technology for fertiliser application were investigated.
The size of the farm, is important for the uptake of all three technologies.

Photo: Colourbox

Voluntary measures

- Designing effective voluntary compensation programs for achieving environmental targets in agriculture faces three basic challenges:
- i) how to make it effective in water protection,
- ii) how to invite the farms that could contribute the most to the goals of the program, and
- iii) how to ensure that farms really do what is promised?

Advise for the post CAP 2020 based on Farm survey in 5 countries

Who: Farmers in 5 countries around the Baltic sea (Sweden, Finland, Denmark, Poland and Estonia):

Type: pig, cattle, crops,

#: 300-600 in each country in all 2400 responses, representative size (>10 ha), region.

Production, fertiliser application/use, manure handling, manure trading, agri-environmental schemes.

› Differences between countries, farm types, regions, soil types etc.

› Large heterogeneity is found in farmers willingness to accept contracts, including subsidy level

› **Policy advise is that subsidies should be differentiated to facilitate a larger uptake**

› Uptake of contracts and resulting effects on nutrient loads to the sea and GHG emissions

Main findings relevant for HELCOM update BSAP

- Agriculture important for nuttrient load reductions: findings support that there is large heterogeneity between farms, regions and countries
- Cost-effective implementation of nutrient load reductions and climate mitigation require flexibility for farmers when choosing measures
- Instruments to facilitate that : the findings points at economic instruments such result based subsidies and contracts, compensations between countries as well as trade
- Subsidies should be differentiated and result based, supporting ongoing proces in CAP
- Learning between countries is important. Coordination of policies.

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Findings relevant for the BAU – structural development of agriculture in the region

- Changes in the livestock sector influences nutrient handling and loads
- Likely an agglomeration of animals and manure until 2030
- Results can be of interest for implementation of EU fertiliser policy
- Manure fertilisation decrease when distance increase from the farm
- Reductions of herd sizes are effective for both nutrient loads and climate