

# GOED LCA METHODOLOGY FOR FISH & KRILL, ALGAE, AND SEED-BASED OMEGA-3S



December 18, 2025

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# We Are EcoEngineers, An LRQA Company

- An advisory firm with an exclusive focus on the energy transition and decarbonization recently acquired by leading global assurance partner LRQA
- A team of engineers, scientists, auditors, consultants, and researchers passionate about their work
- Living and working at the intersection of climate policy, innovative technologies, and the carbon marketplace
- Helping clients navigate the disruption caused by carbon emissions and climate change

ec consulting

ec auditing

ec university

# Our Expertise

15+ years

## EcoEngineers

For 15 years, providing strategic advisory services to our global client base

1,000+

## Life-Cycle Analysis

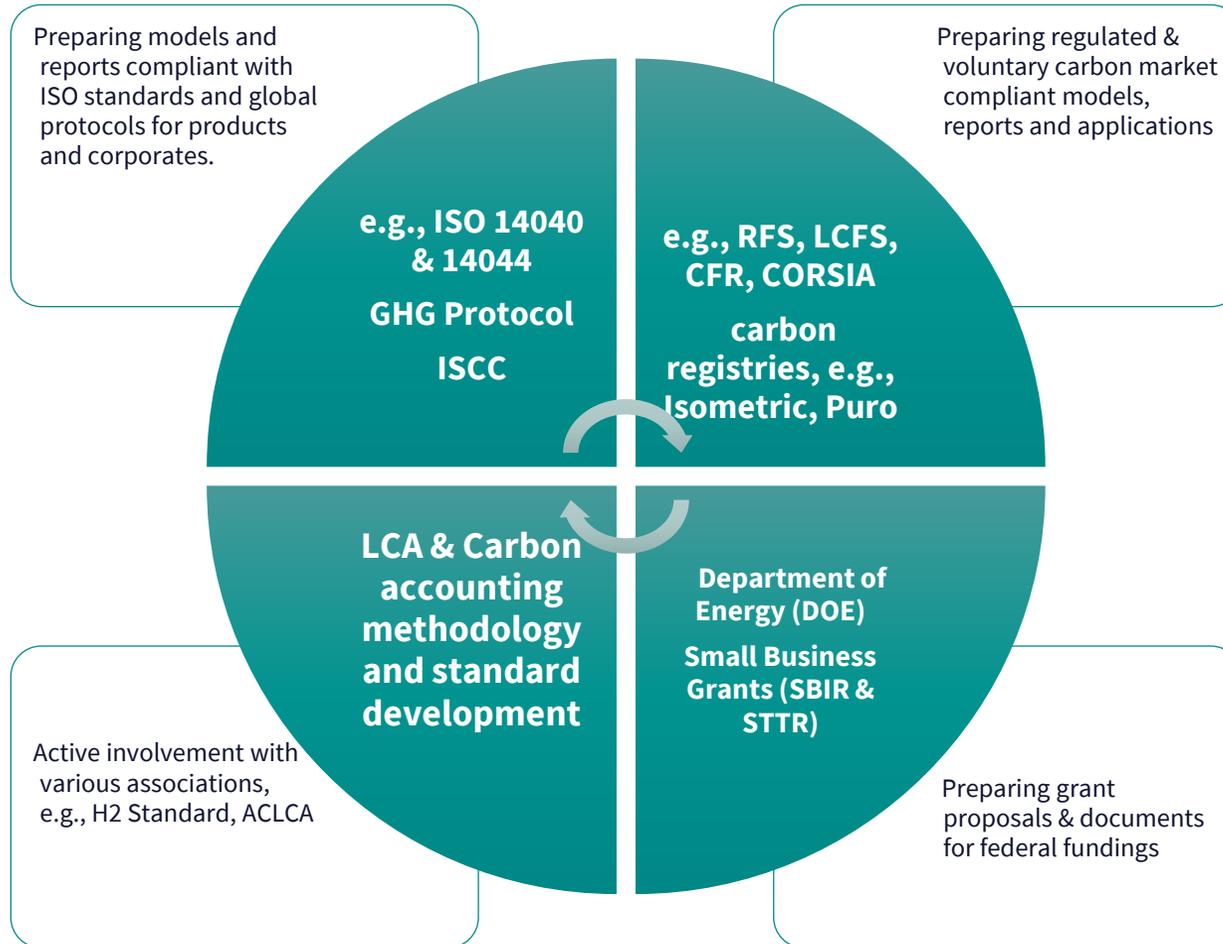
Carbon scores for more than 1,000 fuel pathways and other products

1,000+

## EcoUniversity

Conducted more than 1,000 hours of executive training in carbon management

# OUR CORE LCA COMPETENCIES



# INTRODUCTIONS

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- Life-Cycle Analysis  
Director

# A GUIDELINE FOR TRANSPARENT OMEGA-3 ENVIRONMENTAL SUSTAINABILITY

- A GOED and EcoEngineers (an LRQA company) partnership
- Grounded in ISO 14040 and 14044
- Designed for fish, krill, algae, and seed-based omega-3 supply chains
- Enables credible claims and informed decisions

Identify  
Challenges



Develop  
Methodology



Apply Across  
Supply Chains

# WHY THIS MATTERS: GUIDELINES FOR OMEGA-3 SUSTAINABILITY

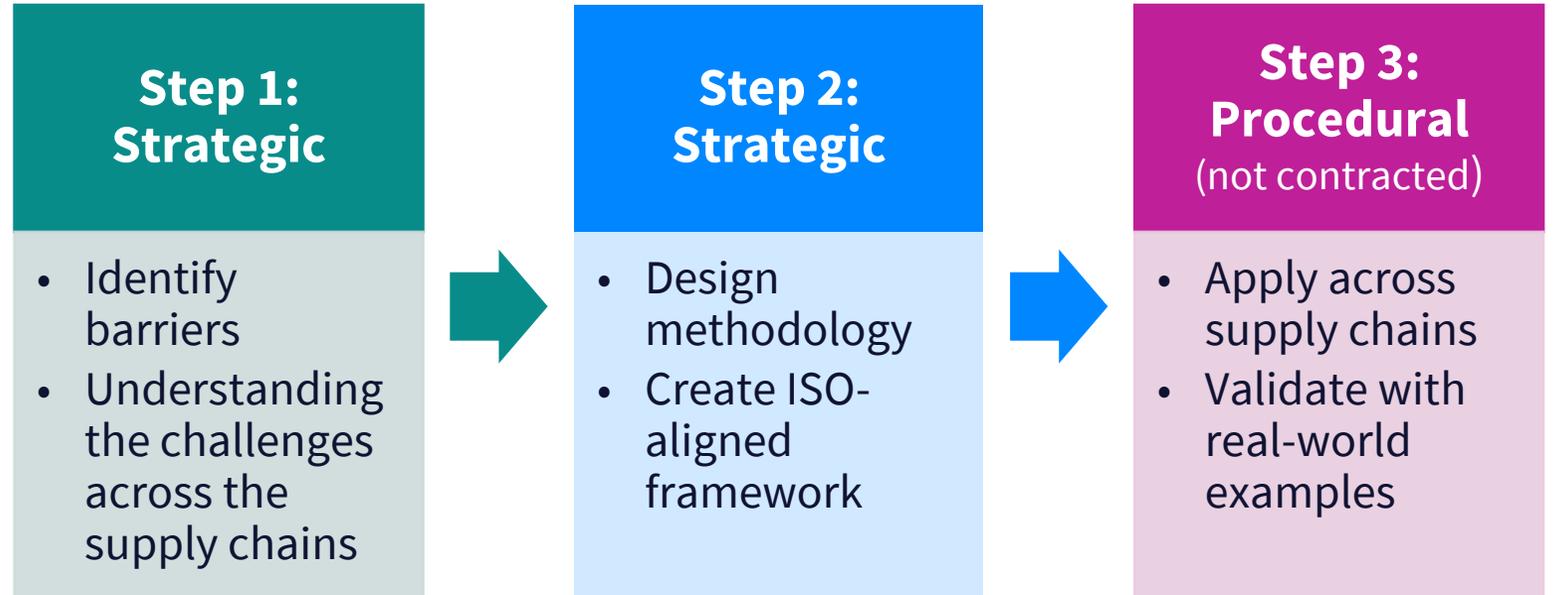
- Potential application
  - Product labeling and environmental claims
  - Corporate sustainability reporting
  - Research and development optimization
  - Policy and benchmarking

- Target audience
  - GOED member companies
  - Regulatory bodies
  - Sustainability auditors
  - Research institutions

- Conditions for public disclosure
  - Transparency across supply chains and products
  - Science-based decisions

# FROM STRATEGY TO ACTION: OUR 3-STEP ROADMAP

- Strategic foundation and practical application for Omega-3 LCAs
- Foundation for credible, comparable sustainability claims



**This presentation provides an overview of the key findings from Step 1**

# A BRIEF INTRODUCTION TO LIFE-CYCLE ASSESSMENT

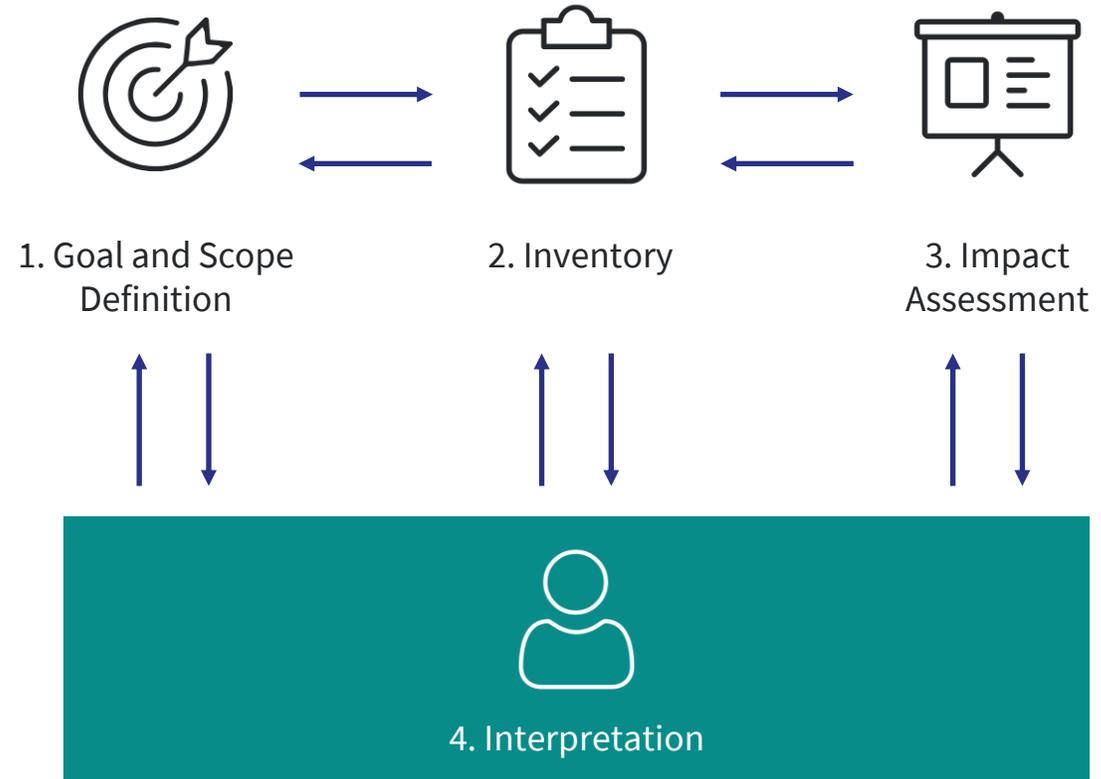


# WHAT IS LCA?

- The systematic and fact-based analysis of the potential environmental impacts associated with products or services during their entire life cycle
- Follows ISO 14040 & 14044; a part of the ISO 14000 Environmental Management family
- Why it matters:
  - Compare existing products with alternatives
  - Optimize product design
  - Inform and educate external stakeholders, including legislators
  - Support product claims
  - Comply with regulations

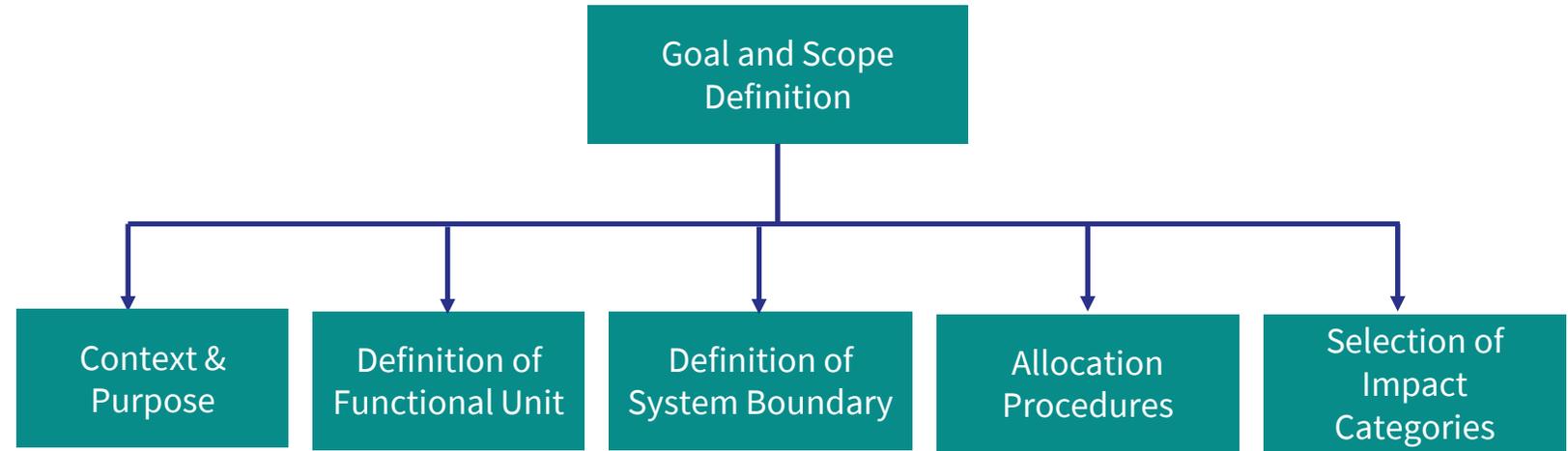


# PHASES OF AN LCA: A DYNAMIC AND ITERATIVE PROCESS



# 1. LCA GOAL AND SCOPE

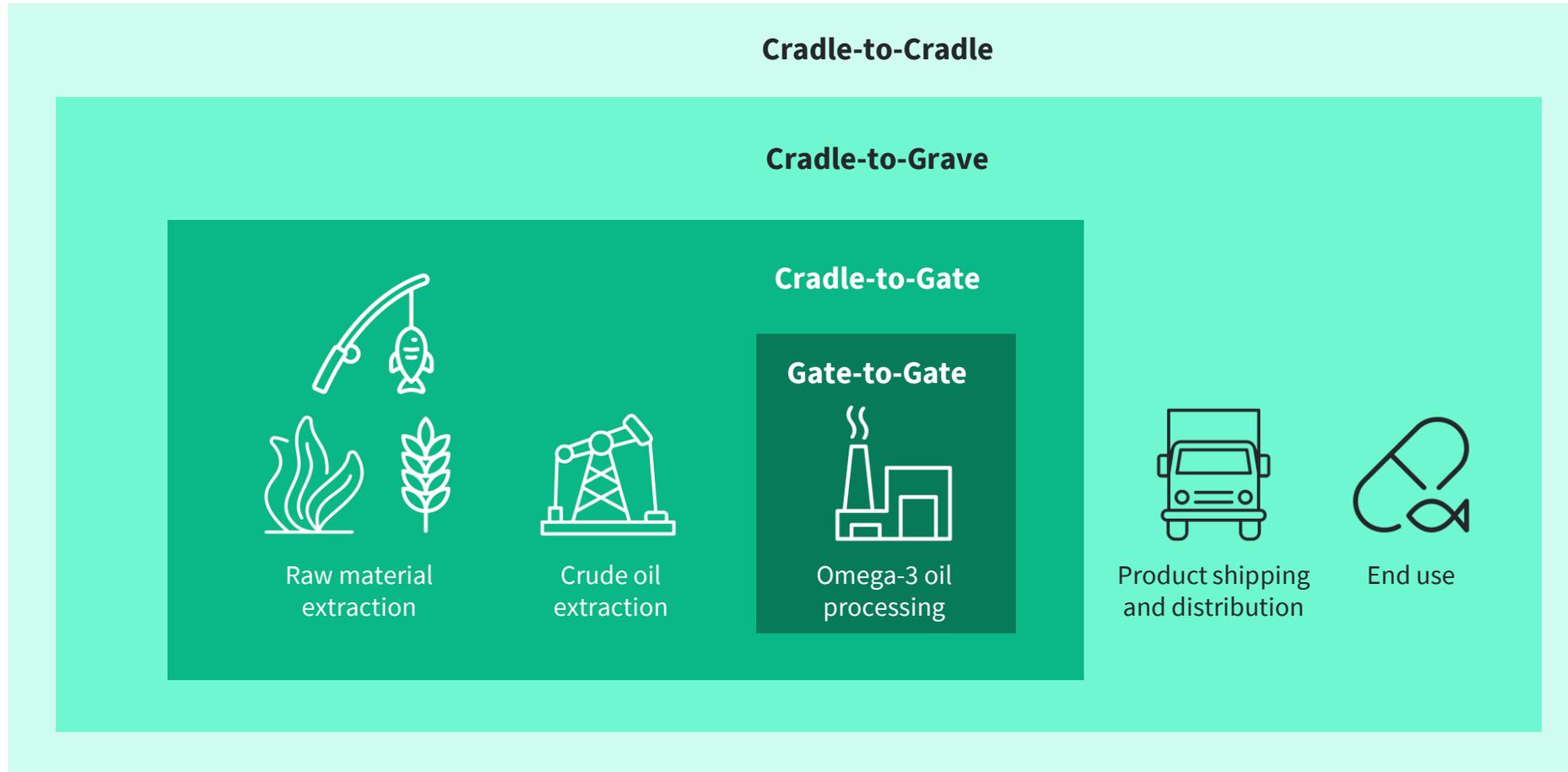
- Reasons for conducting an LCA:
  - A series of parameters to be qualitatively and quantitatively described for an LCA study
  - e.g., which product design to evaluate?
  - e.g., To estimate kg of CO<sub>2</sub>e generated per kg of omega-3 oil produced through specific extraction and processing pathways using defined sources



# FUNCTION AND FUNCTIONAL UNIT

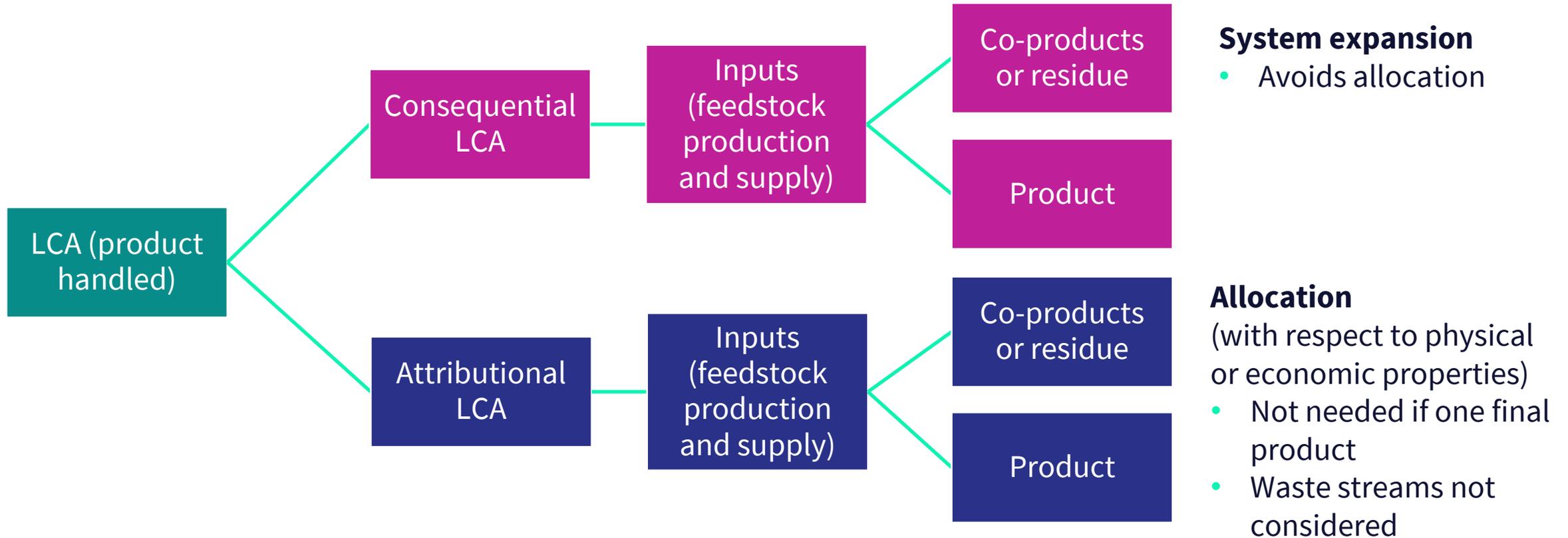
- What is the function of the system studied (what does it do)?
  - The essential purpose of a product system:
  - What the system delivers, not just the final products
  - Example: the essential purpose of producing Omega-3 is to provide bioavailable long-chain EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid)
- Functional unit:
  - Quantifies the function
  - Quantitative basis for relating inputs and outputs
  - Must be clearly defined, measurable, and consistent across compared systems: e.g., 1 kg of oil as final product

# PRODUCT SYSTEM BOUNDARY



Extractions from environment (inputs) ↑↑↑ Releases to environment (outputs) ↓↓↓

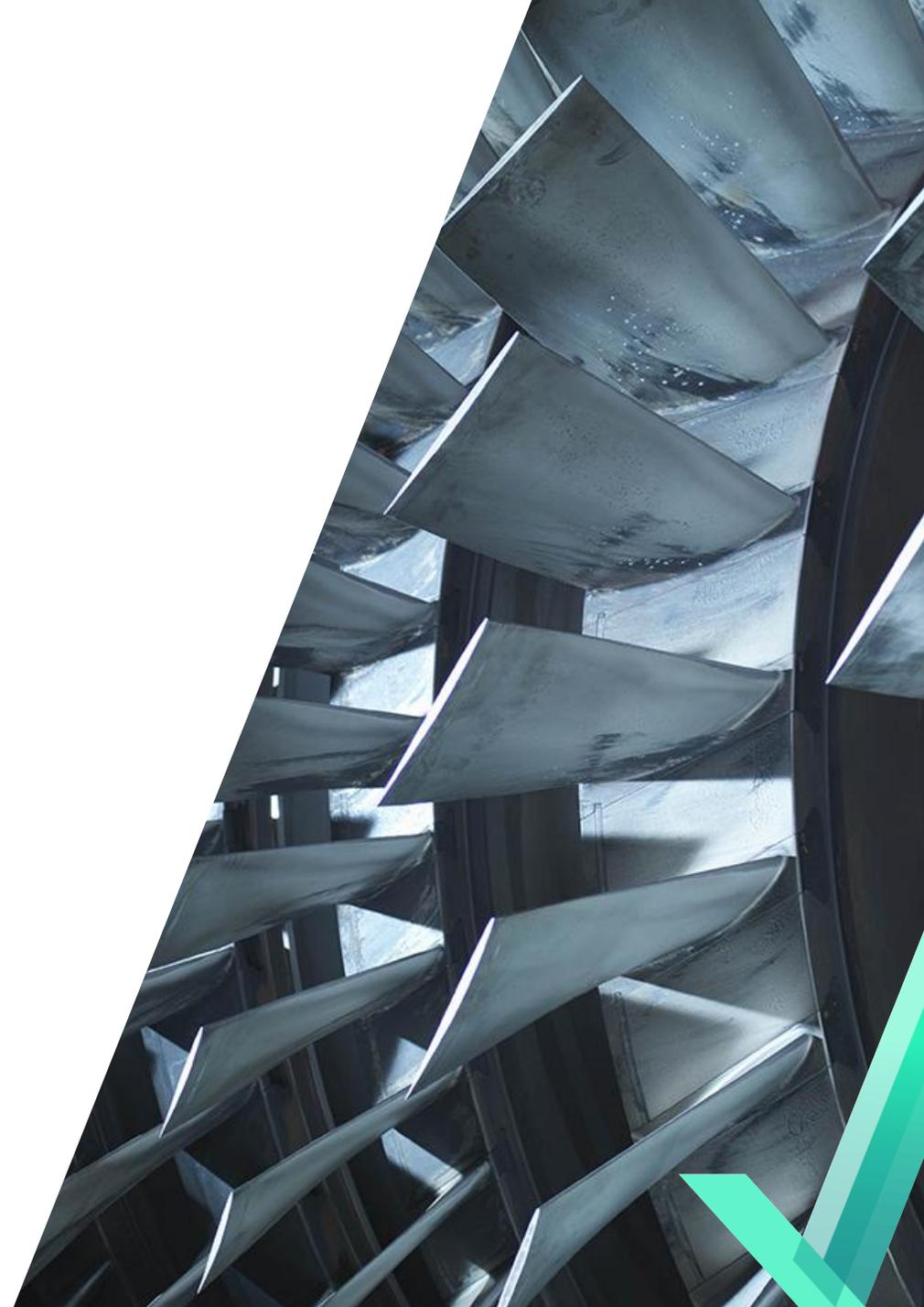
# ALLOCATION: ASSIGNING EMISSIONS VARIES ON APPROACH



ISO recommends avoiding allocation when possible

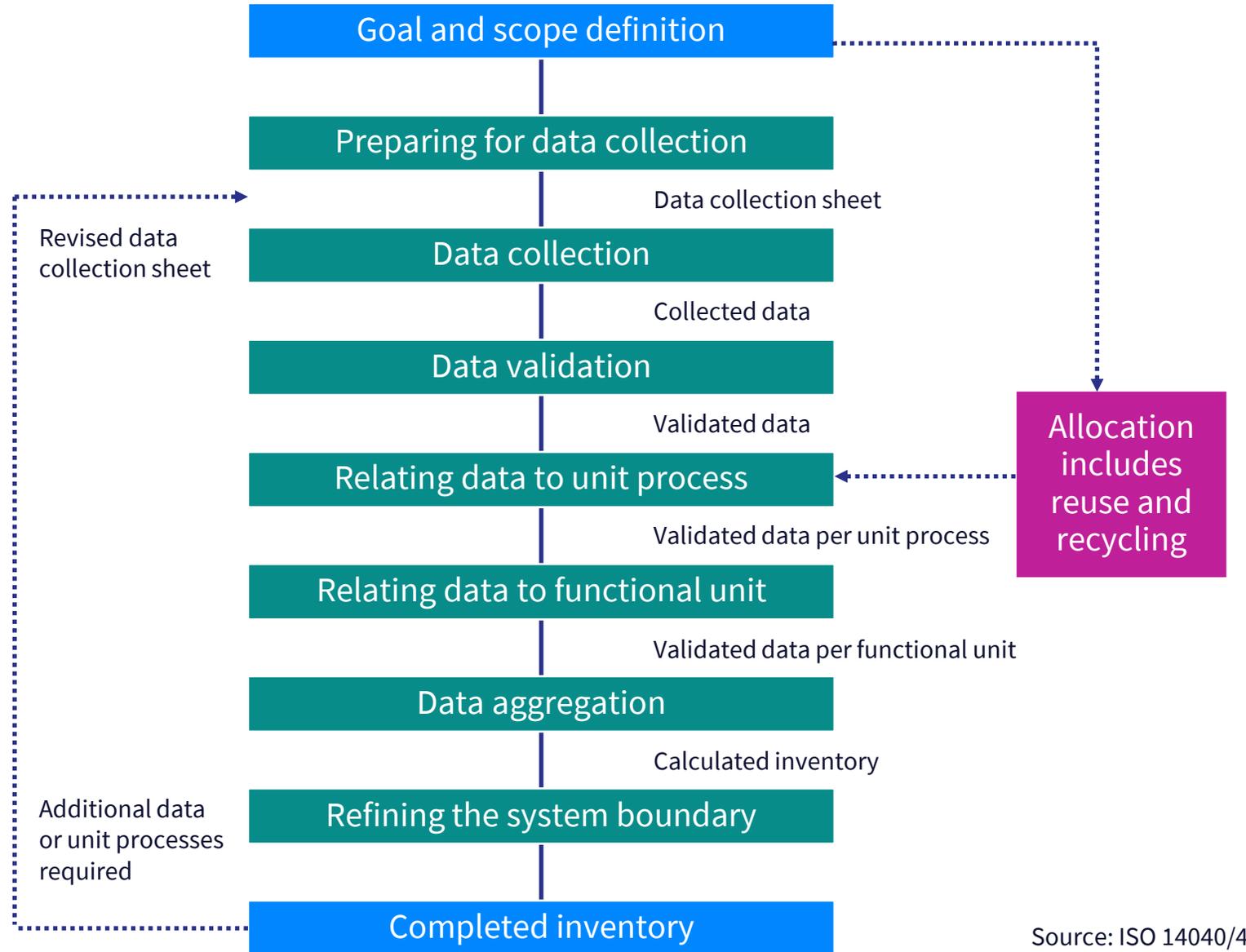
# CUT-OFF CRITERIA

- Rules that determine which inputs, outputs, and processes are included or excluded from the LCA model
- Description of cut-off criteria and assumptions must be clearly stated in the goal and scope
- Quantitative thresholds:
  - Mass
  - Energy
  - Environmental relevance



## 2. LIFE CYCLE INVENTORY

- Construction of the flow model according to the system boundaries decided in goal and scope definition
- Data collection for all activities
- Calculation of the amount of resource use and pollutant emissions of the system in relations to the functional unit



# PAID FOR VS. PUBLIC ACCESS DATABASES



**EFDB**  
emission factor database



<p>IPCC Emissions Factor Database is a library of emission factors and other parameters with background documentation or technical references.</p>	<p>The ecoinvent database contains more than 20,000 reliable life-cycle inventory datasets, covering a range of sectors.</p>	<p>Sphera (formerly GaBi) database is one of the leading product sustainability solutions for life-cycle assessment with over 10,000 users globally.</p>	<p>The USLCI database provides individual accounting of the energy and material flows into and out of the environment that are associated with producing a material, component, or assembly in the U.S.</p>	<p>The U.S. Department of Energy's Office of Transportation Technologies fuel-cycle model called GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) evaluates various engine and fuel combinations on a consistent fuel-cycle basis.</p>
<p><b>Licensing:</b> Free</p>	<p><b>Licensing:</b> Paid; varies on educational or commercial use</p>	<p><b>Licensing:</b> Partly free, partly with a license fee</p>	<p><b>Licensing:</b> Free</p>	<p><b>Licensing:</b> Free</p>
<p><b>Time period:</b> 2002 – present</p>	<p><b>Time period:</b> 1990 – present</p>	<p><b>Time period:</b> 1989 – present</p>	<p><b>Geography:</b> U.S.</p>	<p><b>Geography:</b> U.S.</p>
<p><b>Indicator:</b> GHGs</p>	<p><b>Indicators:</b> e.g., GHGs, nitrate, phosphate, etc.</p>	<p><b>Indicators:</b> e.g., GHGs, nitrate, phosphate, etc.</p>	<p><b>Indicator:</b> e.g., GHGs</p>	<p><b>Indicator:</b> e.g., GHGs, water, particulate matter</p>

# 3. LIFE CYCLE IMPACT ASSESSMENT (LCIA)

- Previous step (Step 2 of LCA): LCI
  - Environmental loads
- Now Step 3 of LCA: LCIA
  - Translating environmental loads (numbers) to impacts (insights)

## Inventory Data

- CO<sub>2</sub>, CH<sub>4</sub>
- Nitrate
- NO<sub>x</sub>
- Particulate matter
- Water

## Impact Categories

- Climate change
- Eutrophication
- Acidification
- Respiratory effect
- Water footprint

# WHY ENVIRONMENTAL IMPACT?

- Environmental consequences of the environmental loads quantified in LCI
- Translation of the loads to impacts (e.g., ozone depletion instead of chlorofluorocarbons or CFC emissions)
- Impacts are more relatable than indicators
- Impacts are more readable and easier to grasp
- Impact assessment makes results more comparable



# GENERAL IMPACT CATEGORIES CONSIDERED IN LIFE-CYCLE ASSESSMENT



- Resource use



- Human health



- Ecological consequences

# LCA TOOLS FOR LCIA



# 4. INTER- PRETATION

- You may get hundreds of data points as results
  - How do you present them?
- Refine the raw results into useful and presentable results based on their importance
- Use different types of diagrams to analyze results
- Evaluate the robustness of the results
  - Sensitivity analysis
  - Uncertainty analysis
  - Data quality assessment

- Ensure results align with the defined goal and scope
- Double-check the model and analyze the results
  - Which life-cycle stage has the highest contribution?
- Conclusions, limitations and recommendations:
  - e.g., use phase/certain process is most important
  - e.g., substituting material that has high energy requirements
- Maybe iterative re-goal/re-scope based on preliminary findings
  - e.g., realization that certain material would be 95% of the results and need to research to better understand that material in scope

# **DEVELOPING THE METHODOLOGY: OUR APPROACH**



# STEPS TAKEN TO DEVELOP THE METHODOLOGY: FIRST STEP

- Foundation

- Define goal and scope in alignment with ISO 14040/44
- Design stakeholder interview framework

**1**

- Data and analysis

- Conduct interviews across diverse stakeholder groups
- Compile data and information inventory
- Review existing LCAs and related literature

**2**

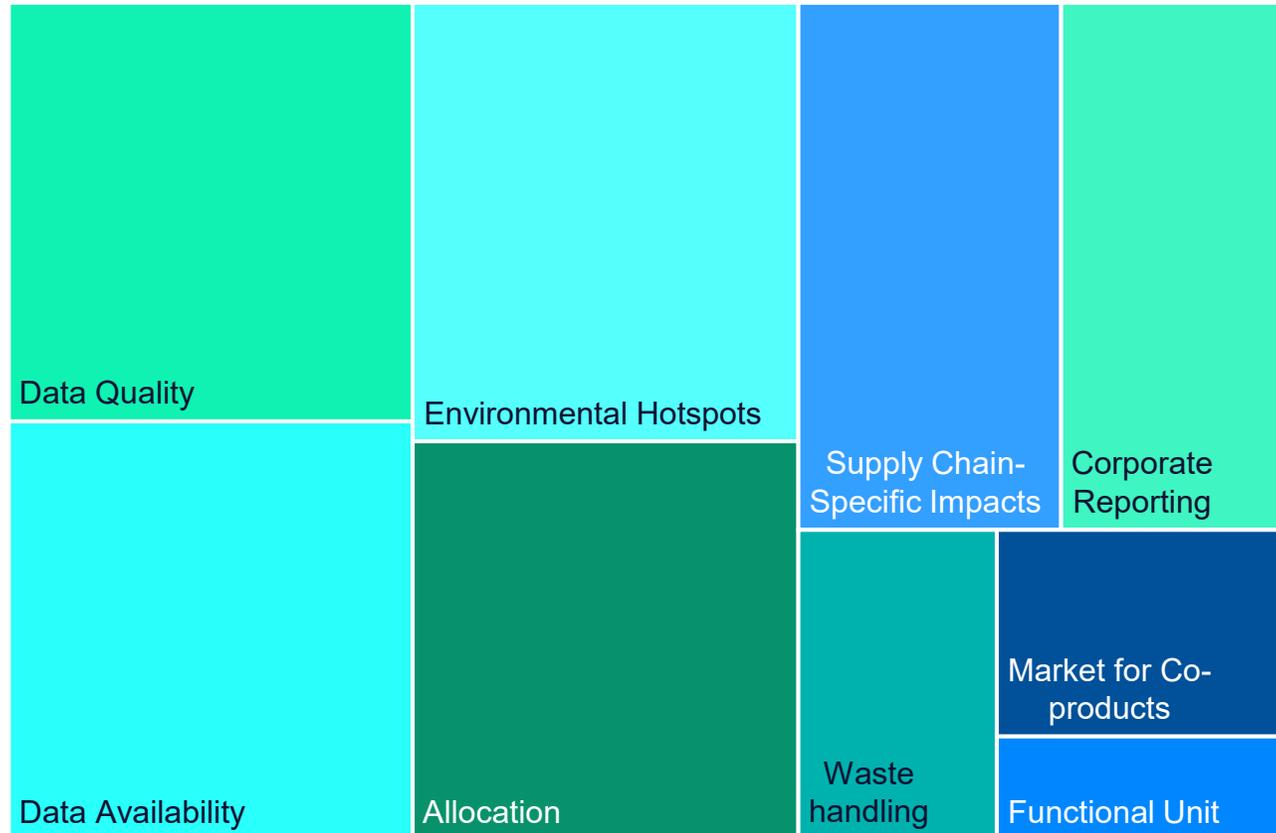
- Validation

- Identify key enablers and barriers to implementation
- Engage and validate insights with GOED members

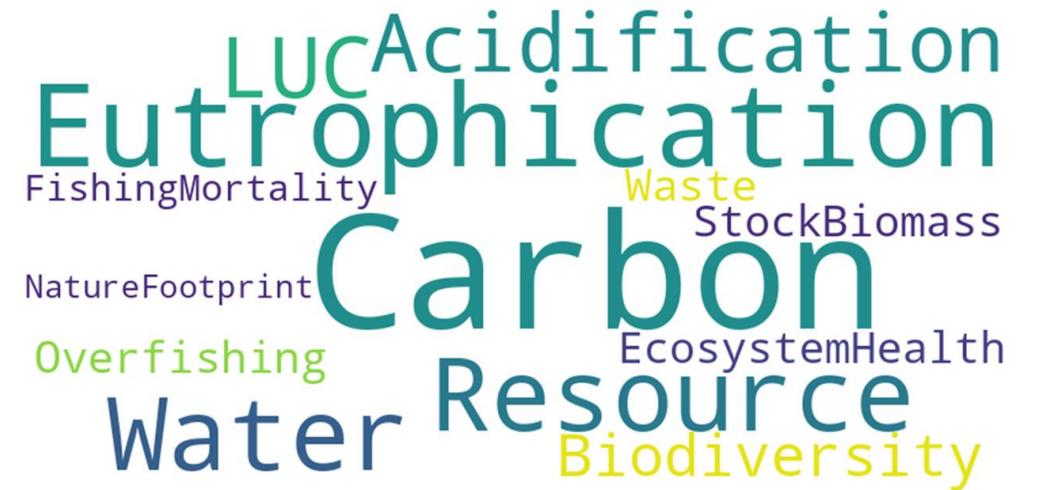
**3**

# WHAT STAKEHOLDERS SHARED

## Issues and topics identified during interviews

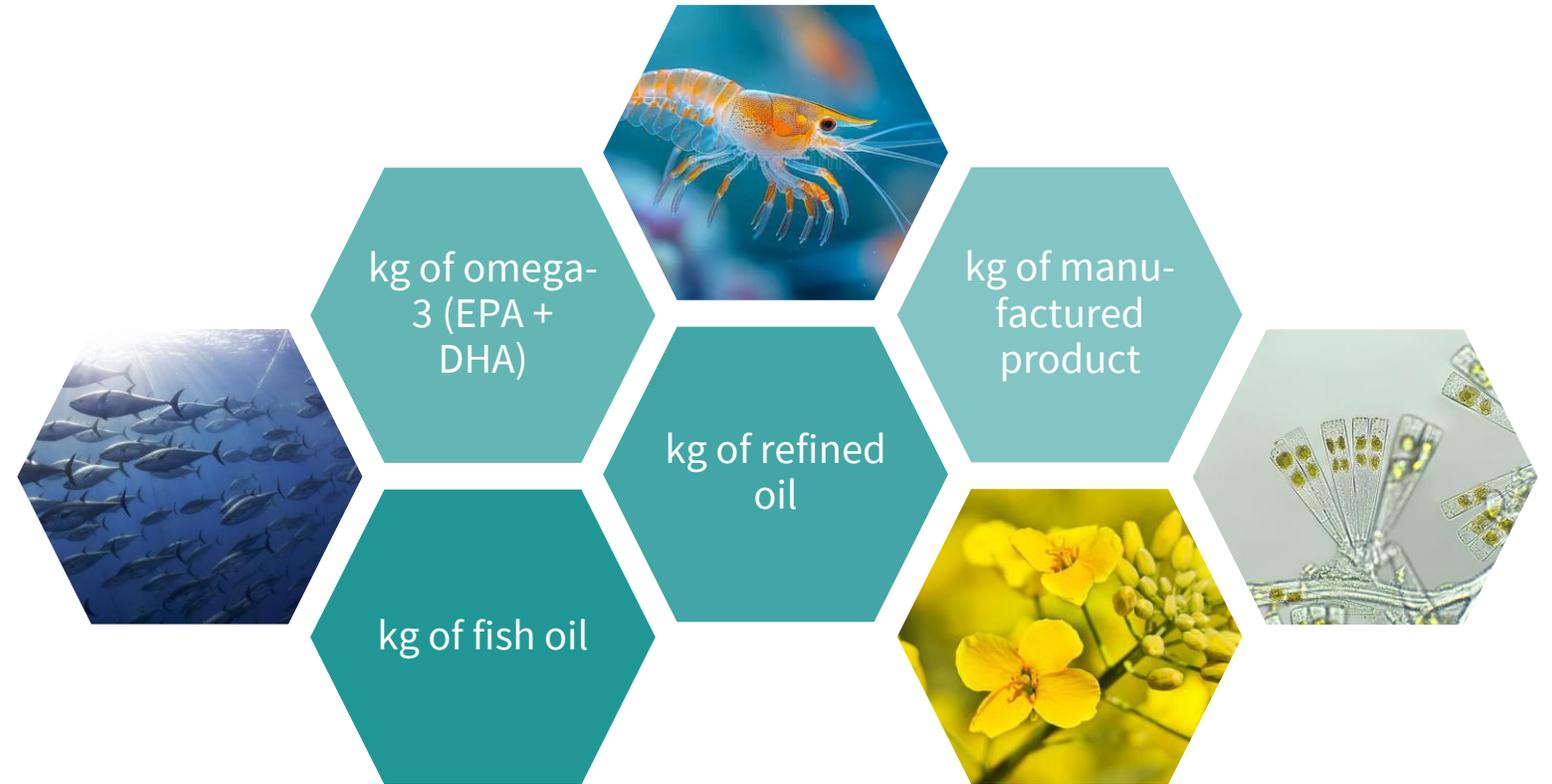


## Environmental impacts emphasized



# FUNCTIONAL UNIT

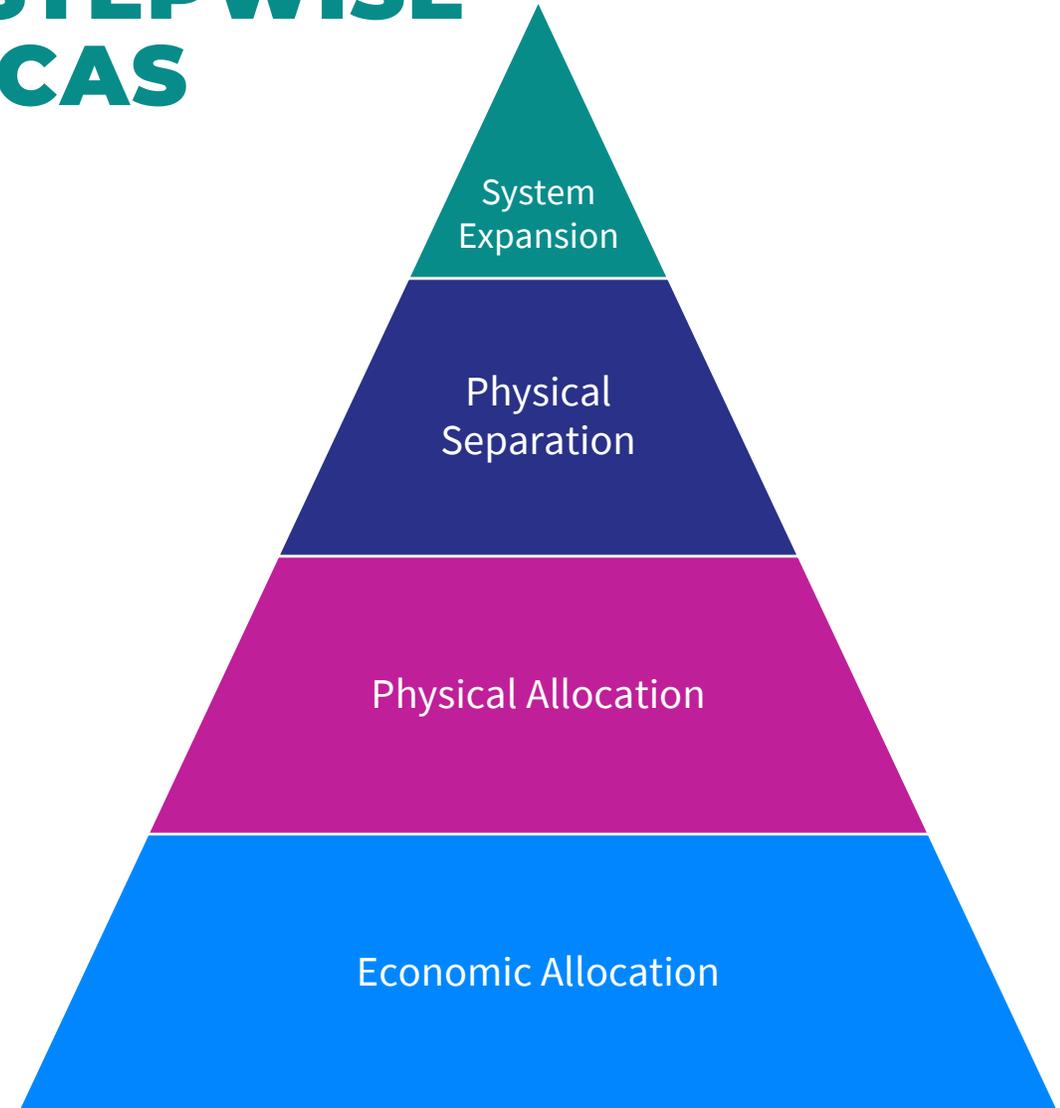
- Functional unit for Omega-3 as a final product: 1 gram/kg of EPA or DHA or both (Omega-3 fatty acids) delivered in final product form to the consumer
  - Ensures comparability across diverse Omega-3 sources
  - Reflects the nutritional function rather than product mass or volume
  - Accounts for variation in concentration, formulation, and delivery (capsule, oil, powder, fortified food)
  - Aligns with existing literature and best practices in nutritional LCAs



**Functional unit used across studies and by interviewed participants across the omega-3 supply chains**

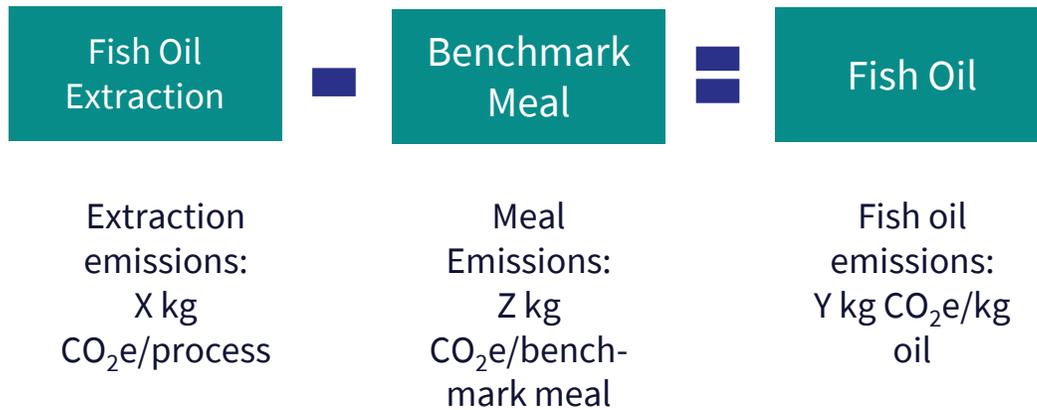
# ALLOCATION PROCEDURE: STEPWISE APPROACH FOR OMEGA-3 LCAS

- Avoid allocation where possible
  - Use system expansion/substitution to capture co-product functions
  - Separate processes so inputs and outputs can be directly assigned to each product
- If allocation is necessary
  - Use physical relationships (mass, energy, nutrient content) that reflect actual resource flows
  - If not feasible, apply economic allocation based on market value (\$/kg meal vs \$/kg oil)
- Core principle
  - Allocation procedures should closely reflect actual material balances and input/output relationships for credible and comparable results

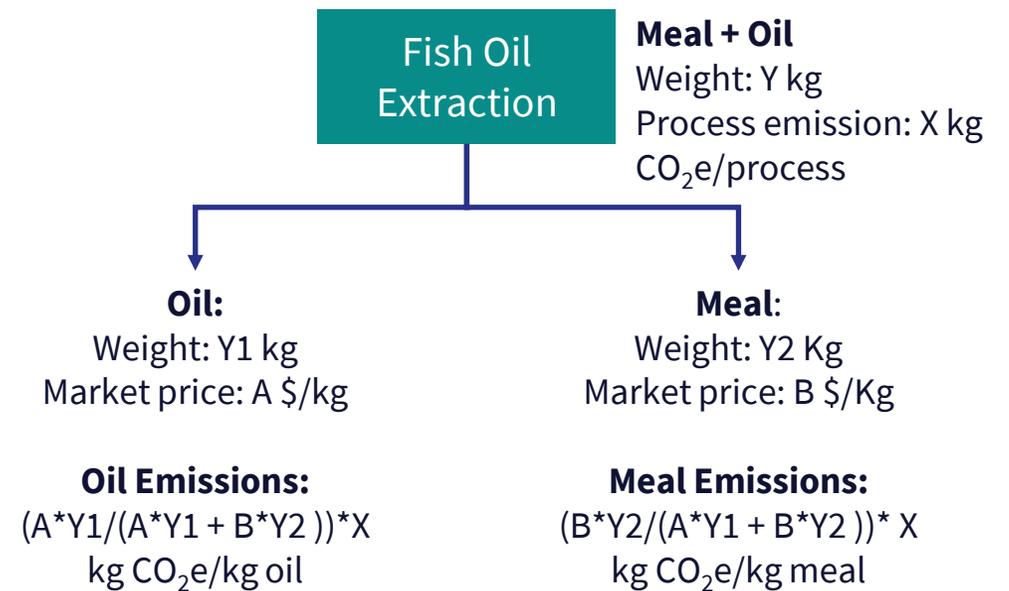


# SYSTEM EXPANSION VS. ALLOCATION

## System Expansion



## Allocation



# GENERAL ALLOCATION RECOMMENDATIONS: ENSURE TRANSPARENCY AND CONSISTENCY

- Clearly distinguish co-products vs. waste (only co-products receive allocated inputs/outputs)
- Document and justify all allocation choices
- Apply methods consistently across similar processes
- Conduct sensitivity analysis when allocation strongly influences results



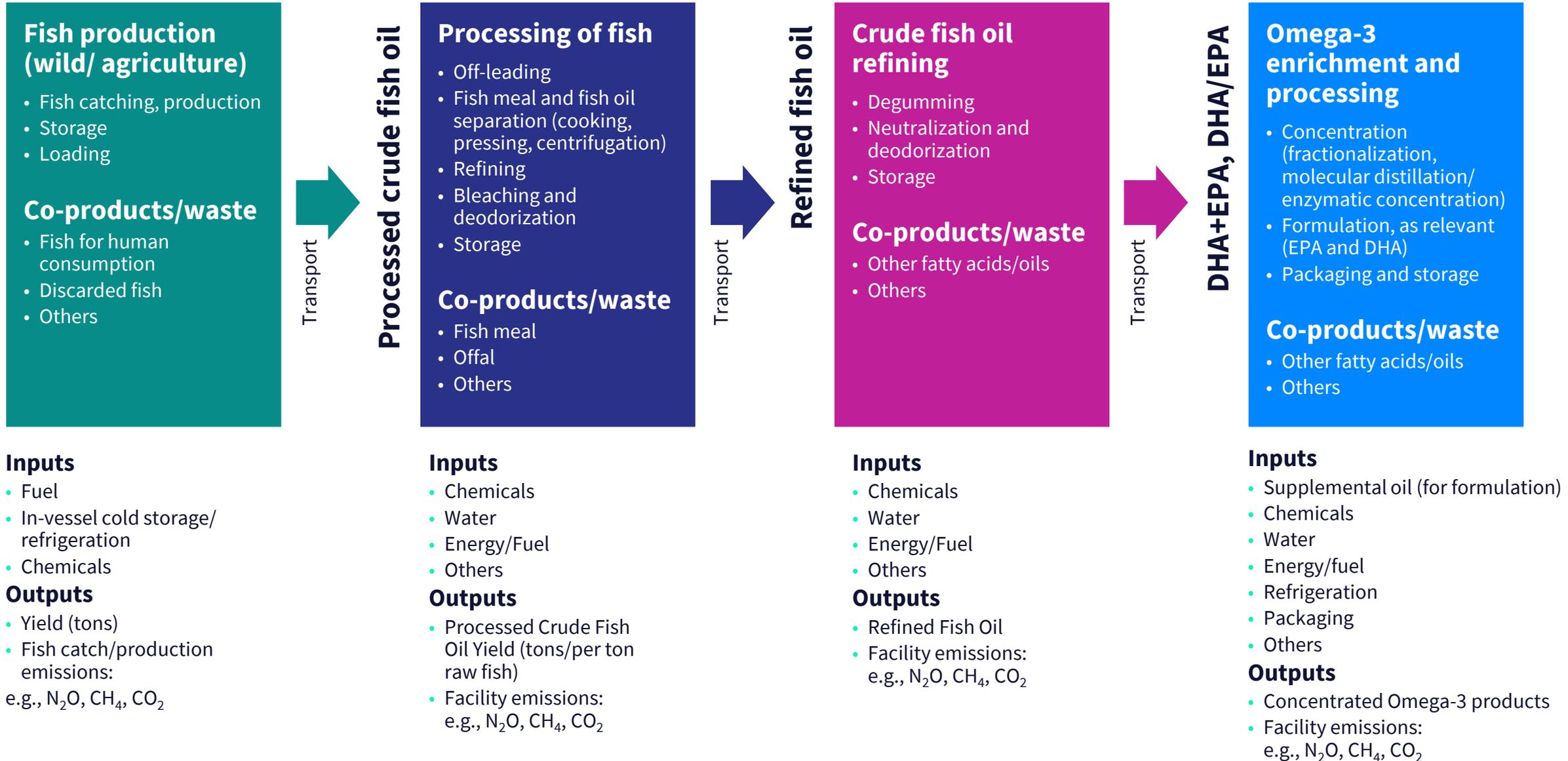
# OMEGA-3 SUPPLY CHAIN- SPECIFIC FINDINGS

Fish and Krill-Based Supply Chain



# FISH-BASED OMEGA-3 SYSTEM BOUNDARY

Fish



# KEY LCA CHALLENGES IN FISH-BASED OMEGA-3 SUPPLY CHAINS

- Fish-based Omega-3 LCAs face unique environmental and data challenges that extend beyond conventional impact categories

- **Data Quality & Representativeness:** Fish and Krill-based Omega-3 supply chains benefit from more mature technologies
- **Regional & Temporal Variability:** Changes in species composition, fish oil yield, and processing energy demand by season or region
- **Completeness and Traceability Gaps:** Limited visibility across complex, global supply chains or with smaller scale fishers
- There is a better visibility for businesses that own the operation across the upstream supply chain

# KEY LCA CHALLENGES IN FISH-BASED OMEGA-3 SUPPLY CHAINS

- **Consistency and LCIA limitations:** Conventional methods often overlook marine ecosystem
  - **Overfishing and habitat impacts:** Threats to marine biodiversity and long-term resource sustainability
    - Emerging metrics (e.g., marine biodiversity indicators) could be integrated
  - **Bycatch and discards:** Unaccounted ecological burdens and loss of resource efficiency



# METHODOLOGICAL CHALLENGES: ALLOCATION

Allocation method can strongly influence results

- e.g., Fishmeal and fish oil are co-produced

Co-product allocation

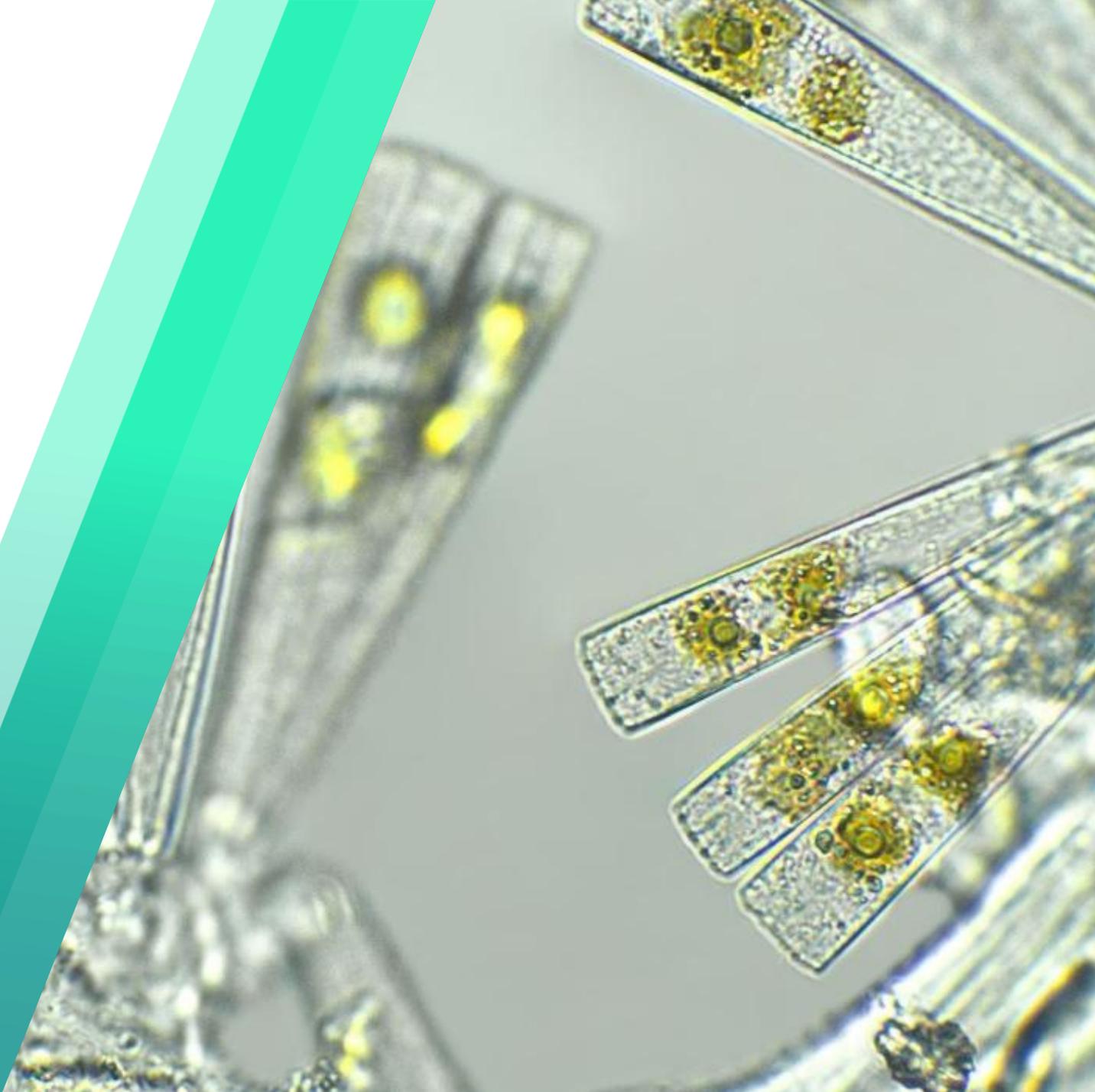
- System Expansion Complexities: Co-products with benchmark from different markets: fishmeal for animal feed vs. aquaculture
- Physical Separation: Lack of unit operation-level data
- Allocation: Economic allocation can skew results due to volatile market prices

Transparency and sensitivity testing are critical



# OMEGA-3 SUPPLY CHAIN- SPECIFIC FINDINGS

Algae-Based Omega-3 Supply Chain



# ALGAE-BASED OMEGA-3 SYSTEM BOUNDARY

Algae biomass

## Algae production and harvesting

### Open Pond (nutrient supply for cultivation)

#### Inputs

- Land use for pond
- Starter culture
- Sunlight
- Freshwater or Saline
- Nutrients (N, P)
- CO<sub>2</sub> (injected or absorbed)
- Others

#### Outputs

- Yield (tons dry matter, algae)
- Emissions: e.g., N<sub>2</sub>O, CO<sub>2</sub>

### Closed photobioreactor (PBR, nutrient supply for cultivation)

#### Inputs

- Enclosed tubes/reactors
- Controlled lights
- Nutrients
- CO<sub>2</sub> supply
- Fuel/energy
- Water
- Others

#### Outputs

- Yield (tons dry matter, algae)
- Emissions: e.g., N<sub>2</sub>O, CO<sub>2</sub>

### Heterotrophic fermentation (substrate production-nutrient supply for cultivation)

#### Inputs

- Feedstock (e.g., sugar, corn dextrose)
- Production/supply
- Nutrients
- Fuel/energy
- Water
- Others

#### Outputs

- Yield (tons dry matter, algae)
- Emissions: e.g., N<sub>2</sub>O, CO<sub>2</sub>

### Co-products/waste

- Water recycled streams
- CO<sub>2</sub> (fermentation)
- Residual culture medium, nutrient-rich effluents
- Others

Transport

Crude oil

## Algae processing

- Centrifugation, filtration, or flocculation
- Drying (mechanical/spray)
- Lipid extraction
- Separation

### Co-products/waste

- Algal meal
- Others

#### Inputs

- Fuel-energy
- Others

#### Outputs

- Dried algal biomass/crude oil
- Emissions: e.g., N<sub>2</sub>O, CO<sub>2</sub>, VOCs

Transport

DHA+EPA, DHA/EPA

## Omega-3 enrichment and processing

- Purification (conventional distillation, molecular distillation, winterization)
- Formulation, as relevant (EPA and DHA)
- Packaging and storage

### Co-products/waste

- Other fatty acids, pigments
- Others

#### Inputs

- Supplemental oil (for formulation)
- Chemicals
- Vacuum systems & equipment
- Water
- Energy/fuel
- Refrigeration
- Packaging
- Others

#### Outputs

- Concentrated Omega-3 products
- Facility emissions: 38 e.g., N<sub>2</sub>O, CH<sub>4</sub>, CO<sub>2</sub>



# KEY LCA CHALLENGES IN ALGAE-BASED OMEGA-3 SUPPLY CHAINS

- Data Representativeness and Traceability
  - Obtaining high-quality, specific data from upstream providers
  - Companies may rely on standard values or generic datasets
  - How to engage with suppliers

- System Boundaries
  - Aligning boundaries in order to compare results
  - Crude, refined, and concentrated oils: each system has different impacts and processing steps.

- Allocation and Co-Product Handling
  - How to properly allocate impacts among multiple outputs (e.g., crude oil, refined oil, biomethane)

# ALGAE OIL— LCA HOTSPOTS

## High Energy Intensity

- Lighting
- Pumps
- Temperature control
- Aeration

## Nutrient and Feedstock Sourcing

- Fossil-based or agriculturally intensive
- Water use and waste management
- Large volumes of water

## Land Use and Infrastructure

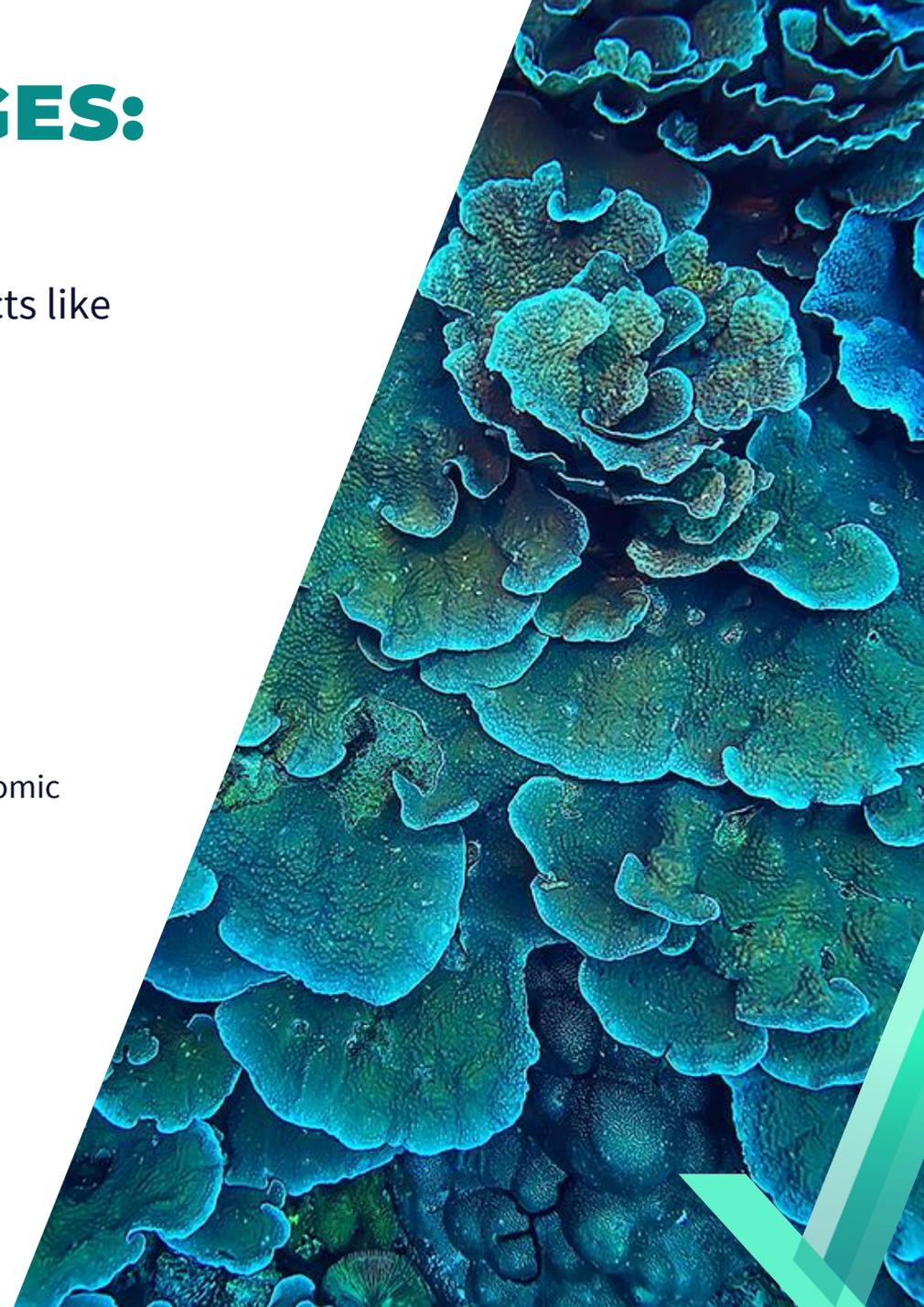
- May use arable land
- Bioreactors
- HVAC systems

## Smaller-Scale and Pilot Operations

- Technology maturity
- Lack of standardized protocols

# METHODOLOGICAL CHALLENGES: ALLOCATION

- **Why an appropriate allocation method matters:** Common co-products like residual biomass or proteins can be significant
- Complexities
  - Multiple functional outputs benchmarked against different markets
    - Algae oil for biofuels, nutraceuticals vs protein-rich biomass for feed
  - Economic allocation leads to volatile market prices
  - Various stakeholders (e.g., sugar refiners) co-produce energy
    - Mass allocation is not feasible due to electricity being a co-product, and instead, economic and energy allocation are used, with prices and energy content as the basis



# OMEGA-3 SUPPLY CHAIN- SPECIFIC FINDINGS

Seed-Based Omega-3 Supply Chain



# SEED-BASED OMEGA-3 SYSTEM BOUNDARY

Canola Oil seed

## Crop production

- Crop cultivation
- Crop harvesting

## Co-products/waste

- Crop residues (stalks, straws)
- Others

Transport



Crude oil

## Oil extraction and refining

- Seed crushing
- Solvent extraction
- Refining and deodorization
- Storage

## Co-products/waste

- Canola meal
- Others

Transport



DHA+EPA, DHA/EPA

## Omega-3 enrichment/processing

- Concentration (chemical/enzymatic)
- Formulation, as relevant (DHA+EPA)
- Packaging and storage

## Co-products/waste

- Other fatty acids/oils
- Others

### Inputs

- Fertilizer
- Chemicals
- Seeds
- Diesel
- Electricity
- Land use

### Farm Outputs

- Yield (tons/bu per acre)
- Field emissions: e.g., N<sub>2</sub>O, CH<sub>4</sub>, CO<sub>2</sub>, SOC change

### Inputs

- Chemicals
- Water
- Energy/fuel
- Others

### Outputs

- Refined crude oil yield (tons/per ton seeds)
- Facility emissions: e.g., N<sub>2</sub>O, CH<sub>4</sub>, CO<sub>2</sub>

### Inputs

- Supplemental oil (for formulation)
- Chemicals
- Water
- Energy/fuel
- Packaging
- Refrigeration
- Others

### Outputs

- Concentrated omega-3 products
- Facility emissions: e.g., N<sub>2</sub>O, CH<sub>4</sub>, CO<sub>2</sub>

# KEY LCA CHALLENGES IN OIL SEED-BASED OMEGA-3 SUPPLY CHAINS

- Oil seed-based Omega-3 LCAs face unique environmental and data challenges mainly for quantifying emissions from land use and land use change

- Data quality technological representativeness
  - Representation of agroecological features corresponding to the specific farm producing Canola seeds
  - Difficulty in capturing actual processing technologies (e.g., solvent extraction vs. mechanical pressing) used in crude oil extraction process
  - Energy efficiency variability between older vs modern processing facilities
  - Sparse data for emerging or novel technologies (e.g., enzymatic extraction)
- Completeness
  - Key upstream processes (e.g., seed breeding) often omitted
  - Waste management practices and outputs frequently excluded
  - High uncertainty in fertilizer use, emission factors, and land-use related impacts
  - Limited or missing treatment of direct and indirect land use change (LUC/iLUC)
  - Inconsistent or absent co-product allocation approaches.

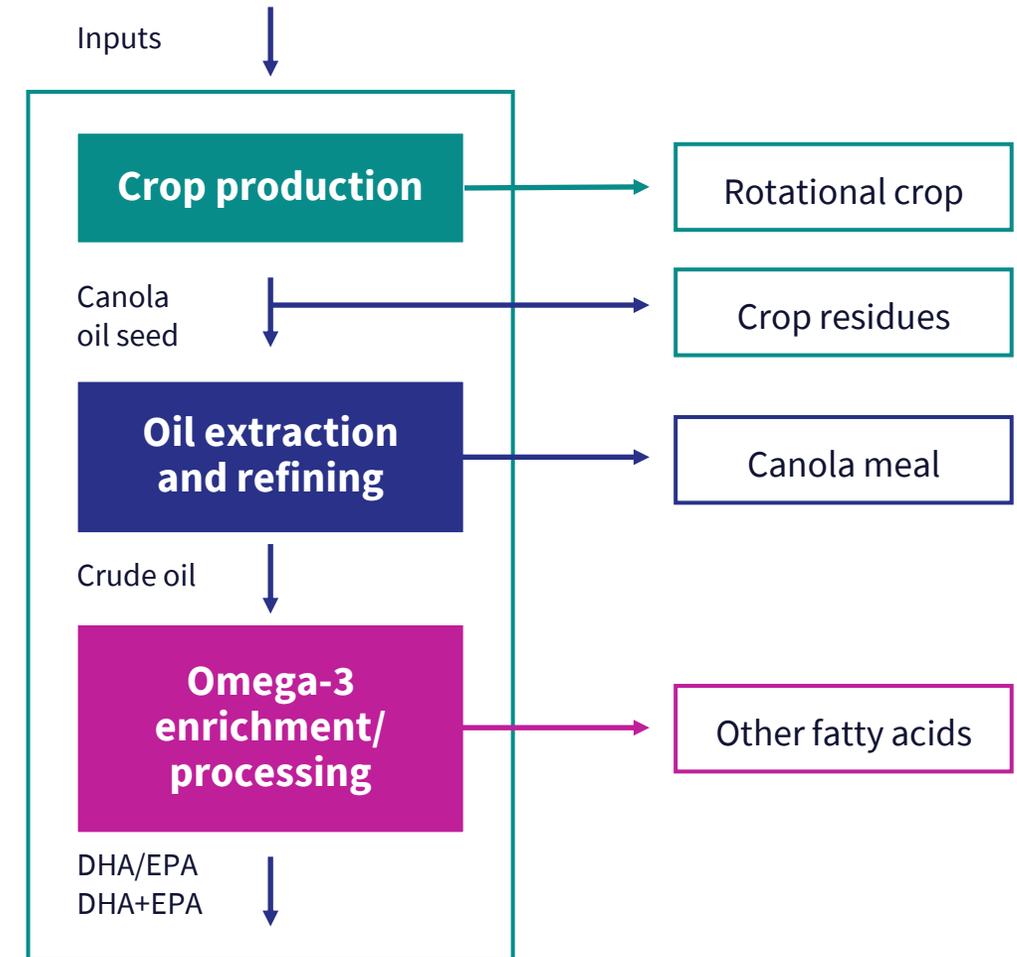
# KEY LCA CHALLENGES IN OIL SEED-BASED OMEGA-3 SUPPLY CHAINS

- Oil seed-based Omega-3 LCAs face unique environmental and data challenges mainly for quantifying emissions from land use and land use change

- Regional & Temporal Variability:
  - Seasonal variations and crop-rotation benefits-less representative, if static datasets are used
  - Technological improvements over time (e.g., renewable energy integration) at farming and post-farm activities (processing).
- Consistency
  - Different studies apply inconsistent system boundaries and Functional Unit.
  - Allocation methods vary (mass vs energy vs economic) affecting the comparability
  - Variations in LCIA method (e.g. GWP vs full LCIA).

# METHODOLOGICAL CHALLENGES: ALLOCATION

- **Why allocation matters:** Various co-products are produced along the supply chain differing with the functionalities (energetic/non-energetics)
- Complexities and best practices
  - Crop rotation benefits
  - Market price volatility for economic allocation
  - Multiple functional outputs (feed vs. energy)
  - Prioritize system expansion or physical allocation
  - Document and justify allocation choices
  - Perform sensitivity analysis



# EXAMPLES OF SHARED OR COMMON LCIA HOTSPOTS AMONG OMEGA-3 SOURCES

Category	Indicator	Fish and Krill-Based*	Algae-Based	Seed-Based
Climate Change	kg CO <sub>2</sub> -eq	Fuel combustion, processing emissions	Energy for cultivation and drying	Agricultural emissions (fertilizer, machinery)
Water Use	m <sup>3</sup> water	Indirect water use for processing	Evaporation and pond maintenance	Irrigation for crop growth
Land Use	m <sup>2</sup> ·year	Minimal unless farm raised	Land for ponds or photobioreactors	Farmland for oilseed crops
Resource Depletion	MJ or kg resource	Fuel and packaging materials	Nutrients and energy inputs	Fertilizers and fossil energy
Eutrophication	kg PO <sub>4</sub> <sup>3-</sup> -eq	Aquaculture nutrient discharge	Nutrient leakage from cultivation	Runoff/release of pollutants to aquatic and terrestrial ecosystem
Acidification	kg SO <sub>2</sub> -eq	Marine fuel emissions	Energy-related emissions	Agricultural emissions

\*Fish-based category may have issues associated with over-fishing that do not fit in mid-point LCA impact categories. However, appropriate methods to evaluate such impacts (habitat impact from over-fishing) exist elsewhere.

# ADDRESSING LCA CHALLENGES: BEST PRACTICES

## Analytical Approaches

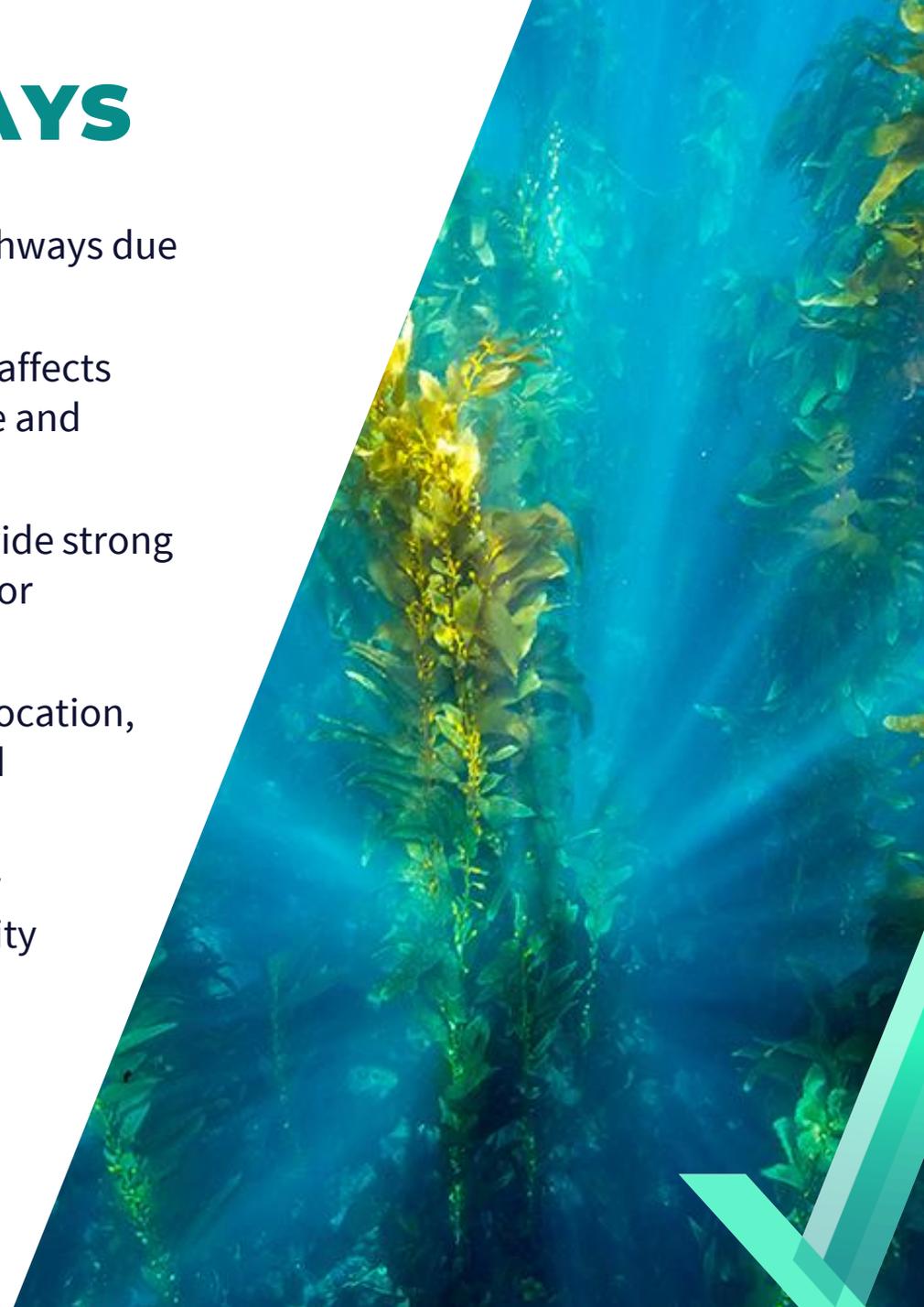
- Perform sensitivity and scenario analyses on key parameters (allocation, fuel use, algae production technology, transport)
  - Incorporate seasonal factors (e.g., fish oil yield, energy use) through scenario modeling.
- Apply uncertainty analyses to quantify robustness
- Report data quality indicators (completeness, representativeness, reliability)
- Use regionalized modeling:
  - e.g., separate results for Peruvian anchovy vs. Norwegian herring
  - e.g., use farm specific data for crop production modeling and the use of process-based models (e.g., to quantify the field emissions, N<sub>2</sub>O, SOC change etc., as well effects of crop rotations, as relevant)
- Differentiate foreground vs. background data variability

## Strategic Actions

- Develop primary data collection protocols with upstream suppliers, e.g., processors and fisheries associations
  - Apply data quality scoring to identify and prioritize data gaps
- Data Traceability and Reliability
  - e.g., Partner with certified sustainable fisheries (e.g., MSC) or sustainable crop farmers to enhance data reliability
  - Implement digital traceability tools, integrate mass balance or other chain of custody approach as an interim solution
- Fish-based
  - Encourage researching & integrating marine ecosystem impact indicators into LCIA frameworks
- Algae-based
  - Improve lipid productivity e.g., through accelerate strain engineering and synthetic biology
  - Consider alternative sources of sugar, e.g., waste biomass
- Seed-based
  - Use process-based models that can reflect the spatial characteristics of the crop production

# CONCLUSIONS AND TAKEAWAYS

- System boundaries vary across fish, oilseed, and algae-based omega-3 pathways due to differences in sourcing, cultivation, and extraction processes.
- The choice of functional unit (EPA, DHA, or combined EPA+DHA) materially affects allocation and can change comparative results; alignment with product use and nutritional value is essential.
- Algae-based omega-3s generally have higher energy requirements but provide strong traceability and avoid marine ecosystem impacts, making them attractive for sustainability-focused markets.
- Fish-based systems are driven largely by fishing fuel use and co-product allocation, while oilseed-based systems are influenced more by agricultural inputs and land-related emissions.
- Purification steps including refining, degumming, and separation are major contributors to overall impacts across all pathways, especially for high-purity EPA or DHA products.
- Consistent methods, high-quality data, and transparent assumptions are necessary to enable fair comparisons across the three production routes.



# NEXT STEPS

- Step 2: Develop High-Level LCA Framework

## Purpose

- Create a consistent, ISO-aligned methodology informed by industry input

## Key Activities

- Define system boundaries & standardized functional unit
- Set allocation approach (e.g., fishmeal co-products) recommendations
- Establish data quality expectations
- Validate with GOED members

## Deliverable

- A draft LCA framework including scope, applicability, product categories, impact methods, data expectations, and reporting guidance.

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# GLOSSARY: ISO 14040/44:2006

- **Life cycle:** “consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal” (ISO 14040:2006, section 3.1).
- **Life-cycle assessment (LCA):** “Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle” (ISO 14040:2006, section 3.2)
- **Life-cycle inventory (LCI):** “Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle” (ISO 14040:2006, section 3.3).
- **Life-cycle impact assessment (LCIA):** “Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product” (ISO 14040:2006, section 3.4)
- **Life-cycle interpretation:** “Phase of life cycle assessment in which the findings of either the inventory analysis or the impact assessment, or both, are evaluated in relation to the defined goal and scope in order to reach conclusions and recommendations” (ISO 14040:2006, section 3.5)
- **Functional unit:** “Quantified performance of a product system for use as a reference unit” (ISO 14040:2006, section 3.20)
- **Allocation:** “Partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems” (ISO 14040:2006, section 3.17)
- **System boundary:** “Set of criteria specifying which unit processes are part of a product system” (ISO 14040:2006, section 3.32). “Examples are cradle-to-gate studies, gate-to-gate studies, and specific parts of the life cycle...” (ISO 14040:2006, section A.1.2)

Source: ISO 14040:2006, Environmental management - Life cycle assessment - Principles and framework, International Organization for Standardization (ISO), Geneva

# THANK YOU

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