

The environmental impacts from the Portuguese fish consumption patterns: assessing cod, hake, sardine, horse mackerel, chub mackerel and salmon

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The Portuguese population is one of the largest seafood consumers worldwide. The consumption patterns are responsible for multiple impacts on the environment.

In order to investigate these potential impacts, 60% of the total mass of seafood consumed in Portugal was assessed through the Life Cycle Assessment methodology. The species assessed include Atlantic cod (salted, dried and frozen), European hake (fresh and frozen), European pilchard (sardine) (fresh and frozen), Atlantic horse mackerel (fresh and frozen), Atlantic chub mackerel and Atlantic salmon (fresh and frozen). Each specie was assessed along each life cycle stage, i.e.: capture (or farming), processing, transport and wholesaling.

The impacts of the abovementioned (six in total) main consumed species were modeled using *SimaPro 7.3.3* and assessed using *CML 2 baseline 2001* methodology. Abiotic Depletion Potential (ADP), Acidification Potential (AP), Eutrophication Potential (EP), Global Warming Potential (GWP 100), Ozone Layer Depletion Potential (ODP), Human Toxicity Potential (HTP 100), Freshwater Aquatic Eco-toxicity Potential (FAETP 100), Marine Aquatic Eco-toxicity Potential (MAETP 100), Terrestrial Eco-toxicity (TETP 100) and Photochemical Oxidant Formation Potential (POFP) are the impact categories assessed.

Results show that the production and combustion of diesel together with the use of cooling agents are the operational inputs that contribute mostly to the environmental impact categories identified. Small pelagics, like sardines, chub and horse mackerel have lower impact. This is mainly due to the higher fuel efficiency of the fishing technique used (i.e. artisanal purse seine fleet) and the absence of use of cooling agents for fish refrigeration.

Regarding the consumption patterns, cod and hake account for about one third of the total seafood mass consumed in Portugal and contribute to over than 80% of the impact for all individual categories analysed (exception is verified for FAETP and TETP). Hake has the largest contribution to all environmental impact categories, ranging from approximately 40% for HTP to over than 70% for ODP. Small pelagics (sardine, horse and chub mackerel) account for 23% of the seafood consumed and have the lowest environmental impact contributions, ranging from 5% for HTP to 8% for ADP and AP. Salmon accounts only for 4% of the total seafood consumed and it is the main responsible for the impacts in FAETP (90%) and TETP (100%) while its potential impacts in other categories can be larger as 17% (as for POFP).

In conclusion it is possible to observe that small pelagics captured locally and/or fish captured by fuel efficient fleet can constitute the main driver towards a lower environmental burden associated with seafood consumption.