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CoolFish

Carbon Footprint of Fisheries

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Greenhouse gas emissions

- Food production: 25% of anthropogenic greenhouse gas (GHG) emissions globally
- Fisheries (2011): 4% of GHGs of global food production
- Customer demand, market share, regulations,…
- Fisheries' emissions grew by 28% between 1990 and 2011
  - Catch amount, choice of species
  - Some directed to industrial use
  - Status of fish stocks
  - Fishing method
  - Fuel and propulsion system
  - Operational choices
  - Refrigeration, …

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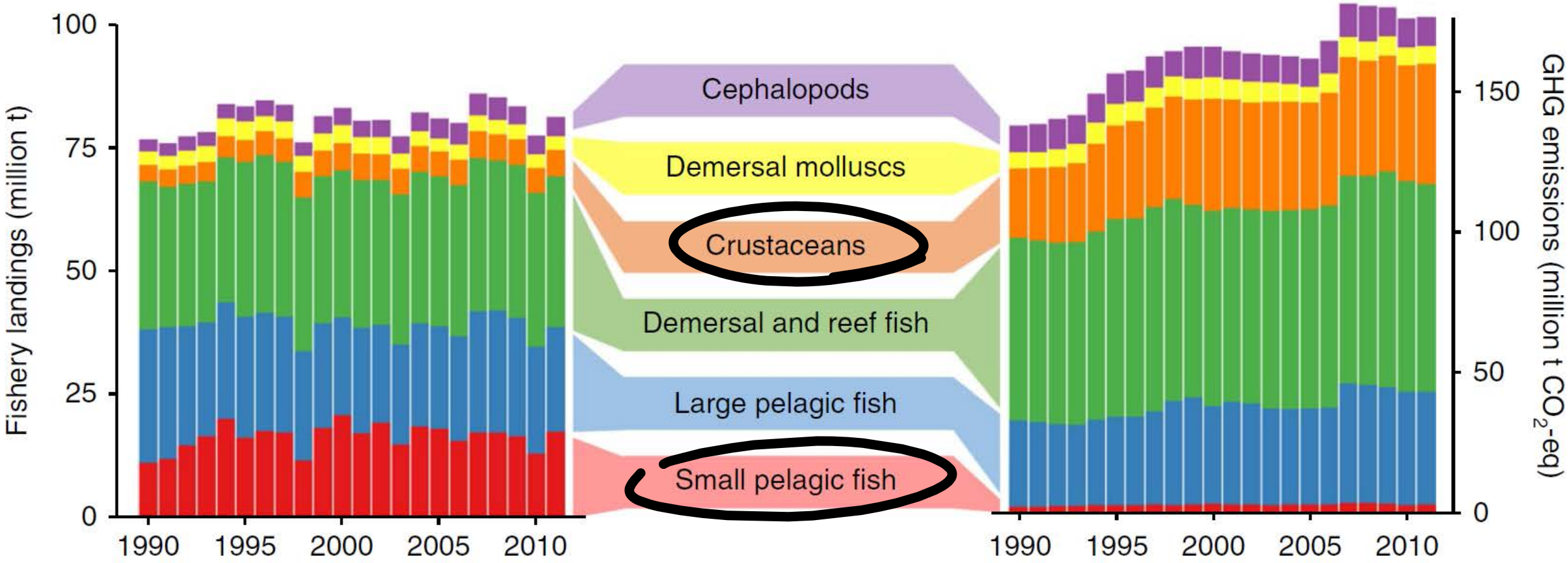
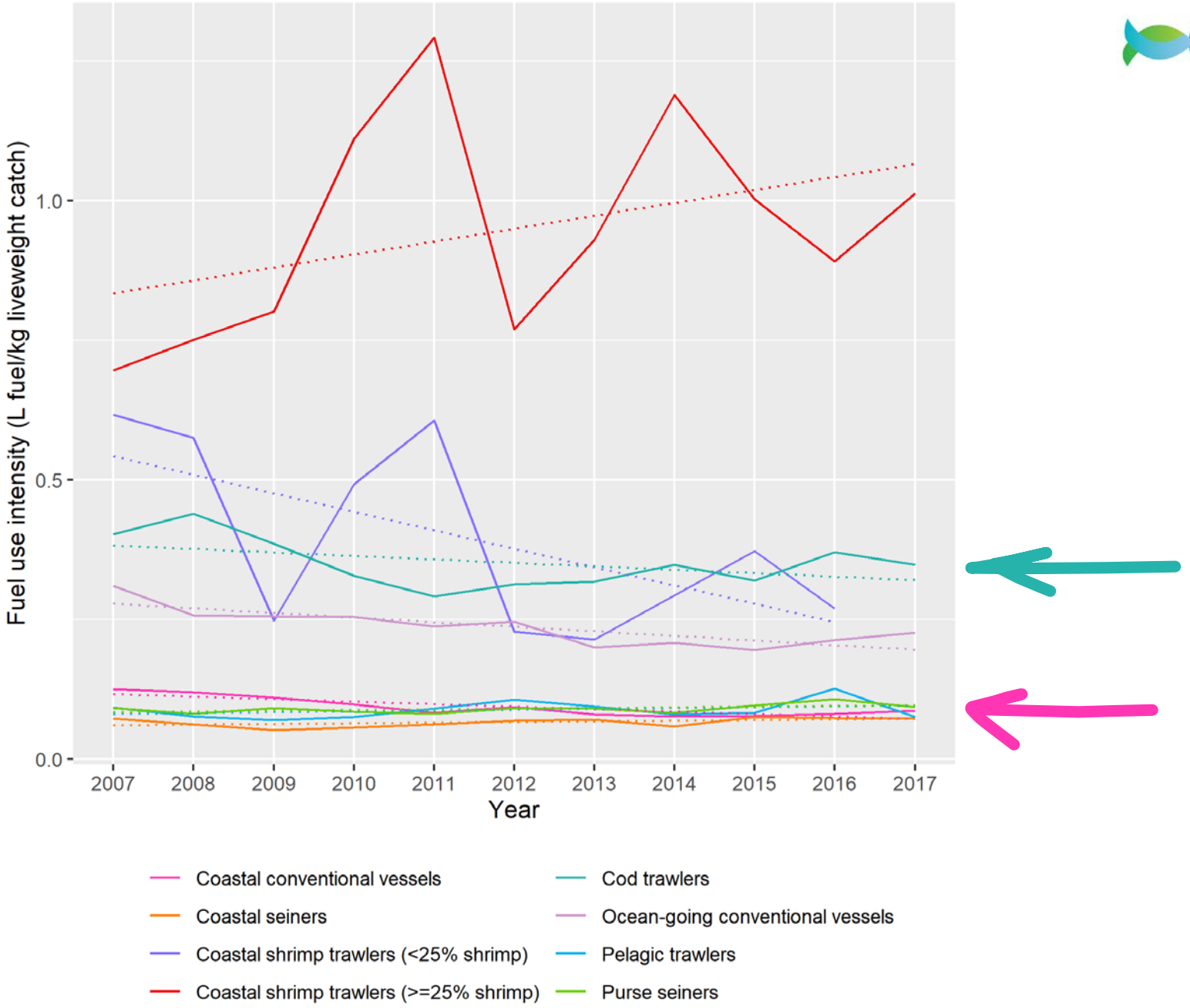
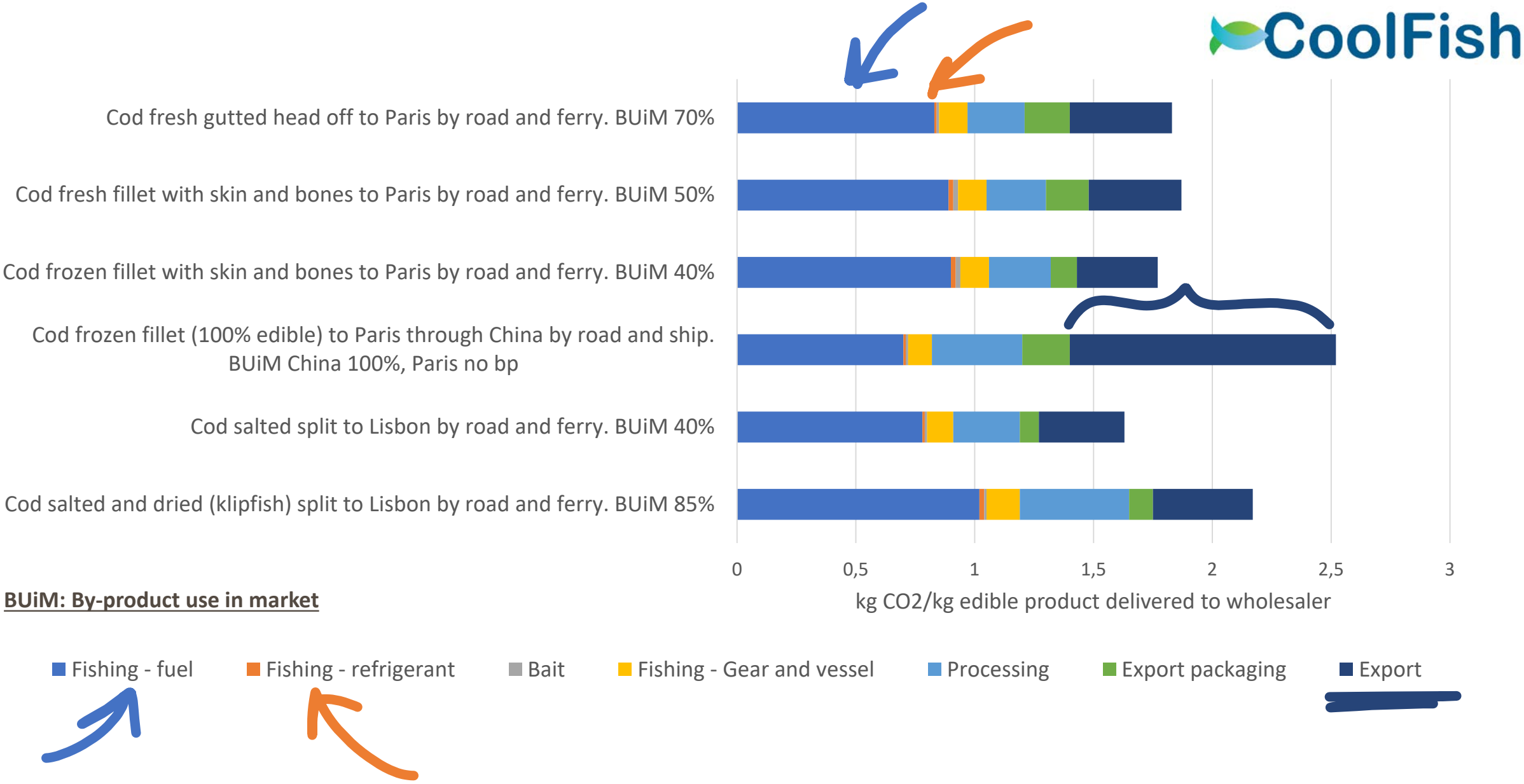


(Source:Parker, R. W. R., J. L. Blanchard, C. Gardner, B. S. Green, K. Hartmann, P. H. Tyedmers and R. A. Watson (2018). "Fuel use and greenhouse gas emissions of world fisheries." Nature Climate Change 8(4): 333-337.)



(Source: Winther U, Skontorp Hognes E, Jafarzadeh S, Ziegler F, 2020, Greenhouse gas emissions of Norwegian seafood products 2017, SINTEF Ocean)



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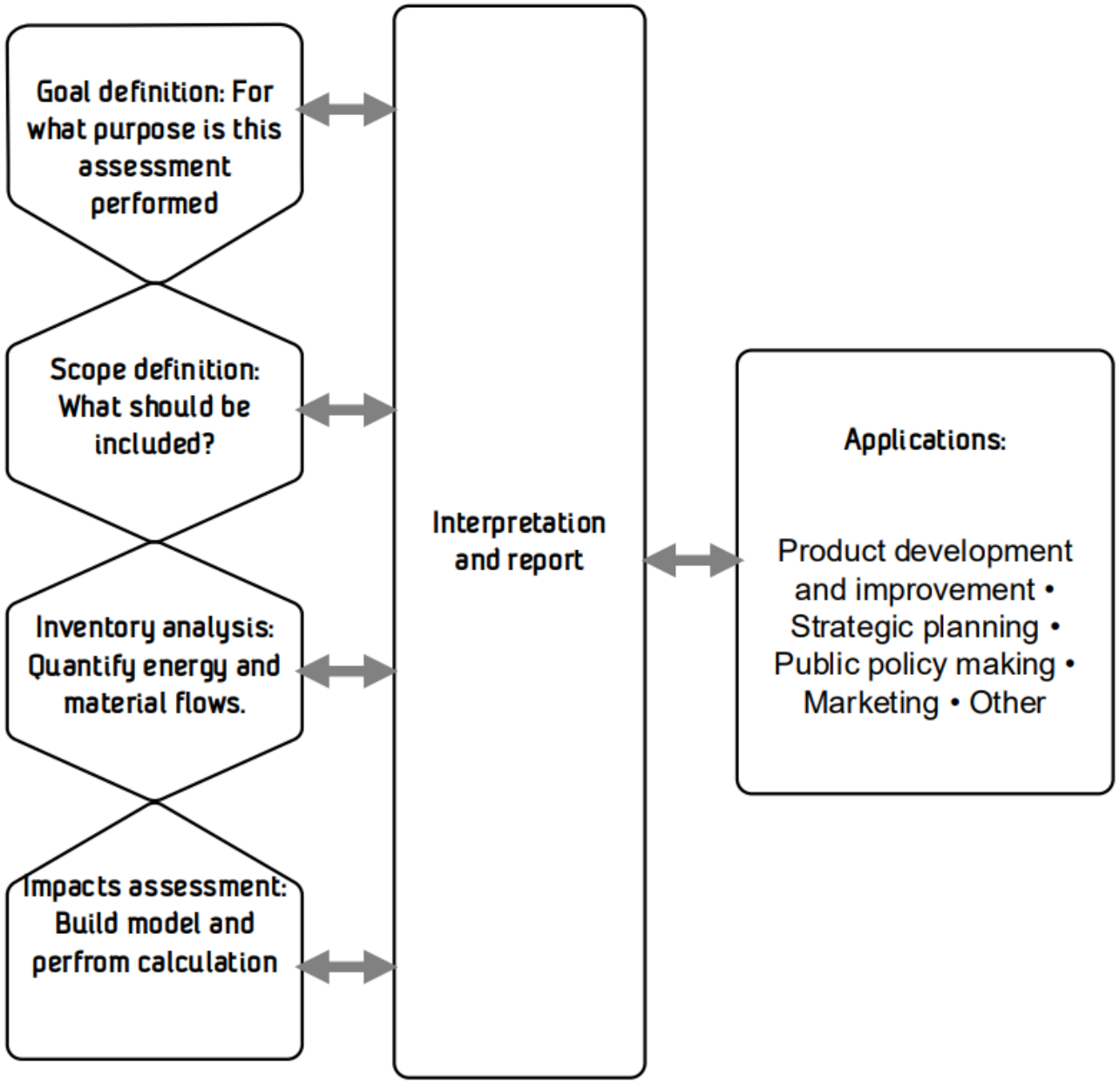
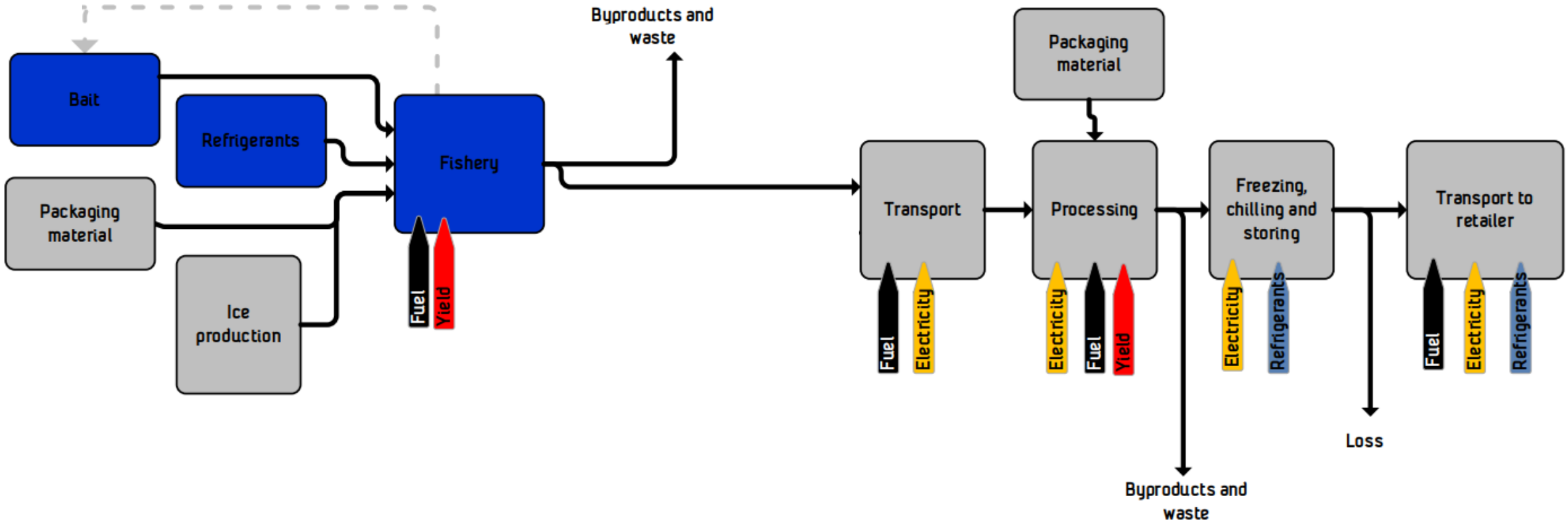
Carbon footprint

- One impact category among many
- Life cycle assessment (LCA): environmental impacts through the life cycle
- Carbon footprint: a simplified form of LCA
- Several standards for carbon footprint estimations
  - For all industries
  - System boundary
  - Allocation
  - …
  - Publicly Available Specification (PAS)-2050
  - ISO 14067,…



(Source: Skontorp Hognes E and Ziegler F, 2014, Handbook for greenhouse gas assessment of seafood products, SINTEF Fisheries and Aquaculture (SINTEF Ocean)))



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Standards for seafood products

- Publicly Available Specification (PAS)-2050-2:2012
  - PAS 2050: British Standards Institute, a generic method for estimating carbon footrpint of products
  - Hotspot impact areas
  - Always significant impact: energy
  - Potential for significant impact: materials used for cooling; ice and refrigerants

- NS 9418:2013
  - Norwegian standard based on ISO/TS 14067

Standards related to refrigeration systems

- Life Cycle Climate Performance (LCCP)
  - Carbon footprint of heating, ventilation and air conditioning (HVAC) and refrigeration systems
  - Direct and indirect emissions during the lifetime
  - International Institute of Refrigeration (IIR) has developed guidelines
  - Comparison tool for systems with similar performance and function

- Total Equivalent Warming Impact (TEWI)
  - Simplified form of LCCP
  - Excludes direct emissions during manufacturing of equipment and fluids,…
  - Critical step: understanding the energy consumption of the refrigeration system

Carbon footprint of seafood products: Tools

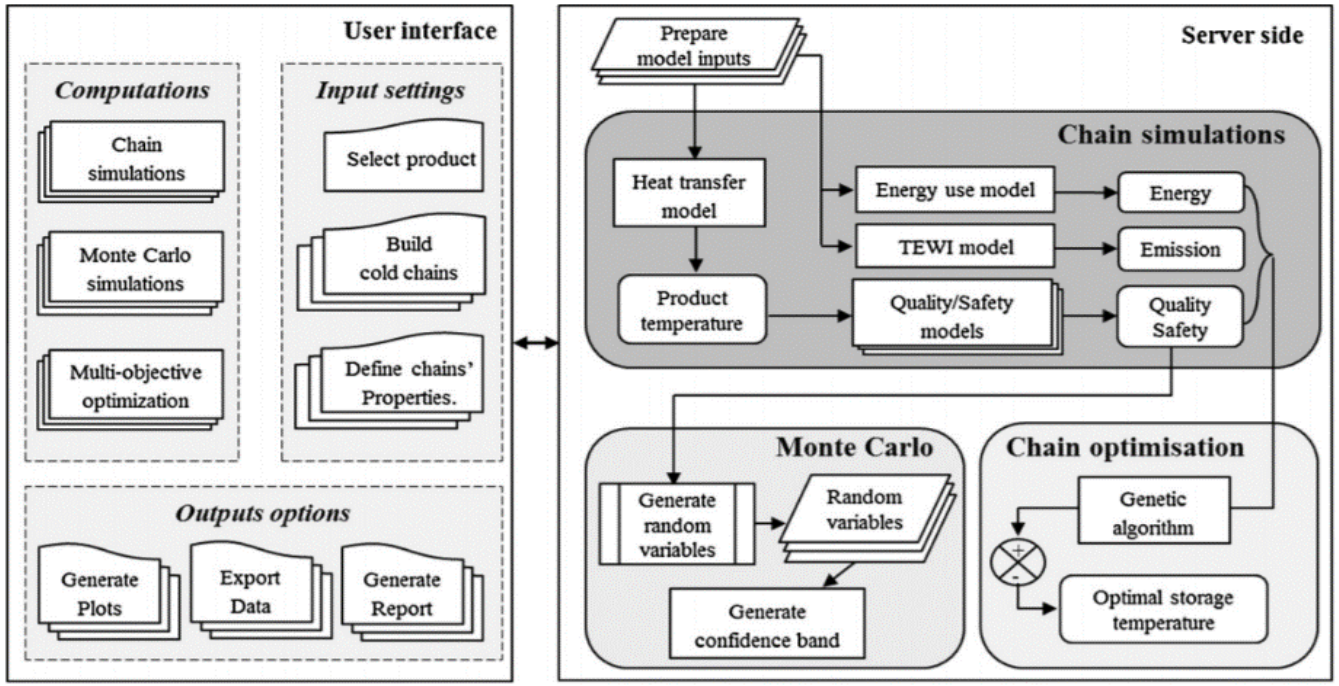
- Poor data on fuel consumption
- Not necessarily vessel specific
- Not necessarily divided between energy consumers
- Several fishing gears may be used
- …

Frisbee Tool

- EU FP7 project FRISBEE (Food Refrigeration Innovation for Safety, consumer Benefit, Environmental impact and Energy optimisation).
- Assessing and optimising refrigeration technologies along European food cold chain, in terms of food quality, energy use and global warming impact
- Six main product categories: salmon fillet

Frisbee Tool

- Tailor-made cold chain
- New technologies: super chilling, …
- Dynamic energy use and carbon footprint (TEWI analysis)
- Quality change (temperature and duration)



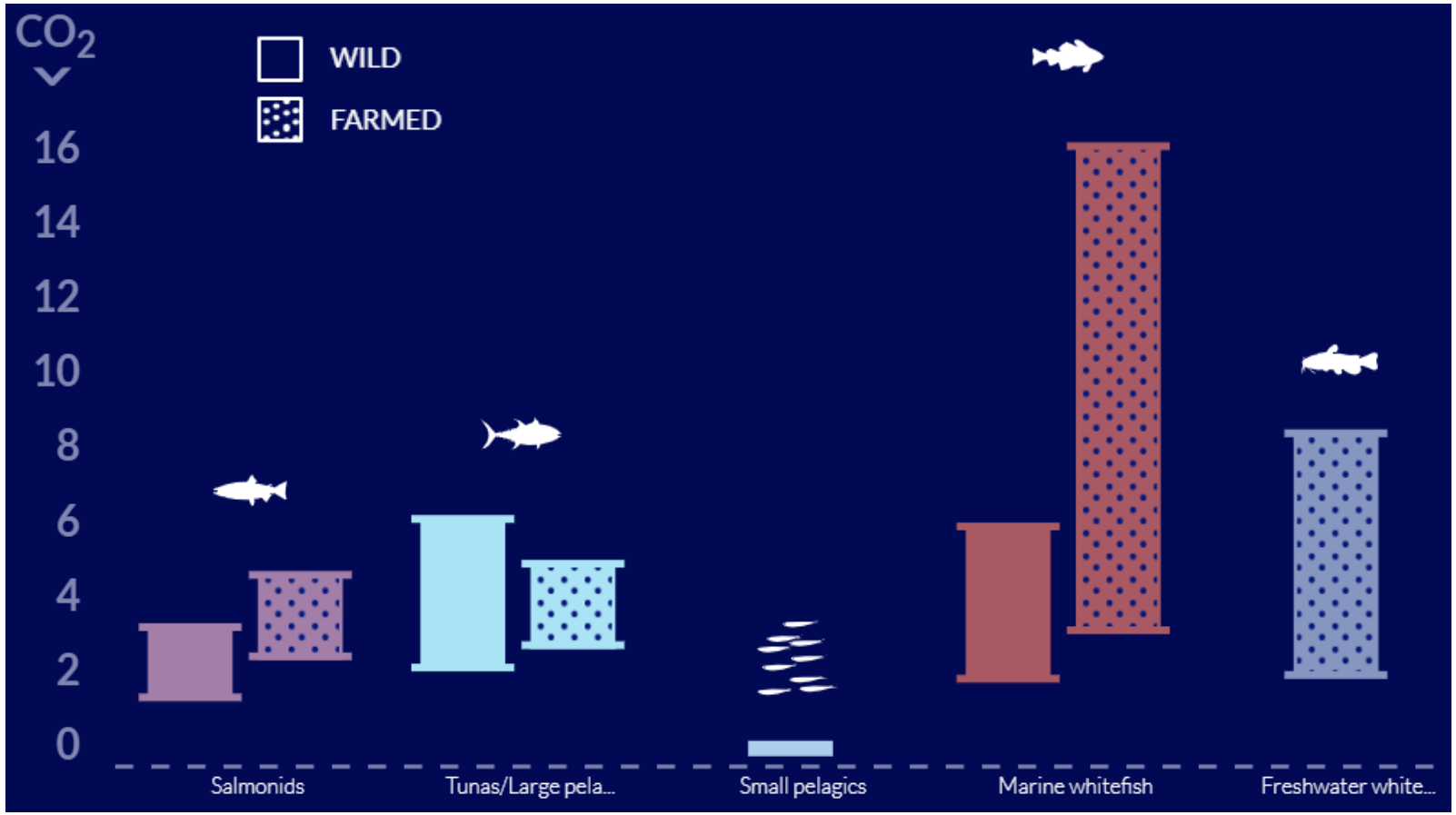
Seafood Carbon Emission tool

- Based on Fisheries Energy Use Database (FEUD), covering official, industrial and scientific data
- Carbon footprint estimates of 154 seafood products: 101 for fisheries and 53 for aquaculture
- Boundary: Up to the point of departure of seafood from primary production and before processing
- Carbon emissions are specific to production method (e.g. fishing method)
- Mainly based on fuel consumption of vessels
- Emissions from burning the fuel plus upstream processes, e.g. refining fuel

Seafood Carbon Emission tool

- Bait-related emissions
- Assiociated uncertainty
- Fuel related emissions are multiplied by 1.33 to account for other factors:
  - Loss of refrigerant
  - Gear manufacturing and maintenance
  - …

Seafood Carbon Emission tool



More info

- Project memo for CoolFish
- Carbon footprint of fisheries review of standards, methods, tool
- Cecilia H Gabrielii and Sepideh Jafarzadeh