Complementary guidance on disproportionate cost limit, when assessing disproportionate costs according to the Swedish Water Management Ordinance (2004:660)

Report 2024:13

Swedish Agency
for Marine and
Water Management

Complementary guidance on disproportionate costs limit, when assessing disproportionate costs according to the Swedish Water Management Ordinance (2004:660)

This report has been produced by the Swedish Agency for Marine and Water Management. The Agency is responsible for the content and conclusions of the report.

Author: Associate Professor Tore Söderqvist, Holmboe & Skarp AB

This report has been produced by the Swedish Agency for Marine and Water Management. The Agency is responsible for the content and conclusions of the report. The report has been translated into English using the European Commission eTranslation language tool, eTranslation (2025) version 16.2 (https://webgate.ec.europa.eu/etranslation/translateDocument.html).

Author: Associate Professor Tore Söderqvist, Holmboe & Skarp AB

ISBN: 978-91-89329-90-4 Cover image: Maja Lagervall

Foreword

In this report, The Swedish Agency for Marine and Water Management provides guidance on how a limit for disproportionate costs can be determined, based on the agency's right to issue regulations under the Water Management Ordinance (2004:660). The guidance is a support in the application of Chapter 4 of the Water Management Ordinance on environmental objectives and relevant provisions in the Swedish Agency for Marine and Water Management's regulations. The guidance has been developed in collaboration with the Geological Survey of Sweden to also include groundwater. The main principles in assessing disproportionate costs do not differ between surface water and groundwater.

The guidance is primarily intended to serve as a guide for the experts within the county administrative boards, including the regional water authorities, who assess disproportionate costs under Chapter 4 of the Water Management Ordinance. The processes and assessments dealt with in the guidance are complex and thus require that those who practically apply the guidance have prior knowledge in the field.

Gothenburg, 2024-06-24,

Johan Kling

Contents

1 Introduction

The background to this guidance is the assessment of disproportionate costs under Chapter 4 of the Water Management Ordinance (2004:660) (VFF). There are EU-wide guidance documents on how to assess disproportionate costs.[1] The guidance documents set out a number of minimum requirements that should be met for the assessment. These are formulated as follows:

As there are uncertainties around the assessments of costs and benefits, the regional water authorities need to consider that

- *Disproportionality should not begin at the point where measured costs simply exceed quantifiable benefits;*
- *the assessment of costs and benefits will have to include qualitative costs and benefits as well as quantitative;*
- *the margin by which costs exceed benefits should be appreciable and have a high level of confidence.*[2]

The guidelines also state that costs and benefits are to be interpreted as economic costs and economic benefits respectively. However, as has been noted in a number of studies[3] , the guidelines do not specify the limit for when costs become disproportionate, i.e. they do not specify what characterises a margin that is "appreciable" and "has a high level of confidence". This definition is considered a political issue for each Member State to decide. Therefore, the attempts at specification that have been made in other Member States are not necessarily transferable to Sweden.

The purpose of this guidance is therefore not to propose a limit, but it does aim to provide a number of considerations that could help in the discussion on what limit to set and how monetised and non-monetised costs and benefits can be addressed in the assessment of disproportionality. For guidance regarding a specific disproportionate costs limit, see the guidance document from the Swedish Agency for Marine and Water Management ”Guidance on time extensions and less stringent objectives” (report 2023:14).

2 Cost-benefit analysis as a basis for assessing disproportionality

Since it is economic costs and economic benefits that should form the basis for the assessment of whether the costs are disproportionate or not, cost-benefit analysis (CBA) is a natural method

[1] The key guidance documents in the Common Implementation Strategy for the Water Framework Directive (CIS) in this context are Guidance Document No. 1 (European Communities, 2003), No. 20 (European Communities, 2009) and No. 36 (European Communities, 2018).

[2] See CIS Guidance Document No. 20, European Communities (2009, p. 13). See also the Swedish Agency for Marine and Water Management's guidance on time extensions and less stringent objectives, Report 2023:14 (p. 18).

[3] See e.g. Macháč et al (2020).

to use. CBA is based on a clear theory[4] and there is a wealth of experience, not least in Sweden, of using CBA, particularly because the method has long been used regularly to assess the economic profitability of investments in transport infrastructure.[5] There are also many examples of how CBA can be applied in the case of environmental measures relating to rivers, lakes, the coast and the sea. [6]

A CBA is aiming at monetisation, i.e. to express costs and benefits in monetary terms. When all costs and benefits are monetised, it becomes possible to compare them. Given such complete monetisation, economic profitability exists if the net present value (NPV) is positive, i.e. the total present value of the benefits exceeds the total present value of the costs:

NPV = sum of present value of benefits− sum of present value of costs > 0 (Equation 1)

Let *B* denote the total present value of benefits and *C* denote the total present value of costs. If "disproportionate costs" were to be interpreted straightforwardly on the basis of this criterion of economic profitability, "disproportionate costs" would prevail if the net present value is negative, i.e. if

$C > B$ (Equation 2)

The points in section 1 indicate, however, that in practice this is not a reasonable definition of 'disproportionate costs'. This is because a CBA can rarely be expected to provide a precise answer; the benefits and costs are usually subject to uncertainty. There are a number of reasons for this, and a review of these reasons is beyond the scope of this guidance. However, to give an indication of the range of uncertainty, it can be observed that it applies to both nature and society and their intertwining.[7] An example of a hydropower-related environmental measure that may benefit fish stocks may concretise this: on the cost side, there may be uncertainties related, for example, to the costs of the measure and to the evolution of electricity prices to value any power production losses, and on the benefit side, there may be uncertainties related, for example, to the degree to which fish stocks will actually be improved and to the valuation of such improvements by fishermen and other people.[8] At a general level, the EU CIS Guidance Document No. 20 recognises that uncertainty about the benefits of measures is usually greater than uncertainty about the costs[9] and specifically mentions the uncertainty associated with benefits related to the impact of measures on services that are not traded on any market.[10] Many ecosystem services are such non-market goods, which can only be monetised using specific valuation methods.[11] The imperfection of such methods in providing information on people's preferences for different ecosystem services is *one* source of uncertainty, but in addition, there is all the uncertainty that lies in the functioning of natural systems and their capacity to provide ecosystem services. In general, the processes in these systems tend to be non-linear, which can manifest themselves,

[4] See e.g. Johansson and Kriström (2018) and Söderqvist (2022) for an introduction to CBA.

[5] Trafikverket (2024).

[6] See e.g. Johansson and Kriström (2012), Söderqvist et al (2017).

[7] To indicate the breadth of the field and how it can be explored, 153 different frameworks for analysing uncertainty associated with environmental change were included in a recent literature review (Bevan, 2022).

[8] See the review of the benefits and costs of environmental measures in the Mörrum River in Söderqvist (2022, p. 15).

[9] CIS Guidance Document No. 20, European Communities (2009, p. 12).

[10] Ibid, p. 11.

[11] See Söderqvist (2022) for a brief introduction to different valuation methods.

for example, in the form of threshold effects when systems are overstressed by, for example, climate change and biodiversity loss.[12] This source of uncertainty is important not least for the assessment of what happens if environmental measures are *not* taken, i.e. what happens in the reference (e.g. business as usual) alternative in a CBA of environmental measures, and which therefore affects the magnitude of the benefits of taking action. Put simply, the benefits of an environmental measure that achieves a certain level of ecosystem services will be higher the worse the situation avoided by the measure. Furthermore, assessments of the magnitude of the need for environmental measures aimed at protecting and restoring nature should be understood, inter alia, from the perspective of uncertainty, with risks of e.g. threshold effects, in order to ensure with sufficient margin the functionality and stability of natural systems.[13]

There are thus many reasons why there may be uncertainty about the size of the benefits and costs of measures. This applies both to (1) the benefits and costs that can be expressed in monetary terms and (2) the benefits and costs for which there are no monetary estimates and which therefore cannot be expressed in monetary terms. The points on disproportionate costs in section 1 reflect both (1) and (2).

The first paragraph on disproportionate costs in section 1 can be interpreted as meaning that even if all benefits and costs were monetised, uncertainties in monetisation mean that one cannot safely conclude that costs are disproportionate as soon as a point estimate of C is greater than a point estimate of B. With reference to the third point on disproportionate costs in section 1 it is required that C exceeds B by a certain margin. This can be expressed as the following must apply:

$$C > B \times F, \qquad \text{(Equation 3)}$$

where F is a factor expressing the desired margin, i.e. F is a value above 1. [14]

The second paragraph on disproportionate costs in section 1 refers to the existence of qualitative costs and benefits, i.e. costs and benefits that cannot be expressed in monetary terms due to lack of information, and that these qualitative costs and benefits must also be taken into account in a final assessment of whether the costs are disproportionate or not.

In section 3 the identification of disproportionate costs is discussed, ignoring the fact that some costs and benefits cannot be expressed in monetary terms. This involves looking only at monetised costs and benefits and their uncertainty. Non-monetised costs and benefits are then addressed again in section 4. The reason for this separation is that if it can be established with acceptable certainty that the monetised costs are disproportionate (or not disproportionate), then this can facilitate the assessment of whether they are still disproportionate (or not disproportionate) when the qualitative (i.e. non-monetised) costs and benefits are factored into the assessment.

[12] See e.g. Dasgupta (2021) and Folke et al. (2021). See Dudgeon (2019) for an overview of specific threats to freshwater ecosystems.

[13] See Rockström et al. (2023) for a recent such assessment.

[14] The same relationship can be expressed by the so-called cost-benefit ratio (B/C): $B/C < 1/F$.

3 Monetary criteria for disproportionality

3.1 Criterion based on probabilistic uncertainty analysis

For CBA, a standard problem is that there is uncertainty about the monetary size of the costs and benefits. One main approach to deal with this is a probabilistic uncertainty analysis.[15] In such an uncertainty analysis, the uncertainty in the cost and benefit items for which there is uncertainty is first described using probability distributions.[16] Simulations (Monte Carlo analysis) can then be used to estimate an empirical probability distribution for the net present value.[17]

An example of such an estimated empirical probability distribution is shown in the left-hand diagram in Figure 1. The y-axis shows the probability of a certain value of the net present value on the x-axis. Alternative ways to show the same estimate are through the empirical distribution function or through the empirical survival function, which is equal to 1 minus the empirical distribution function. The right-hand diagram shows the empirical survival function, and from this it is easy to read the probability that the net present value reaches a certain value: for example, the probability that the net present value is greater than zero is equal to about 20% and the probability that the net present value is greater than –8 million is equal to about 100%.

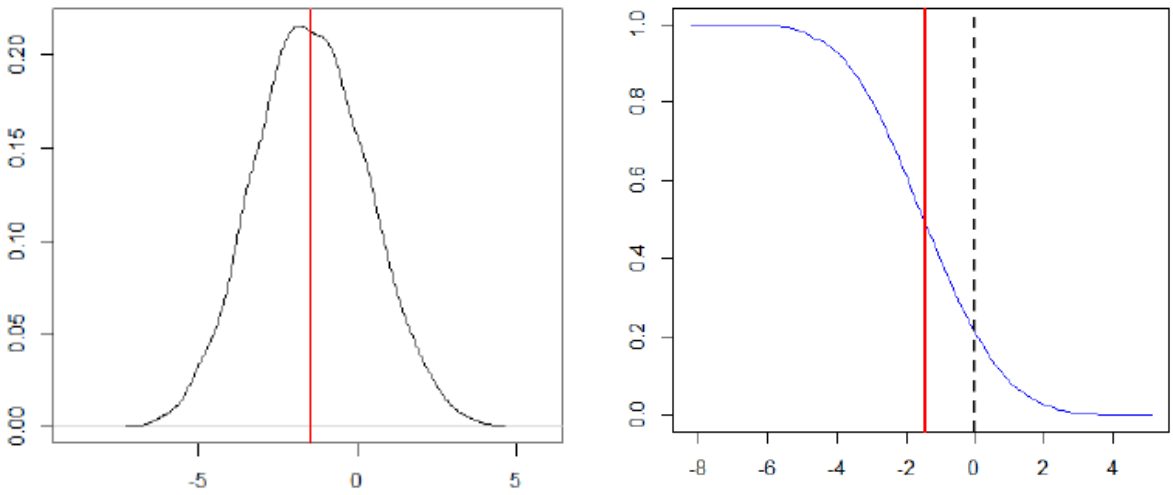

Figure 1 The left graph shows, as a result of a simulation, an estimated empirical probability distribution for the net present value. The right graph shows the same estimate in terms of the empirical survival function. The red line marks the mean of the net present value. The x-axis measures the net present value in millions of SEK, and the y-axis measures probabilities. Source: Söderqvist et al (2017, pp. 62-63).

The question now becomes: *Do the charts in Figure 1 describe a situation where the costs can be judged to be disproportionately high?* The average net present value, indicated by the red line in the diagrams, is in this example about SEK –1.5 million, i.e. according to the average, the sum of the present value of the costs exceeds the sum of the present value of the benefits. But does this correspond to what is stated in the third paragraph of section 1, i.e. that the costs exceed the benefits by a margin that is appreciable and has a high level of certainty? This is not self-evident,

[15] See e.g. Johansson and Kriström (2016, Chapter 11) for this and other approaches.

[16] See e.g. Söderqvist et al (2017, p. 60).

[17] See e.g. Johansson and Kriström (2012, 2016), Söderqvist et al. (2015, 2017).

as there is a not negligible probability (20%) that the net present value is positive, i.e. there is a 20% probability that the costs *do not* exceed the benefits. The third point could be interpreted as meaning that there are disproportionate costs if the probability that the net present value is positive is sufficiently small. If it is sufficiently small, the first point should also be considered to be fulfilled, as the mean of the NPV cannot be expected to have a very small negative value (just below zero) while the probability that the NPV is positive is small.

How small a probability is 'sufficiently small'? This is for the relevant decision-makers to judge. The starting point here is that the first and third points of section 1 indicate a need for caution: it would be serious to make the mistake of judging costs as disproportionate when they are in fact proportionate. The EU CIS Guidance Document No. 20 further emphasises that the Water Framework Directive (WFD) is an environmental directive and that derogations from its objectives should not be a rule but should only be made in exceptional cases.[18] This is also reflected by the guidance's statement that in weighing the risk of failing to achieve the objectives of the Directive against the risk of not using cost-effective means to achieve the objectives, priority should be given to minimising the former risk.[19] Therefore, for disproportionate costs to exist, the probability that the net present value is positive must be very small, in line with commonly used levels of statistical significance, e.g. no more than 5% or no more than 1%. In such a case, the example in the diagrams in Figure 1 does *not* describe a case of disproportionate costs; the mean of the NPV is indeed negative, but the probability of a positive NPV (20%) is too high.

Using a probabilistic uncertainty analysis to assess whether costs are disproportionate or not, as described above, has clear strengths in that the uncertainty in different cost and benefit items is handled systematically and analysed simultaneously. However, the analysis is demanding in that the uncertainty must be specified for the cost and benefit items, with the choice of probability distribution and the parameter values needed to determine the shape of the distribution. To help, there are methods and software[20] designed to discuss in a practical way which probability distributions and parameter values should be used for different costs and benefits.[21] Such discussions usefully involve experts and stakeholders with complementary starting points and knowledge, ideally leading to a broad consensus. Furthermore, there are many different types of simulation tools.[22] Nevertheless, the approach entails a complexity that can be difficult and resource-intensive to manage in practical applications, especially as the analysis should also take into account possible correlations between different cost and benefit items. So while there are good reasons to move towards the above approach, an alternative way of assessing whether costs are disproportionate or not may also be needed.

3.2 Criterion based on a simpler sensitivity analysis

An alternative way of making the assessment of disproportionality could be to carry out the uncertainty analysis as a simpler sensitivity analysis, where the outcome of various parameter assumptions is studied, e.g. with regard to electricity price, labour costs for environmental measures, social discount rate, etc. This approach is less satisfactory from a scientific point of

[18] CIS Guidance Document No. 20, European Communities (2009, p. 10).

[19] CIS Guidance Document No. 20, European Communities (2009, p. 12).

[20] E.g. the Shelf approach, see Oakley and O'Hagan (2016) and O'Hagan et al. (2006).

[21] See Ohlin Saletti et al (2023) for an example of such discussions.

[22] E.g. the @RISK software. See also a simple variant in the FRAM-KLIV tool (Söderqvist et al., 2017).

view than a probabilistic uncertainty analysis, but can be less resource-intensive. The outcome of such a sensitivity analysis is illustrated by the number line in Figure 2. For the benefits, a mean value B_{mean} has been estimated, and a sensitivity analysis making *realistic* changes to the parameter assumptions has identified a range from a *lowest reasonable* estimate of the sum of present value of the benefits (B_{min}) to a *highest reasonable* estimate of the sum of present value of the benefits (B_{max}). In Figure 2 the same type of range has been identified for costs. As in the case of probabilistic uncertainty analysis, what are "realistic" changes can be assessed through discussions between experts and stakeholders with complementary starting points and knowledge.

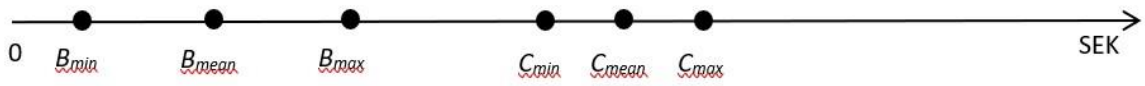

Figure 2 . Schematic illustration of ranges for the sum of present value of benefits (B) and the sum of present value of costs (C). B_{mean} is the mean value of the sum of present value of benefits, and C_{mean} is the mean value of the sum of present value of costs.

Since $C_{mean} > B_{mean}$ Figure 2 shows an example (like the example in Figure 1) where the mean of the net present value is negative. Again, however, the question is whether the costs exceed the benefits sufficiently for the costs to be judged disproportionate. As described above in the case of probabilistic uncertainty analysis, there is a need for caution - it would be a serious error to judge costs as disproportionate when they are in fact proportionate. Now, there are no probabilities to help with the assessment, but there is information on how high the benefits can reasonably be at most (B_{max}) and how low the costs can reasonably be at least (C_{min}). A condition for disproportionate costs could therefore be that C_{min} should exceed B_{max}, i.e:

$$C_{min} > B_{max} \text{ ,} \qquad \text{(Equation 4)}$$

a condition which is fulfilled in the example in Figure 2.

If the condition is met and the costs are thus deemed disproportionate, the comparison between C_{min} and B_{max} implies that there is a very small risk that the net present value would in fact be positive, i.e. a very small risk that the costs are deemed disproportionate even though they are in fact proportionate. This gives us a condition similar to the one above for the probabilistic uncertainty analysis. It could possibly be argued that the risk of committing the serious error is still not small enough because there is an inherent uncertainty in the magnitude of the value of C_{min} and B_{max}. In that case, one way to further reduce the risk of this serious error would be to include a factor F, so that the condition becomes:

$$C_{min} > B_{max} \times F, \qquad \text{(Equation 5)}$$

where $F > 1$.

3.3 Some remarks

The above is an attempt to formulate conditions for disproportionate costs that could be compatible with the first and third points of section 1 for a case of probabilistic uncertainty analysis and for a case of a simpler sensitivity analysis. The former is more satisfactory from a scientific point of view and therefore desirable, but the latter could be relevant for a transitional period if there are insufficient resources for a probabilistic uncertainty analysis.

Regardless of how the monetary analysis is carried out, it should be essential that the same type of reasoning is used in analyses of environmental measures in different locations, so that the comparison between benefits and costs is made in a consistent manner. Suppose, for example, that benefits in the form of existence values have been estimated for a particular stretch of river A through a valuation study, and that these existence values are therefore included in the monetary benefits of environmental measures in stretch of river A. If there is reason to believe that existence values will also arise there due to proposed environmental measures for another river section B, some kind of assessment of the size of the existence values should also be made for river section B, e.g. by means of a new valuation study or by value transfer. To completely refrain from weighing in the existence values for river section B even though they are weighed in for river section A entails an inconsistency in the types of benefits that are taken into account.

In general, it can be expected that there is a great need for monetary analyses to be transparent and comparable, and that there are procedures for continuous feedback of experience, so that the analyses are always made with the best available data. This also applies to the handling of non-monetised costs and benefits, which is the subject of the next section.

4 Criteria for disproportionality when certain items are difficult to monetise

The previous section dealt with how uncertainty can be handled in the context of a monetary analysis and how conditions for whether costs are disproportionate or not could be formulated, on the one hand in the case of a probabilistic uncertainty analysis and on the other hand in the case of a simpler sensitivity analysis. In both cases, conditions were formulated to minimise the risk of costs being considered disproportionate when they are in fact proportionate. However, a typical case for environmental measures is that they entail certain benefits and costs that are difficult to monetise due to lack of knowledge, i.e. they cannot be included in the monetary analysis. This is the situation addressed by the second point in section 1 flags, i.e. that also qualitatively described costs and benefits have to be included in the assessment of disproportionate costs. An example of a difficult-to-monetise benefit of environmental measures may be the non-use values (e.g. existence values) that can be associated with increased biodiversity.[23] However, there may also be difficult-to-monetise items on the cost side, such as the negative impact on cultural sites that environmental measures may lead to. Sometimes such difficult-to-monetise benefits and costs

[23] See Söderqvist et al. (2017) for different types of economic values, such as existence values and other non-use values.

may have been estimated for a specific case through special valuation studies, but it is often not obvious how such estimates should be transferred to other cases (so-called value transfer).[24]

How can non-monetised costs and benefits be addressed in the disproportionality assessment? In some special cases, the assessment of disproportionality in the monetary analysis may be sufficient to assess disproportionality even if some cost and benefit items have not been monetised, see the list in Table 1.[25] Such special cases are, for example, cases A and E, where the non-monetised cost and benefit items are qualitatively assessed as "small", i.e. so small that they cannot be expected to change the conclusion of the disproportionality assessment in the monetary analysis. Other special cases occur when the non-monetised items assessed as large would reinforce a conclusion of disproportionality or not disproportionate. Such cases are B and G in Table 1. In case B, the disproportionality condition is met for the monetary benefits and costs while the non-monetary costs are deemed to be large while the non-monetary benefits are deemed to be small. In case G, the disproportionality condition is not met for the monetary benefits and costs while the non-monetary benefits are assessed to be large while the non-monetary costs are assessed to be small. The other cases lead to less certain conclusions, in particular C and F.

Table 1 . Different cases where disproportionate costs may or may not be deemed to exist.

Case	Is the disproportionate cost condition met in the monetary analysis?	Non-monetary benefits	Non-monetary costs	Disproportionate cost?
A	Yes	Small	Small	Yes
B	Yes	Small	Large	Yes
C	Yes	Large	Small	Uncertain
D	Yes	Large	Large	Probably, if the non-monetary benefits and costs broadly cancel each other out
E	No, it is not.	Small	Small	No, it is not.
F	No, it is not.	Small	Large	Uncertain
G	No, it is not.	Large	Small	No, it is not.
H	No, it is not.	Large	Large	Probably not, if the non-monetary benefits and costs broadly cancel each other out

5 To provide a better basis for assessing disproportionality

Unfortunately, qualitative statements such as 'large' or 'small' are problematic in assessing disproportionate costs. Where is the line between "large" and "small"? When does the sum of several 'small' cost or benefit items become so large that the total non-monetised cost or benefit

[24] See Söderqvist (2022) for a brief introduction to different valuation methods and to value transfer.

[25] The table has some similarities with the reasoning and structure of Table 1 in section 3.2.4 of CIS Working Group 2.2 (2003), but there it is assumed that only benefits are non-monetised.

becomes 'large'? These are two examples of questions that indicate that the assessment of disproportionate costs would be facilitated by estimating the size of costs and benefits that are currently difficult to monetise. This therefore appears to be an urgent area for investigation.

One possibility that could be tested is to express the magnitude of such costs and benefits semi-quantitatively, e.g. by scoring. However, this requires work on defining scoring scales and probably also weighting of the different scored cost and benefit items, as well as establishing a process for scoring and weighting. In addition, the scored and weighted costs and benefits must somehow be compared with the monetised costs and benefits, which is a challenge that can be addressed in different ways in multi-criteria analysis.[26] However, this problem can be avoided by monetising the non-monetised costs and benefits instead. This may seem at first sight to be a difficult task in practice, as there may be a lack of opportunities for value transfer from existing valuation studies[27] and new applications of environmental economics valuation methods may be resource intensive[28] . However, there should be an urgent need to identify particularly large and important knowledge gaps and to focus work on new valuation studies to fill these gaps.

One possible complementary monetisation option that could be tested is to apply deliberative valuation[29] , where relevant stakeholders come together to discuss reasonable monetary values for currently non-monetised costs and benefits. To be consistent with CBA, deliberative monetary valuation should aim for stakeholders to assess what is the most reasonable monetary valuation based on available information about public preferences, not their own preferences.

There may be cases where only *one* cost or benefit item that is difficult to monetise is significant enough to determine whether the costs are disproportionate or not. The size of existence values may be an example of such an item. In such a case, the deliberative monetary valuation could start by examining at what level of existence values the costs would exceed the disproportionality threshold. This threshold could then be applied to the population concerned, after which the participating stakeholders would assess whether a lower or higher value per household than the threshold is likely, given the best available information on the size of existence values from existing valuation studies. A further step to take would be for participants not only to conclude whether a lower or higher value than the threshold is likely, but also to assess the level of existence value itself. This judgement could be updated through new deliberative monetary valuations as new information from further valuation studies becomes available.

[26] An overview of different methods for multi-criteria analysis can be found in Söderqvist (2022).

[27] However, the knowledge base is constantly growing, thanks in part to ongoing updates of databases such as the Ecosystem Services Valuation Database (ESVD), see www.esvd.info.

[28] But not necessarily more resource-intensive than careful value transfer studies, cf. Kinell and Söderqvist (2011).

[29] A brief introduction to deliberative evaluation can be found in Söderqvist (2022), see e.g. Isacs et al. (2023) for an example.

6 References

Bevan, L. D., 2022. The ambiguities of uncertainty: A review of uncertainty frameworks relevant to the assessment of environmental change. Futures 137, 102919.

CIS Working Group 2.2, 2003. Toolbox on Identification and Designation of Artificial and Heavily Modified Water Bodies. Common Implementation Strategy Working Group 2.2 on Heavily Modified Water Bodies, 15 January 2003.

Dasgupta, P., 2021. The Economics of Biodiversity: The Dasgupta Review. HM Treasury, London.

Dudgeon, D., 2019. Multiple threats imperil freshwater biodiversity in the Anthropocene. Current Biology 29, R942-R995.

European Communities, 2003. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No. 1, Economics and the environment: The implementation challenge of the Water Framework Directive. Office for Official Publications of the European Communities, Luxemburg.

European Communities, 2009. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No. 20, Guidance document on exemptions to the environmental objectives. Technical Report 2009–027. Office for Official Publications of the European Communities, Luxemburg.

European Communities, 2018. Common Implementation Strategy for the Water Framework Directive and the Floods Directive. Guidance Document No. 36, Exemptions to the environmental objectives according to Article 4(7).

Folke, C., Polasky, S., Rockström, J., Galaz, V., Westley, F., et al., 2021. Our future in the Anthropocene biosphere. Ambio 50, 834-869.

Kinell, G., Söderqvist, T., 2011. Ekonomisk värdering med scenariometoder: En vägledning som stöd för genomförande och upphandling. Report 6469, Swedish Environment Protection Agency, Stockholm.

Isacs, L., Kenter, J. O., Wetterstrand, H., Katzeff, C., 2023. What does value pluralism mean in practice? An empirical demonstration from a deliberative valuation. People and Nature 5, 384-402. https://doi.org/10.1002/pan3.10324

Johansson, P-O., Kriström, B., 2012. The Economics of Evaluating Water Projects: Hydroelectricity Versus Other Uses. Springer-Verlag, Heidelberg.

Johansson, P-O., Kriström, B., 2016. Cost-Benefit Analysis for Project Appraisal. Cambridge University Press, Cambridge, UK.

Johansson, P-O., Kriström, B., 2018. Cost-Benefit Analysis. Cambridge Elements. Cambridge University Press, Cambridge, UK.

Macháč, J., Brabec, J., Vojaček, O., 2020. Development and implementation of the concept of disproportionate costs in water management in Central Europe in the light of the EU WFD. Water Alternatives 13, 618-633.

Oakley, J. E., O'Hagan, A., 2016. Shelf: The Sheffield Elicitation Framework (Version 3.0). https://shelf.sites.sheffield.ac.uk

O'Hagan, A., Buck, C., E., Daneshkhah, A., Eiser, J., Richard, Garthwaite, P., H., Jenkinson, D., J., Oakley, J. E., Rakow, T., 2006. Uncertain Judgements: Eliciting Experts' Probabilities. John Wiley & Sons, West Sussex, UK.

Ohlin Saletti, A., Lindhe, A., Söderqvist, T., Rosén, L., 2023. Cost to society from infiltration and inflow to wastewater systems. Water Research 229, 119505. https://doi.org/10.1016/j.watres.2022.119505

Rockström, J., Gupta, J., Qin, D., Lade, S. J., Abrams, J. F., et al., 2023. Safe and just Earth system boundaries. Nature 619, 102-111. https://doi.org/10.1038/s41586-023-06083-8.

Söderqvist, T., 2022. Assessment methods for disproportionate costs according to the Swedish water management ordinance (2004:660) - An overview. Report 2022:14, Swedish Agency for Marine and Water Management, Gothenburg.

Söderqvist, T., Brinkhoff, P., Norberg, T., Rosén, L., Back, P-E., Norrman, J., 2015. Cost-benefit analysis as a part of sustainability assessment of remediation alternatives for contaminated land. Journal of Environmental Management 157, 267-278.

Söderqvist, T., Nordzell, H., Hasselström, L., Wallentin, E., Franzén, F., Ivarsson, M., Soutukorva, Å., 2017. Samhällsekonomisk lönsamhetsbedömning av miljöåtgärder i vattendrag. Report 2017:428, Energiforsk AB, Stockholm.

Trafikverket, 2024. Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn, ASEK 8.0. http://www.trafikverket.se/asek.

Complementary guidance on disproportionate costs limit, when assessing disproportionate costs according to the Swedish Water Management Ordinance (2024:660)

The background to this guidance is the assessment of disproportionate costs under the Ordinance on Water Management (2004:660). A number of minimum requirements that should be fulfilled for the assessment of disproportionate costs emerge from EU-wide guidance. These are formulated as follows:

As there are uncertainties around the assessments of costs and benefits, the water authority needs to consider

- *Disproportionality should not begin at the point where measured costs simply exceed quantifiable benefits;*
- *the assessment of costs and benefits will have to include qualitative costs and benefits as well as quantitative;*
- *the margin by which costs exceed benefits should be appreciable and have a high level of confidence.*

The guidelines also state that costs and benefits are to be interpreted as economic costs and economic benefits respectively. However, as has been noted in several studies, the guidelines do not specify the limit for when costs become disproportionate, i.e. they do not specify what characterises a margin that is "appreciable" and "has a high level of confidence". This definition is considered a political issue for each Member State to decide. Therefore, the attempts at specification that have been made in other Member States are not necessarily transferable to Sweden.

The purpose of this guidance is therefore not to propose a limit, but it does aim to provide some reasoning that could help the discussion on what limit to set and how monetised and non-monetised costs and benefits can be addressed in the assessment of disproportionality.

SwAM, The Swedish Agency for Marine and Water Management is the responsible government agency tasked to protect, restore and ensure sustainable use of freshwater resources and seas including fisheries management.

Swedish Agency
for Marine and
Water Management