

# Allocation in Life Cycle Assessments of Seafood Production Systems: Review of Problems and Strategies

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As Life Cycle Assessment (LCA) is being increasingly applied to study the environmental impacts of fisheries and aquaculture, the LCA methodology must be adapted to ensure that recommended strategies reflect the unique aspects of seafood production systems. In particular, the present study indicates that existing strategies for co-product allocation are often not appropriate in LCAs of seafood production systems. The focus of this methodological paper is on the specific allocation problems faced in studying fisheries and aquaculture systems and how they have been addressed to date.

Through an extensive literature review of existing LCA studies in this field, allocation problems specific to fisheries and aquaculture systems are examined to understand 1) how environmental burdens were allocated, and 2) the rationale behind the chosen method. The strengths and weaknesses of the allocation strategies are examined, followed by a discussion of the need to adapt existing allocation procedures to suit the unique problems associated with seafood production systems.

Results of this study indicate that allocation problems in seafood production systems are most likely to arise when dealing with: landed by-catch in capture fisheries, the use of co-product feed ingredients in aquaculture feeds, multiple outputs from fish farms, and the generation of by-products in seafood processing. Economic allocation was found to be the most widely used approach to date, however perceived weaknesses of this method suggest it should be carefully considered in future studies. System expansion and mass allocation were shown to be inappropriate in most cases, and allocation based on the gross energy content of co-products is proposed as an alternative means of allocating environmental burdens in some instances. It is also argued that a detailed, consistent approach to documenting allocation decisions in published reports is needed to increase the effectiveness and rigour of seafood production LCAs.

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