

The non-use value of biodiversity impacts

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Developing a unit price for use in socio-economic assessments of new policies and projects in Denmark

Kennet Uggeldahl, Thomas Lundhede, Jette Bredahl Jacobsen, Søren Bøye Olsen

Department of Food and Resource Economics, University of Copenhagen

The world is in the midst of an unprecedented global biodiversity crisis (Diaz et al. 2019). At the heart of this problem lies widespread institutional failure to consider the true value of nature and biodiversity in policy- and decision-making, leading to underinvestment in e.g., nature protection and conservation efforts (Dasgupta 2021). One central reason is that the societal welfare generated by biodiversity, which includes both use and non-use values, is not fully reflected in market prices. Despite broad agreement that non-use values of biodiversity (existence and bequest values) make up a considerable share of the total value, they are rarely included in the economic analyses regularly conducted to guide policy- and decisionmakers.

Focusing on the Danish context, non-use values of biodiversity impacts are typically not included in socio-economic assessments, i.e., Cost-Benefit Analysis (CBA), of new policies and projects. It is however a foundational analytical principle in CBA that all welfare effects of a project or policy should be assessed and included in monetary terms, whether they are use values or non-use values (e.g., European Commission 2014; OECD 2018). Specifically concerning non-use values, the Danish Ministry of Finance, in their current guidelines for conducting CBA in Denmark, recommends including non-use values in CBAs when two conditions are met: 1) The non-use values are assessed to have a substantial effect, and 2) it is possible to use several independent and well-documented valuations of the non-use value. Projects and policies with impacts on biodiversity will arguably most often meet the first condition. Thus, the typical practice of omitting non-use value biodiversity impacts in Danish CBAs of such projects and policies are likely related to the second condition.

While several independent and well-documented Danish primary valuation studies assessing non-use values of biodiversity impacts exist (e.g. Campbell et al., 2014, Lundhede et al., 2014, Jacobsen & Thorsen 2010; Jacobsen et al. 2008, 2011, 2012; Jensen et al. 2019), they are rarely used in CBA in practice, perhaps because the guidelines from the Ministry of Finance – surprisingly contradictory to condition 2 above – also state the following: *“Due to the current theoretical and empirical problems in valuing non-use values, it is not considered appropriate to value non-use values oneself.”* (Finansministeriet 2023, p45). It is not explicated exactly what these current theoretical

and empirical problems are, but methodological challenges associated with estimating non-use values, which is only possible with Stated Preference (SP) methods, are well-known in the literature. More than 16 years ago, a review by Olsen et al. (2008) also concluded that methodological uncertainties were so substantial, that it could not be recommended in general to include non-use value estimates in Danish CBAs. However, they did also conclude that continued methodological research and empirical investigations would likely enable proper inclusion of non-use values in CBA in the future.

Methodological research have since then increased the validity of the SP methods to an extent where such studies today – if following broadly acknowledged best practice guidance as outlined in e.g. Johnston et al. (2017) and Mariel et al. (2021) – may find publication in top scientific journals like Science, and where results of such studies may even be used to provide evidence of non-the use values of environmental damages in litigations and court rulings (Bishop et al. 2017). Recently, the updated guidelines¹ regarding the use of CBA by Federal agencies in the US also concluded that “*techniques consistent with the best available economic science enabling estimates of these non-use values should be employed when appropriate and feasible*” and “*estimation of these values is challenging relative to observing prices in markets, though techniques for estimating implicit prices that are not observed in markets are well developed*”.

To advance the inclusion of non-use values of biodiversity impacts in future CBAs in Denmark, we conduct what is probably the biggest and most thorough Danish study aimed specifically at empirically estimating such values. Besides exemplifying how non-use values can be valued appropriately when using state-of-the-art approaches and following best practice scientific guidance to address theoretical and empirical problems, we also provide value estimates that may serve as unit values for use in benefit transfer to include non-use values of biodiversity impacts in future Danish CBAs.

We employ a survey-based Stated Choice Experiment to elicit Danish citizens' preferences and WTP for biodiversity changes. Realizing that biodiversity is an inherently complex concept and that survey respondents have limited cognitive capacity and attention span, previous studies have typically simplified the way impacts on biodiversity are communicated to respondents, e.g. by using simplified partial indicators of biodiversity such as number of species being protected (Strange et al. 2024). Arguing that this may not sufficiently capture the many dimensions and aspects of biodiversity, we instead use a composite index to describe impacts on biodiversity. Specifically, we use the Biodiversity Intactness Index (Scholes and Biggs 2005) which is also adopted by IPBES as a 'core' indicator of progress toward the Convention on Biological Diversity's Aichi Targets (Martin et al. 2019). An advantage of using this index is that it is clearly defined, generally applicable, scalable, spatially explicit and mapped for all of Denmark.

The development of the questionnaire used for collecting data followed best practice recommendations (Johnston et al. 2017; Mariel et al. 2021), involving several focus group discussions, a Q-study investigating the public's perceptions and understanding of biodiversity and its value (Uggeldahl et al. 2023), as well as a pilot survey with 195 respondents to qualify and validate the questionnaire. Furthermore, the overall experimental setup entailed several split samples designed to enable a range of tests to assess validity of obtained results. Using an online questionnaire, responses from more than 6000 citizens, sampled randomly from the Danish population using the CPR register and inviting via e-boks, have been collected in a December 2023 and January 2024.

¹ <https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf>

We are currently analyzing data from the first round of data collection and preparing a second round of data collection to be conducted in June-August 2024. At the DØRS conference, based on state-of-the-art econometric choice modelling, we will present a) our main results in terms of Willingness-To-Pay estimates for increases in the Biodiversity Intactness Index, b) a range of tests to assess the validity of these estimates, and c) guidance on how these values can be used as key figures for benefit transfer in future Danish CBAs.

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