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# Product Environmental Footprint Category Rules (PEFCR) for Unprocessed Marine Fish Products

## 2025

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# PEFCR

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# Unprocessed

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# Marine Fish Products

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## Version 1

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## 2025

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Date of expiration: December 31, 2025

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Acknowledgements

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<sup>1</sup> <https://www.fhf.no/fhf/about-fhf-english/>

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208 Acronyms

AF	Allocation Factor
AR	Allocation Ratio
B2B	Business to Business
B2C	Business to Consumer
BFCR	Biological Feed Conversion Ratio
BoC	Bill of Components
BoM	Bill of Materials
CF	Characterization Factor
CFF	Circular Footprint Formula
CFF-M	Circular Footprint Formula – Modular form
COD	Chemical Oxygen Demand
CPA	Classification of Products by Activity
DC	Distribution Centre
DMI	Dry Matter Intake
DNM	Data Needs Matrix
DQA	Data Quality Assessment
DQR	Data Quality Rating
DQS	Data Quality Score
DW	Dry weight
EA	Economic Allocation
EC	European Commission
EF	Environmental Footprint
EF3.1	Environmental Footprint database version 3.1
EFCR	Economic Feed Conversion Ratio
EI	Environmental Impact
ELCD	European reference Life Cycle Database
EoL	End-of-Life
FEFAC	European Feed Manufacturers' Federation
FU	Functional Unit
GE	Gross Energy intake
GHG	Greenhouse Gas
GR	Geographical Representativeness
GWP	Global Warming Potential
GWP100	Global Warming Potentials with a time horizon of 100 years
Ha	Hectare
HH	Human Health (used in ionizing radiation HH)
ILCD	International Reference Life Cycle Data System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
JRC	Joint Research Centre
kWh	kilowatt hour
LCA	Life Cycle Assessment
LCDN	Life Cycle Data Network

LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
LT	Lifetime
LUC	Land Use Change
Lw	Live weight
Lwe	Live weight equivalents
NACE	Statistical classification of economic activities in the European Community
NDA	Non-Disclosure Agreement
NGO	Non-Governmental Organisation
NMVOC	Non-methane volatile compounds
NPK	Nitrogen (N), Phosphorus (P) and Potassium (K)
OEF	Organisation Environmental Footprint
OW	One Way
P	Precision
PCR	Product Category Rules
PDO	Protected Designation of Origin
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PEF-RP	Product Environmental Footprint study of the Representative Products
ReCiPe	ReCiPe 2016 v1, A harmonized LCA method <sup>2</sup>
RER	Region Europe
RF	Reference Flow
RP	Representative Product
RUaEP	Resource Use and Emissions Profile
SC	Steering Committee
Scope 1	Referring to the GHG Protocol nomenclature, direct emissions from owned or controlled sources.
Scope 2	Referring to the GHG Protocol nomenclature, indirect emissions from the generation of purchased energy.
Scope 3	Referring to the GHG Protocol nomenclature, all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.
SMRS	Sustainability Measurement & Reporting System
TAB	Technical Advisory Board
TeR	Technological Representativeness
TiR	Time Representativeness
Tonne	1000 kg
TS	Technical Secretariat
UNEP	United Nations Environment Programme
UUID	Universally Unique Identifier

<sup>2</sup> <https://www.rivm.nl/documenten/recipe2016v11>



WW	Wet weight
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## 209 Definitions

210 The PEF Method [1] provides a complete list of definitions, and the most relevant  
211 ones for this PEFCR are also presented here.

212

213 **Activity data** - This term refers to information which is associated with processes  
214 while modelling Life Cycle Inventories (LCI). The aggregated LCI results of the  
215 process chains that represent the activities of a process are each multiplied by the  
216 corresponding activity data<sup>3</sup> and then combined to derive the environmental  
217 footprint associated with that process. Examples of activity data include quantity of  
218 kilowatt-hours of electricity used, quantity of fuel used, output of a process (e.g.  
219 waste), number of hours equipment is operated, distance travelled, floor area of a  
220 building, etc. Synonym of “non-elementary flow”.

221 **Additional environmental information** – Environmental information outside the EF  
222 impact categories that is calculated and communicated alongside PEF results.

223 **Additional technical information** – Non-environmental information that is  
224 calculated and communicated alongside PEF results.

225 **Allocation** – An approach to solving multi-functionality problems. It refers to  
226 “partitioning the input or output flows of a process or a product system between  
227 the product system under study and one or more other product systems” (ISO  
228 14040:2006).

229

230 **Attributional** – Refers to process-based modelling intended to provide a static  
231 representation of average conditions, excluding market-mediated effects.

232 **Average Data** – Refers to a production-weighted average of specific data.

233 **Benchmark** – A standard or point of reference against which any comparison may  
234 be made. In the context of PEF, the term ‘benchmark’ refers to the average  
235 environmental performance of the representative product sold in the EU market.

236

237 **Bill of materials** – A bill of materials or product structure (sometimes bill of  
238 material, BOM or associated list) is a list of the raw materials, sub-assemblies,  
239 intermediate assemblies, sub-components, parts and the quantities of each needed  
240 to manufacture the product in scope of the PEF study. In some sectors it is  
241 equivalent to the bill of components.

242

243 **By-catch** - The catch of aquatic organisms that are not targeted. This includes  
244 organisms that are outside legal-size limits, over-quotas, threatened, endangered

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<sup>3</sup> Based on GHG protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 2011).

245 and protected species, and discarded for whatever other reasons, as well as  
246 nontargeted organisms that are retained and then sold or consumed<sup>4</sup>.  
247

248 **Company-specific data** – It refers to directly measured or collected data from one  
249 or multiple facilities (site-specific data) that are representative for the activities of  
250 the company. It is synonymous to “primary data”. To determine the level of  
251 representativeness a sampling procedure may be applied.  
252

253 **Comparative Assertion** – An environmental claim regarding the superiority or  
254 equivalence of one product versus a competing product that performs the same  
255 function (including the benchmark of the product category) (adapted from ISO  
256 14044:2006).  
257

258 **Comparison** – A comparison, not including a comparative assertion, (graphic or  
259 otherwise) of two or more products based on the results of a PEF study and  
260 supporting PEFCRs.  
261

262 **Co-product** – Any of two or more products resulting from the same unit process or  
263 product system (ISO 14040:2006).

264 **Cradle to Gate** – A partial product supply chain, from the extraction of raw  
265 materials (cradle) up to the manufacturer’s “gate”. The distribution, storage, use  
266 stage and end of life stages of the supply chain are omitted.

267 **Cradle to Grave** – A product’s life cycle that includes raw material extraction,  
268 processing, distribution, storage, use, and disposal or recycling stages. All relevant  
269 inputs and outputs are considered for all of the stages of the life cycle.

270 **Data Quality** – Characteristics of data that relate to their ability to satisfy stated  
271 requirements (ISO 14040:2006). Data quality covers various aspects, such as  
272 technological, geographical and time-related representativeness, as well as  
273 completeness and precision of the inventory data.

274 **Data Quality Rating (DQR)** - Semi-quantitative assessment of the quality criteria of  
275 a dataset based on Technological representativeness, Geographical  
276 representativeness, Time-related representativeness, and Precision. The data  
277 quality shall be considered as the quality of the dataset as documented.

278 **Direct elementary flows** (also named elementary flows) – All output emissions and  
279 input resource use that arise directly in the context of a process. Examples are  
280 emissions from a chemical process, or fugitive emissions from a boiler directly  
281 onsite.  
282

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<sup>4</sup> <http://www.fao.org/documents/card/en/c/CA2905EN/>

283 **Direct land use change (dLUC)** – The transformation from one land use type into  
284 another, which takes place in a unique land area and does not lead to a change in  
285 another system.  
286

287 **Elementary flows** – In the life cycle inventory, elementary flows include “material  
288 or energy entering the system being studied that has been drawn from the  
289 environment without previous human transformation, or material or energy leaving  
290 the system being studied that is released into the environment without subsequent  
291 human transformation” (ISO 14040, 3.12). Elementary flows include, for example,  
292 resources taken from nature or emissions into air, water, soil that are directly  
293 linked to the characterisation factors of the EF impact categories.  
294

295 **Environmental aspect** – Element of an organisation’s activities or products or  
296 services that interacts or can interact with the environment (ISO 14001:2015).

297 **Environmental Footprint (EF) compliant dataset** – Dataset developed in  
298 compliance with the EF requirements provided at  
299 <https://eplca.jrc.ec.europa.eu/LCDN/developerEF.html>

300 **Environmental Footprint (EF) Impact Assessment** – Phase of the PEF analysis  
301 aimed at understanding and evaluating the magnitude and significance of the  
302 potential environmental impacts for a product system throughout the life cycle of  
303 the product (based on ISO 14044:2006). The impact assessment methods provide  
304 impact characterisation factors for elementary flows in order to aggregate the  
305 impact to obtain a limited number of midpoint indicators.

306 **Environmental Footprint (EF) Impact Assessment method** – Protocol for  
307 quantitative translation of life cycle inventory data into contributions to an  
308 environmental impact of concern.

309 **Environmental Footprint (EF) Impact Category** – Class of resource use or  
310 environmental impact to which the life cycle inventory data are related.

311 **Foreground elementary flows** - Direct elementary flows (emissions and resources)  
312 for which access to primary data (or company-specific information) is available.

313 **Foreground Processes** – Refer to those processes in the product life cycle for which  
314 direct access to information is available. For example, the producer’s site and other  
315 processes operated by the producer or its contractors (e.g. goods transport, head-  
316 office services, etc.) belong to the foreground processes.

317 **Functional unit** – The functional unit defines the qualitative and quantitative  
318 aspects of the function(s) and/or service(s) provided by the product being  
319 evaluated. The functional unit definition answers the questions “what?”, “how  
320 much?”, “how well?”, and “for how long?”.

321 **Gate to Gate** – A partial product supply chain that includes only the processes  
322 carried out on a product within a specific organisation or site.

323 **Gate to Grave** – A partial product supply chain that includes only the distribution,  
324 storage, use, and disposal or recycling stages.

325 **Hotspot analysis** – Once the user of the PEF method ensures that the PEF model is  
326 robust and conforms to all aspects defined in the goal and scope definition phases,  
327 the main contributing elements to the PEF results shall be identified. See  
328 paragraph 6.1 in ref. [1] **Indirect land use change (iLUC)** – It occurs when a demand  
329 for a certain land use leads to changes, outside the system boundary, i.e. in other  
330 land use types. These indirect effects may be mainly assessed by means of  
331 economic modelling of the demand for land or by modelling the relocation of  
332 activities on a global scale.

333 **Input flows** – Product, material or energy flow that enters a unit process. Products  
334 and materials include raw materials, intermediate products and co-products (ISO  
335 14040:2006).

336 **Life cycle Assessment (LCA)** – Compilation and evaluation of the inputs, outputs  
337 and the potential environmental impacts of a product system throughout its life  
338 cycle (ISO 14040:2006).

339 **Life cycle impact assessment (LCIA)** – Phase of life cycle assessment that aims at  
340 understanding and evaluating the magnitude and significance of the potential  
341 environmental impacts for a system throughout the life cycle (ISO 14040:2006). The  
342 LCIA methods used provide impact characterisation factors for elementary flows to  
343 in order to aggregate the impact to obtain a limited number of midpoint and/or  
344 damage indicators.

345 **Live weight (Lw) and live weight equivalents (Lwe)** - Used to specify the weight of  
346 fish before it is killed. For farmed fish this also indicates the weight before starving  
347 and bleeding.

348 **PEFCR supporting study** – PEF study based on a draft PEFCR. It is used to confirm  
349 the decisions taken in the draft PEFCR before the final PEFCR is released.

350 **PEF report** – Document that summarises the results of the PEF study.

351 **PEF study of the representative product (PEF-RP)** – PEF study carried out on the  
352 representative product(s) and intended to identify the most relevant life cycle  
353 stages, processes, elementary flows, impact categories and any other major  
354 requirements needed for the definition of the benchmark for the product category/  
355 sub-categories in scope of the PEFCR.

356 **PEF study** – Term used to identify the totality of actions needed to calculate the  
357 PEF results. It includes the modelling, the data collection, and the analysis of the  
358 results. It excludes the PEF report and the verification of the PEF study and report.

359 **Prepared fishery products (Unprocessed fishery products)** - Products that have not  
360 undergone processing, including products that have been divided, parted, severed,  
361 sliced, boned, minced, skinned, ground, cut, cleaned, trimmed, milled, chilled,  
362 frozen, deep-frozen or thawed.

363

364 **Primary data**<sup>5</sup> - This term refers to data from specific processes within the supply  
365 chain of the user of the PEF Method or user of the PEFCR. Such data may take the  
366 form of activity data, or foreground elementary flows (life cycle inventory). Primary  
367 data are site-specific, company-specific (if multiple sites for the same product) or  
368 supply chain specific. Primary data may be obtained through meter readings,  
369 purchase records, utility bills, engineering models, direct monitoring,  
370 material/product balances, stoichiometry, or other methods for obtaining data  
371 from specific processes in the value chain of the user of the PEF Method or user of  
372 the PEFCR. In this method, primary data can be a synonym of "company-specific  
373 data" or "supply-chain specific data".

374

375 **Processed fishery products** – Products that have undergone a process that  
376 substantially alters the initial product, including heating, smoking, curing, maturing,  
377 drying, marinating, extraction, extrusion or a combination of those processes.

378 **Product Category Rules (PCRs)** – Set of specific rules, requirements and guidelines  
379 for developing Type III environmental declarations for one or more product  
380 categories (ISO 14025:2006).

381 **Product Environmental Footprint Category Rules (PEFCRs)** – Product category  
382 specific, life cycle-based rules that complement general methodological guidance  
383 for PEF studies by providing further specification at the level of a specific product  
384 category. PEFCRs help to shift the focus of the PEF study towards those aspects and  
385 parameters that matter the most, and hence contribute to increased relevance,  
386 reproducibility, and consistency of the results by reducing costs versus a study  
387 based on the comprehensive requirements of the PEF method. Only the PEFCRs  
388 listed on the European Commission website  
389 ([http://ec.europa.eu/environment/eussd/smgp/PEFCR\\_OEFSR\\_en.htm](http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm)) are  
390 recognised as in line with this method.

391 **Product flow** – Products entering from or leaving to another product system (ISO  
392 14040:2006).

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<sup>5</sup> Based on GHG protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 2011).

393 **Reference flow** – Measure of the outputs from processes in a given product system  
394 required to fulfil the function expressed by the functional unit (based on ISO  
395 14040:2006).

396 **Representative product (model)** - The RP may be a real or a virtual (non-existing)  
397 product. The virtual product should be calculated based on average European  
398 market sales- weighted characteristics of all existing technologies/materials  
399 covered by the product category or sub-category. Other weighting sets may be  
400 used, if justified, for example weighted average based on mass (ton of material) or  
401 weighted average based on product units (pieces).

402 **Round fish** - For wild fish this is identical to “live fish”, but for certain aquaculture  
403 systems the term “round weight” refers to the biomass after starving and bleeding.  
404

405 **Secondary data**<sup>6</sup> - It refers to data not from a specific process within the supply-  
406 chain of the company performing a PEF study. This refers to data that is not directly  
407 collected, measured, or estimated by the company, but sourced from a third party  
408 LCI database or other sources. Secondary data includes industry average data (e.g.,  
409 from published production data, government statistics, and industry associations),  
410 literature studies, engineering studies and patents, and may also be based on  
411 financial data, and contain proxy data, and other generic data. Primary data that go  
412 through a horizontal aggregation step are considered as secondary data.

413 **Specific Data** – Refers to directly measured or collected data representative of  
414 activities at a specific facility or set of facilities. Synonymous with “primary data.”

415 **System boundary** – Definition of aspects included or excluded from the study. For  
416 example, for a “cradle-to-grave” EF analysis, the system boundary includes all  
417 activities from the extraction of raw materials through the processing, distribution,  
418 storage, use, and disposal or recycling stages.

419 **Unit process** – Smallest element considered in the LCI for which input and output  
420 data are quantified (based on ISO 14040:2006).

421

422 **Unprocessed fishery products = Prepared fishery products** - Products that have  
423 not undergone processing, and includes products that have been divided, parted,  
424 severed, sliced, boned, minced, skinned, ground, cut, cleaned, trimmed, husked,  
425 milled, chilled, frozen, deep-frozen or thawed.

426 **User of the PEFCR** – a stakeholder producing a PEF study based on a PEFCR.

427 **Waste** – Substances or objects which the holder intends or is required to dispose of  
428 (ISO 14040:2006).

429

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<sup>6</sup> Based on GHG protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 2011).

## 430 1 Introduction

431 This document is a Product Environmental Footprint Category Rule (PEFCR) that  
432 specifies how the Product Environmental Footprint (PEF) Method [1] shall be  
433 applied to the product category, “unprocessed marine fish for human consumption  
434 (wild caught and farmed)”. This PEFCR is developed based on the Product  
435 Environmental Footprint Representative Product (PEF-RP) study for the Marine Fish  
436 PEFCR consumed in the EU market (see 3.4). The purpose of this PEFCR is to  
437 provide instruction to companies on what they shall include and how to perform a  
438 PEF study of their products.

439 The PEF Method [1] is a Life Cycle Assessment (LCA)-based method used to quantify  
440 the relevant environmental impacts of products (goods or services). It builds on  
441 existing approaches and international standards. PEF studies are carried out for a  
442 range of reasons, including internal benchmarking and assessments of continuous  
443 improvement, as well as to meet voluntary or mandatory reporting requirements.

444 This PEFCR has been developed according to Annex A in the PEFCR guidance  
445 document [1]. Where the requirements in this PEFCR are more specific than those  
446 in the PEF Method, this more specific guidance shall be followed. For any  
447 requirements that are not specified in this PEFCR, the user shall refer to the  
448 documents that this PEFCR is in conformance with.

449  
450 Users should note that the PEF Method will evolve to take into account future  
451 improvements regarding impact assessment methodologies and data availability.  
452 Specifically with respect to this PEFCR, the PEF Method currently does not account  
453 for the status of the targeted stock and impacts on the seabed (as well as other  
454 impacts relating to biodiversity more broadly). Hence, in section 3.10, this PEFCR  
455 attempts to address this gap in the assessment of the environmental impact of wild  
456 caught fish by including a way to document impacts not captured by the PEF  
457 Method’s standard 16 impact categories. The fundamental importance of the  
458 status of the targeted stock and impacts on the seabed implies that their  
459 assessment shall be communicated at the same level of prominence and visibility as  
460 the assessment of the 16 standard impact categories.

461

### 462 1.1 Contact information

463 For questions about this PEFCR please contact:

- 464 - Henrik Stenwig: [henrik.stenwig@sjomatnorge.no](mailto:henrik.stenwig@sjomatnorge.no)
- 465 - Andrea Nistad: [andrea.nistad@asplanviak.no](mailto:andrea.nistad@asplanviak.no)

466

## 467 2 General information about the Marine Fish PEFCR

468 The following sections present principal aspects of how this PEFCR was developed  
469 and how it shall be used.

470

471 **2.1 Technical Secretariat**

472 This PEFCR is the product of the work of a Technical Secretariat (TS). *Table 2-1*  
 473 presents the TS members.

474  
 475

*Table 2-1 TS members*

Organization	Type of Organization	Contact
EU Fish Processors and Traders' Association (AIPCE-CEP)	Representative organization	<a href="mailto:ksipic@kellencompany.com">ksipic@kellencompany.com</a>
Asplan Viak AS	Research institute	<a href="mailto:andrea.nistad@asplanviak.no">andrea.nistad@asplanviak.no</a>
AquaPEF (Observer)	PEF project	<a href="mailto:sramos@azti.es">sramos@azti.es</a>
The Bellona Foundation	NGO	<a href="mailto:silje@bellona.no">silje@bellona.no</a>
Cermaq Norway	Company (aquaculture)	<a href="mailto:silje.ramsvatn@cermaq.com">silje.ramsvatn@cermaq.com</a>
Federation of European Aquaculture Producers (FEAP)	Representative organization	<a href="mailto:Szilvia@feap.info">Szilvia@feap.info</a>
European Feed Manufacturers' Federation (FEFAC)	Representative organization	<a href="mailto:avandenbrink@fefac.eu">avandenbrink@fefac.eu</a>
Force Technology (Observer)	Research institute	<a href="mailto:mimi@force.dk">mimi@force.dk</a>
Lerøy Seafood Group ASA	Company (fishing and aquaculture)	<a href="mailto:ahm@leroy.no">ahm@leroy.no</a>
Njordseas (Avramar Spain)	Company (aquaculture)	<a href="mailto:e.soler@avramar.eu">e.soler@avramar.eu</a>
Norwegian Fishermen's Association	Representative organization	<a href="mailto:jan.henrik.sandberg@fiskarlaget.no">jan.henrik.sandberg@fiskarlaget.no</a>
Norwegian Seafood Federation (TS Chair)	Representative organization	<a href="mailto:henrik.stenwig@sjomatnorge.no">henrik.stenwig@sjomatnorge.no</a>
Pelagia AS	Company (fishing and feed production)	<a href="mailto:karen.tonnesen@pelagia.com">karen.tonnesen@pelagia.com</a>
PRé Sustainability (Observer)	LCA Consultancy	<a href="mailto:zampori@pre-sustainability.com">zampori@pre-sustainability.com</a>
Royal Greenland AS	Company (fishing and retail)	<a href="mailto:lisc@royalgreenland.com">lisc@royalgreenland.com</a>

476

477 **2.2 Consultations and stakeholders**

478 The development of this PEFCR included public consultations and stakeholder  
 479 involvement. This included the following activities:

- 480 - Public consultation of the PEF-RP studies;
- 481 - Public consultation of PEFCR drafts;
- 482 - Establishment of a website for outreach to interested parties; and
- 483 - Contact and engagement with NGOs and other stakeholders that were  
 484 considered relevant.

485



486 **2.3 Review of the PEFCR development**

487 *Table 2-2* presents the members of the independent panel that provided external  
488 reviews throughout the development of this PEFCR. Their reviews were performed  
489 according to section A.2.9 in Annex A of the PEF Method [1].

490  
491

*Table 2-2 Members of the PEFCR review panel*

Category	Name	Affiliation
Industry expert	Tom Maidment	Hilton Foods
LCA expert	Angel Avadí	CIRAD
LCA expert	Ian Vázquez-Rowe	PUCP

492  
493  
494

Annex 10.1 presents the biographical sketches of the Review Panel members.

495 **2.3.1 Review statement**

496 This PEFCR was developed in compliance with the PEF method adopted by the  
497 Commission (December 2021).

498

499 The representative products correctly describe the average products sold in Europe  
500 for the product category/sub-categories in scope of this PEFCR.

501

502 PEF supporting studies carried out in compliance with this PEFCR would reasonably  
503 lead to reproducible results and the information included therein may be used to  
504 make comparisons and comparative assertions under the prescribed conditions  
505 (see chapter 3.11 on limitations).

506 The validation statement of the Review Panel is included in Appendix 2.

507 **2.4 Geographic validity**

508 This PEFCR is valid for fisheries and aquaculture providing the EEA market with  
509 marine fish.

510

511 **2.5 Language**

512 The PEFCR is written in English. The original in English supersedes translated  
513 versions in case of conflicts.

514

515 **2.6 Conformance to other documents (guiding documents for this PEFCR)**

516 This PEFCR has been prepared in conformance with the following documents (in  
517 prevailing order):

518

- 519 - The PEF Method as defined in [1]. **This PEFCR provides specifications for**  
520 **how the PEF Method shall be applied for Marine fish consumed in the EU**  
521 **market.**
- 522 - Annex A - REQUIREMENTS TO DEVELOP PEFCRS AND PERFORM PEF STUDIES  
523 IN COMPLIANCE WITH AN EXISTING PEFCR in [1].

## 524 2.7 Terminology: shall, should and may

525 This PEFCR uses precise terminology to indicate the requirements, the  
526 recommendations and options that could be chosen when a PEF study is  
527 conducted.

- 528 - The term “shall” is used to indicate what is required in order for a PEF study  
529 to be in conformance with this PEFCR.
- 530 - The term “should” is used to indicate a recommendation rather than a  
531 requirement. Any deviation from a “should” recommendation has to be  
532 justified and made transparent when developing a PEF study.
- 533 - The term “may” is used to indicate an option that is permissible. Whenever  
534 options are available, the PEF study shall include adequate argumentation  
535 to justify the chosen option.

536 The section on Definitions provides more useful definitions of selected terms.  
537

## 538 3 PEFCR scope

539  
540 In addition to the PEFCR scope, Section 3 also provides instructions on the  
541 system/stages/processes that this PEFCR covers and thus shall be addressed in a  
542 Marine Fish PEF. Note that the production of feed is to be included according to the  
543 PEFCR Feed for food-producing animals [3] as described in section 3.2.1.  
544

### 545 3.1 PEFCR Product scope

546 The product scope (product category) of this PEFCR is unprocessed wild and  
547 unprocessed farmed marine fish for direct human consumption in the EU market.  
548 This scope includes anadromous species (fish that migrate from the sea up into  
549 fresh water to spawn, such as salmon). This scope excludes crustaceans, molluscs  
550 and other aquatic invertebrates as well as freshwater fish, both wild and farmed  
551 (see section 3.1.1 for more detail).  
552

553 The product scope considers how Regulation (EC) no 852/2004<sup>7</sup> defines  
554 “*processing*” as any action that substantially alters the initial product, including  
555 heating, smoking, curing, maturing, drying, marinating, extraction, extrusion or a  
556 combination of those processes. This is different from “*unprocessed products*”,  
557 which refers to foodstuffs that have not undergone processing, and includes  
558 products that have been divided, parted, severed, sliced, boned, minced, skinned,  
559 ground, cut, cleaned, trimmed, husked, milled, chilled, frozen, deep-frozen or  
560 thawed.  
561

---

<sup>7</sup> Regulation (EC) no 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (OJ L 139, 30.4.2004, p. 1)

562 Likewise, per Regulation (EC) No 853/2004<sup>8</sup>, which provides specific hygiene rules  
563 for food of animal origin, “*prepared fishery products*” refers to unprocessed fishery  
564 products that have undergone an operation affecting their anatomical wholeness,  
565 such as gutting, heading, slicing, filleting, and chopping.

566

567 For fish that undergo processing, the Marine Fish PEFCR shall work as a module for  
568 the life cycle from cradle to processing gate.

569

### 570 3.1.1 Product scope classification

571 The Classification of Products by Activity (CPA) codes for the products that this  
572 PEFCR is valid for are:

- 573 • 03.0 Fish and other fishing products
  - 574 ○ 03.00 Fish and other fishing products
    - 575 ▪ 03.00.1 Fish, live
    - 576 ▪ 03.00.12 Live fish, marine, not farmed
    - 577 ▪ 03.00.14 Live fish, marine, farmed
    - 578 ▪ 03.00.2 Fish, fresh or chilled
    - 579 ▪ 03.00.21 Fresh or chilled fish, marine, not farmed
    - 580 ▪ 03.00.23 Fresh or chilled fish, marine, farmed

581

582 In addition to these stages, the following classes under C Manufactured products  
583 10.20 Processed and preserved fish, crustaceans and molluscs will also be covered:

- 584 ▪ 10.20.1 Fish, fresh, chilled or frozen
- 585 ▪ 10.20.11 Fish fillets and other fish meat (whether or not  
586 minced), fresh or chilled
- 587 ▪ 10.20.12 Fish livers and roes, fresh or chilled
- 588 ▪ 10.20.13 Fish, frozen
- 589 ▪ 10.20.14 Fish fillets, frozen
- 590 ▪ 10.20.15 Fish meat, (whether or not minced), frozen
- 591 ▪ 10.20.16 Fish livers and roes, frozen

592

593 Products that are **not** included in the scope:

- 594 ▪ 03.00.13 Live fish, freshwater, not farmed
- 595 ▪ 03.00.15 Live fish, freshwater, farmed
- 596 ▪ 03.00.22 Fresh or chilled fish, freshwater, not farmed
- 597 ▪ 03.00.24 Fresh or chilled fish, freshwater, farmed
- 598 ▪ 03.00.31 Crustaceans, not frozen, not farmed
- 599 ▪ 03.00.32 Crustaceans, not frozen, farmed
- 600 ▪ 03.00.4 Molluscs and other aquatic invertebrates, live, fresh  
601 or chilled

---

<sup>8</sup> Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 (OJ L 226, 25.6.2004, p. 22)

- 602                           ▪ 03.00.5 Pearls, unworked
- 603                           ▪ 03.00.6 Other aquatic plants, animals and their products
- 604                           ▪ 03.00.7 Support services to fishing and aquaculture
- 605                           ▪ 03.00.11 Live ornamental fish
- 606                           ▪ 10.20.2 Fish, otherwise prepared or preserved
- 607                           ▪ 10.20.21 Fish fillets, dried, salted or in brine, but not smoked
- 608                           ▪ 10.20.22 Fish livers and roes dried, smoked, salted or in brine
- 609                           ▪ 10.20.23 Fish, dried, whether or not salted, or in brine
- 610                           ▪ 10.20.24 Fish, including fillets, smoked
- 611                           ▪ 10.20.25 Fish, otherwise prepared or preserved, except
- 612   prepared fish dishes
- 613                           ▪ 10.20.26 Caviar and caviar substitutes
- 614                   ○ 10.8 Other food products
- 615                           ▪ 10.85.1 Prepared meals and dishes
- 616                           ▪ 10.85.12 Prepared meals and dishes based on fish,
- 617   crustaceans and molluscs

### 618 3.2 PEFCR system scope

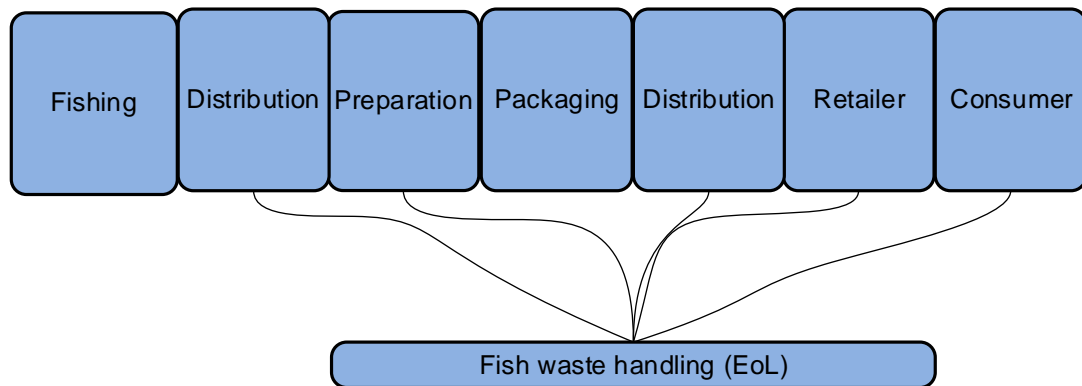
619 The scope of this PEFCR covers the life cycle stages of wild and farmed marine fish  
 620 products as illustrated in Figure 3-1 for wild products and Figure 3-2 for farmed  
 621 products.

622  
 623 The life cycle of marine fish products is divided into the following stages:

- 624 - Feed production: Growing, fishing and other production of feed raw  
 625 materials, processing of feed ingredients and compound feed production  
 626 and their packaging (see paragraph 3.2.1 regarding use of PEFCR Feed for  
 627 food-producing animals).
- 628 - Production: Fishing (including onboard preparation). Transport of the fish  
 629 from fishing to shore is part of the production stages. Aquaculture juvenile  
 630 production and grow out. For farming of anadromous fish with the grow out  
 631 stage in the sea, the juvenile production in fresh water is within the scope of  
 632 this PEFCR.
- 633 - Distribution: Transport of fish from landing to preparation to retailer  
 634 (including transshipment at sea). This stage also includes storing of the fish  
 635 and transport packaging.
- 636 - Preparation: Harvest (slaughter), gutting, filleting, and refrigeration and/or  
 637 freezing.
- 638 - Manufacturing: This includes production of the packaging materials, packing  
 639 of the final retail product, and waste handling of the materials after use.
- 640 - Retailer and Consumption (use): This stage includes the retail of the  
 641 product, transport from the retailer to the consumer, and packaging  
 642 materials as listed above. (Retail may include food service or sale of goods.)

643

644



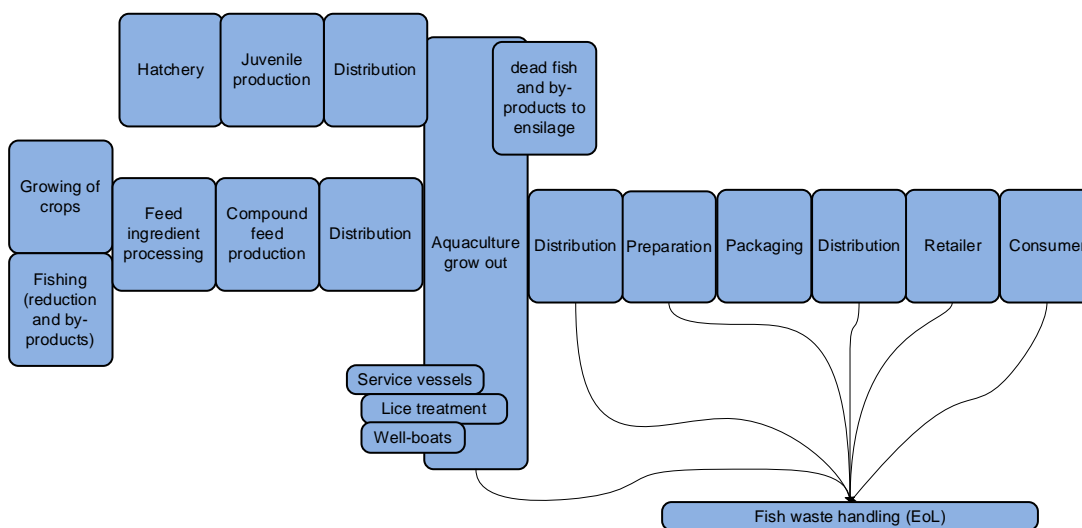
645

646

Figure 3-1 System scope wild marine fish products

647

648



649

650

Figure 3-2 System scope farmed marine fish products

651

### 3.2.1 Feed for fish farming and system boundaries

653 Feed for fish farming is within the system boundaries of this PEFCR, meaning that  
 654 the feed production shall be included in the PEF profile of farmed marine fish  
 655 products, but the instructions on how the PEF profile of the feed (to the fish farm)  
 656 shall be calculated are found in the PEFCR Feed for food-producing animals [3].  
 657 Section 6.2 provides more detail on how feed shall be included.

658

659 The PEF profile of the feed reported to the fish farmer shall cover the impact  
 660 categories identified as most important in section 4.

661

### 3.3 Targeted audience, comparability, and data quality requirements

663 The main purpose of this PEFCR is to set rules for how a company that produces  
 664 marine fish calculates and documents the PEF profile of their products.

665

666 The PEF will be calculated by many different actors in the marine fish life cycle and  
 667 this PEFCR provides solutions for different cases, but the basic principle is that the

668 analysis is performed with the availability of the most important data for the PEF of  
669 marine fish products (section 5.3). The most important activities of marine fish  
670 production are the *fishing* of the "wild fish products" and *keeping and feeding*  
671 regarding the "farmed fish products". Thus, the operators of these stages (covering  
672 cradle to end-gate of their production units) are the most relevant contributors of  
673 product specific, primary information needed to assess the PEF impacts of the  
674 product. This makes the fishing vessel operators and fish farmers the most central  
675 intended users of this PEFCR. Solutions for other operators to carry out a PEF study  
676 are presented in section 5.6. However, regardless of who is conducting the study,  
677 the following rules apply regarding the allowable data quality scores for different  
678 uses of the results from this PEFCR:

679

- 680 1) If the calculated PEF-profile shall be used to substantiate comparative  
681 assertion at product level, it is required that the DQR total score shall be  
682 **less than or equal to 2.**
- 683 2) If the calculated PEF-profile shall be used for comparison at product level, it  
684 is required that the DQR total score shall be **less than or equal to 3.**

685

### 686 3.3.1 Default values and data

687 This PEFCR presents EF datasets that can be used to cover some of the inputs and  
688 activities that constitute the marine fish life cycle. These datasets are presented in  
689 the inventory data Excel file located at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources). This  
690 PEFCR does not include default values. If the applicant is missing data to complete  
691 the PEF analysis, they shall find the best available proxies for these data, and this  
692 shall be reflected in the Data Quality Rating (DQR) score.

693

### 694 3.4 Representative products and studies

695 The development of this PEFCR included the establishment of representative  
696 products (RP). These products are virtual products that represent the product  
697 category as they are consumed in the EU market. These representative products  
698 are analysed in what is referred to as a PEF-RP study. This is a mandatory exercise  
699 in the development of a PEFCR and it is used to identify the environmental hotspots  
700 of the product category that the PEFCR covers. The full documentation of the PEF-  
701 RP study and how the RPs are defined is in a separate report<sup>9</sup>.

702

703 The two representative products modelled are presented in Table 3-1. Both are a  
704 "virtual (non-existing) product", since they are made up of different  
705 technologies/materials and calculated based on average sales-weighted  
706 characteristics of all technologies/materials covered by the scope of the PEFCR.

707

708 Additionally, results of the overarching product category are calculated for the RP  
709 of *marine fish*, which is a weighed combination of the RP of the sub-categories *wild*  
710 *marine fish* and *farmed marine fish*. The RP values of the *marine fish* allows

---

<sup>9</sup> Current draft of the Marine Fish PEF-RP Report available at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources).

711 comparative assertion between the sub-categories via the benchmark for the  
 712 overarching product category.

713  
 714

*Table 3-1 The representative products*

Overarching Product category	Representative product	Product sub-categories	Representative product (one for each sub-category)
Marine Fish for Human Consumption	Virtual product based on data on EU consumption of marine fish both farmed and captured	Wild caught marine fish	Virtual product based on data on EU consumption of marine fish and global fisheries.
		Farmed marine fish from aquaculture	Virtual product based on data on EU consumption of marine fish and global aquaculture production.

715  
 716

### 717 3.5 Supporting studies

718 A PEFCR supporting study is a PEF study based on a draft PEFCR. It is used to  
 719 confirm the decisions taken in the draft PEFCR before the final PEFCR is released.  
 720 Five supporting studies were completed and reviewed as part of the process to  
 721 improve the draft PEFCR.

722

### 723 3.6 Functional unit and reference flow

724 The functional unit shall be 1 kg of consumed product as presented in Table 3.2,  
 725 consumed at home, in restaurants or elsewhere.

726

727 The reference flow is the amount of product needed to fulfil the defined function  
 728 and shall be measured in kg.

729

730 See section 3.1 for a description of the types of products for which this PEFCR is  
 731 valid.

732

733

734

735

Table 3-2 Definition of functional unit

What	Marine fish products for human consumption and the packaging needed to deliver it.
How much	1 kg consumed edible <sup>10</sup> fraction of fish.
How well	The product should be appropriate for human consumption.
How long	Available for consumption before the expiry date. Losses shall be included in the assessment all the way through final consumption.
Where	Consumption in the EU27+EFTA and all types of final consumption, e.g. households, restaurants and hotels etc.

736

737

Details and default data for the consumption (e.g. loss rates), yields and preparation methods are presented in section 6.5.

738

739

### 740 3.7 System boundary

741

Table 3-3 presents the life cycle stages that shall be included and a non-exhaustive list of activities each life cycle stage includes.

742

743

744

Table 3-3 Description of life cycle stages that shall be included

Life cycle stage	Farmed	Wild
Feed Production	Growing, fishing and other production of feed raw materials. Processing of feed ingredients and compound feed production and packaging.	N/A
Production (Manufacturing)	Hatchery, juvenile production and grow out of fish.	Fishing (including transport to land and onboard preparation).
Preparation (Manufacturing)	Harvest (slaughter), gutting, filleting, refrigeration and/or freezing.	Gutting, filleting, refrigeration and/or freezing.
Distribution	Packing of the final retail product, packaging materials and transport, including cooling, from preparation to retailer.	
Consumption (Use)	Retail of the product and consumption.	
End of life	Handling of fish mass that is not sold as a commercial product, or not consumed.	

<sup>10</sup> The concept "edible" is product/species specific and is defined by the "yield-factor". Examples: Small pelagic species are eaten whole with bones; the liver from several species are eaten; the head and bones might be used when preparing soups, etc. The default edible yield factor is presented in the inventory data Excel file (see the current version of the Marine Fish PEFCR Inventory Data file at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources)).



- 745 In reality, fish might be:
- 746 • caught and gutted in the vessel before landing;
  - 747 • caught and not gutted before landing;
  - 748 - caught and not killed before being transported to land and kept alive in
  - 749 cages; (but not fed) before landed and killed (this is not defined as
  - 750 aquaculture (as not fed));
  - 751 • farmed and transported when living and killed on land;
  - 752 • farmed and killed at site and transported to land and then prepared; or
  - 753 • farmed and killed and gutted at site in special vessels (that is, there is no
  - 754 transport between *production* and *preparation*).

755

756 Hence, the activities in each life cycle stage shall be clearly described. Some

757 processes are excluded due to missing data (see section 3.11.2).

758

### 759 3.7.1 Cut-off

760 The rules for cut-off are defined by the PEF method<sup>11</sup> and states that any cut-off

761 shall be avoided, unless under the following rules:

762

- 763 • Processes and elementary flows may be excluded up to 3.0% (cumulatively)
- 764 based on material and energy flows and the level of environmental
- 765 significance (single overall score). The processes subject to a cut-off shall be
- 766 made explicit and justified in the PEF report, in particular with reference to
- 767 the environmental significance of the cut-off applied.
- 768 • This cut-off must be considered in addition to the cut-off already included in
- 769 the background datasets. This rule is valid for both intermediate and final
- 770 products.
- 771 • The processes that (cumulatively) account for less than 3.0% of the material
- 772 and energy flow, as well as the environmental impact for each impact
- 773 category may be excluded from PEF study.

### 774 3.8 Impact Assessment: List of EF impact categories

775 The impact assessment is done using the EF3.1 method<sup>12</sup>. Table 3.4 presents the

776 impact categories this method includes. For the full detail on the different models

777 for each category refer to the Environmental Footprint reference packages<sup>13</sup>.

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<sup>11</sup> <https://environment.ec.europa.eu/system/files/2021-12/Annexes%201%20to%202.pdf>

<sup>12</sup> The current EF impact assessment method can be found here:

<https://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>

<sup>13</sup> EF reference package spreadsheet (see above link).

Table 3-4 Impact categories and reference substances in the current EF3.1 impact assessment method

EF Impact category	Impact category indicator	Unit	Characterisation model	Robustness
Climate change, total	Global warming potential (GWP100)	kg CO <sub>2</sub> eq	Bern model - Global warming potentials (GWP) over a 100-year time horizon (based on IPCC 2013)	I
Ozone depletion	Ozone depletion potential (ODP)	kg CFC-11 eq	EDIP model based on the ODPs of the World Meteorological Organisation (WMO) over an infinite time horizon (WMO 2014 + integrations)	I
Human toxicity, cancer	Comparative toxic unit for humans (CTUh)	CTUh	based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	III
Human toxicity, non-cancer	Comparative toxic unit for humans (CTUh)	CTUh	based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	III
Particulate matter	Impact on human health	Disease incidence	PM model (Fantke et al., 2016 in UNEP 2016)	I
Ionising radiation, human health	Human exposure efficiency relative to U <sup>235</sup>	kBq U <sup>235</sup> eq	Human health effect model as developed by Dreicer et al. 1995 (Frischknecht et al, 2000)	II
Photochemical ozone formation, human health	Tropospheric ozone concentration increase	kg NMVOC eq	LOTOS-EUROS model (Van Zelm et al, 2008) as applied in ReCiPe 2008	II
Acidification	Accumulated exceedance (AE)	mol H <sup>+</sup> eq	Accumulated exceedance (Seppälä et al. 2006, Posch et al, 2008)	II
Eutrophication, terrestrial	Accumulated exceedance (AE)	mol N eq	Accumulated exceedance (Seppälä et al. 2006, Posch et al, 2008)	II
Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (P)	kg P eq	EUTREND model (Struijs et al, 2009) as applied in ReCiPe	II
Eutrophication, marine	Fraction of nutrients reaching freshwater end compartment (N)	kg N eq	EUTREND model (Struijs et al, 2009) as applied in ReCiPe	II
Ecotoxicity, freshwater	Comparative toxic unit for ecosystems (CTUe)	CTUe	based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	III
Land use	Soil quality index	Dimensionless (pt)	Soil quality index based on LANCA model (De Laurentiis et al. 2019) and on the LANCA CF version 2.5 (Horn and Maier, 2018)	III
Water use	User deprivation potential (deprivation- weighted water consumption)	m <sup>3</sup> water eq of deprived water	Available WATER Remaining (AWARE) model (Boulay et al.,2018; UNEP 2016)	III
Resource use, minerals and metals	Abiotic resource depletion (ADP ultimate reserves)	kg Sb eq	van Oers et al., 2002 as in CML 2002 method, v.4.8	III
Resource use, fossils	Abiotic resource depletion – fossil fuels (ADP-fossil)	MJ	van Oers et al., 2002 as in CML 2002 method, v.4.8	III

786

787

788

789

790

791

792 **3.9 Additional technical information**

793 The following additional technical information shall be reported:

794

795 Farmed products:

796 - The system descriptions shall include the types of technologies that are  
797 used and where the different stages and activities are taking place.

798 Examples of relevant aspects to describe:

799 - Kind of containment. Describe the system so that the level and  
800 system for containment is clear. Clearly state how/if the system  
801 includes collection of sludge and type of wastewater treatment.

802 - Density of fish in cage expressed as:

803 - kg fish per m<sup>3</sup> at the time of the start of slaughter (before removing any  
804 from the cage for slaughter) and

805 - Number of fish per m<sup>3</sup> at the time of start of the grow-out period

806 - Following period expressed in number of days.

807 - State if the system is land-based, semi land-based or in sea. The location of  
808 the fish farming shall be explained in terms of distance from shore and GPS  
809 coordinates (according to the ETRS89 system).

810 - The length of an average production cycle shall be presented. If the  
811 production from roe to fish ready for slaughter include different locations,  
812 this system shall be explained by a flow chart together with a description of  
813 the duration for each stage. The average size (weight) of the juveniles shall  
814 be clearly stated.

815 Wild products: For fishing it is important to include a good explanation of how,  
816 where and when the fishing is performed. This requires a complete explanation  
817 that shall include, but not be limited to, the following clarifications:

818 - Classify the fishing gear(s) used according to Annex 3 in the Regulation (EU)  
819 No 1379/2013<sup>14</sup> of the European Parliament on the common organisation of  
820 markets in fishery and aquaculture products.

821 - Specify fishing area according to the most detailed level of FAO codes for  
822 Major Marine Fishing Areas<sup>15</sup>. If the vessel operated in different areas,  
823 indicate all of them and which months each area was fished.

824 - Other relevant information:

825 - Specify the main targeted species.

826 - Specify if there are clearly separated seasons or if it is a more continuous  
827 fishery with number of distinct seasons during one year for a given species  
828 and in which months) Example: Some fishing is almost exclusively  
829 performed during a specific time of the year.

830 - Specify by-catch by species and weight per year.

---

<sup>14</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1379>

<sup>15</sup> <https://www.fao.org/fishery/en/area/search>

- 831 - Specify the use of different fishing gears throughout the fishing period.  
832 Specify month by month what gears were used.  
833 - Specify, if relevant, the on-board preparation or processing done as part  
834 of the fisheries.

### 835 3.10 Additional environmental information

836 Marine fishing and marine aquaculture are highly relevant for a number of  
837 environmental impacts not directly captured by the current PEF Impact assessment  
838 method (EF3.1, section 3.8). Among these other impacts, direct and indirect biotic  
839 impacts on targeted and non-targeted stocks, species and marine ecosystems are  
840 very important. Feed used for farmed marine products is a very important input in  
841 this regard, as it links farmed marine fish to the biodiversity impacts of global  
842 agricultural systems and capture fisheries.

843  
844 The additional environmental information required by this PEFCR is limited by the  
845 requirements in the PEF Method (section A.3.2.7.1) [1], which states that  
846 *“Additional environmental information may be included only if the PEFCR specifies*  
847 *the method that shall be used for its calculation”*, thus only impacts that can be  
848 quantified are suggested as additional environmental information.

849  
850 In particular, the sustainability of the targeted fish stock is a key factor in the overall  
851 environmental impact of a wild-caught fishery product. In 2019, more than a third  
852 of all fish stocks globally were fished at unsustainable levels according to the FAO<sup>16</sup>,  
853 while almost 60% were fished at their Maximum Sustainable Yield (MSY).  
854 Overfishing can lead to a decrease in fish populations, disrupting the balance of  
855 marine ecosystems and poses a threat to global food security as many people rely  
856 on fish as a primary source of protein. Consequently, the PEFCR should suggest a  
857 method that should be used for the stock sustainability assessment in PEFCR studies  
858 on wild-caught products.

859  
860 The Scientific, Technical and Economic Committee for Fisheries STECF is the  
861 scientific body that the Commission consults regarding the conservation and  
862 management of living marine resources, including biological, economic,  
863 environmental, social and technical considerations. In its report [Marketing](#)  
864 [standards: review of fishery criteria and underlying methodologies](#) (EWG 22-12)<sup>17</sup>,  
865 the STECF proposes a comprehensive method for grading / scoring the sustainability  
866 of a stock on a 5-point scale (i.e. A for highest sustainability grade down to E for the  
867 lowest grade). Section 3.1.8 of the EWG 22-12 report describes the grading method  
868 in detail. The decision tree in figure 2 of the report visualizes the approach. A  
869 summary of the approach is provided in [Annex 5](#)<sup>18</sup>.

870

---

<sup>16</sup> [Towards blue transformation \(fao.org\)](https://www.fao.org/blue-transformation/)

<sup>17</sup> <https://publications.jrc.ec.europa.eu/repository/handle/JRC132121>

<sup>18</sup> Based on the method developed by the STECF, DG MARE is currently working on an information system that would enable operators (and other stakeholders) to determine the stock sustainability.

871 In addition to the indicator regarding stock sustainability, STECF concluded in the  
872 same report that an indicator regarding the impact on the seabed has been fully  
873 developed. EWG 22-12 provided an updated version of the Excel file (control panel in  
874 Annex 1 of the report) developed by the ad hoc contract supporting the EWG  
875 including the revision of gear and habitat scores. The Excel file for calculating the  
876 impact on the seabed is available here:

877 [https://stecf.jrc.ec.europa.eu/documents/d/stecf/stecf-22-12-annex-1-impact-on-](https://stecf.jrc.ec.europa.eu/documents/d/stecf/stecf-22-12-annex-1-impact-on-seabed)  
878 [seabed](https://stecf.jrc.ec.europa.eu/documents/d/stecf/stecf-22-12-annex-1-impact-on-seabed).

879

880 In PEF studies, the stock sustainability assessment and the indicator of the impact  
881 on the seabed shall be communicated at the same level of prominence and visibility  
882 as the assessment of the 16 standard impact categories.

883

884 The following additional environmental information shall also be reported:

885

886 Wild products:

887 - Ghost fishing

888     o Number of fishing gears lost per unit of catch (referencing the most  
889     detailed level of FAO codes for Major Marine Fishing Areas<sup>19</sup>).

890     o Information about systems to retrieve lost fishing gear in the fishing  
891     areas (referencing the most detailed level of FAO codes for Major  
892     Marine Fishing Areas).

893     o The properties of the fishing gears are expected to be reported  
894     under “additional technical information”.

895 - Area trawled within the specific areas specified under section 3.10 as  
896     distance trawled per unit of catch landed.

897 - Number of mammals killed per unit of catch landed. Specify species.

898 - Number of birds killed per unit of catch landed. Specify species.

899 - Plastic lost to sea (number of gears containing plastics and weight of ropes  
900     and floats).

901 Farmed products:

902 - Escapees: number of fish escaped per tonne of fish produced.

903 - Number of mammals killed per tonne of production (specify species as well  
904     as accidental versus deliberate animal removals).

905 - Number of birds killed per tonne of production (specify species).

906 - Plastics lost to sea (number of fishing gears and weight of ropes and floats).

907

---

<sup>19</sup>[https://www.fao.org/search/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=FAO+codes+fo](https://www.fao.org/search/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=FAO+codes+for+Major+Marine+Fishing&cof=FORID%3A9)  
[r+Major+Marine+Fishing&cof=FORID%3A9](https://www.fao.org/search/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=FAO+codes+for+Major+Marine+Fishing&cof=FORID%3A9)

908 **3.10.1 Antifouling chemicals**

909 Emission of toxic chemicals to marine water is not covered by the current EF Impact  
910 assessment method. The exclusion of marine ecotoxicity from the PEF method  
911 limits its applicability to comparison with comparable (terrestrial) protein sources.

912

913 To include information about this environmental impact the following shall be  
914 reported:

- 915 - The antifouling chemicals used on equipment and vessels (list the product  
916 name and antifouling agents included).
- 917 - The mass input of these chemicals per unit of catch or production. The time  
918 frame specified for this factor shall reflect the durability of the antifouling  
919 chemicals.
- 920 - A statement (expert judgement) on the percentage of the overall system  
921 (vessels and equipment) covered by this information.
- 922 - A statement (expert judgement) on the end-of-life of the antifouling paints.  
923 Example: Are they mainly lost to the marine environment or is some of it  
924 collected during maintenance or onshore washing?
- 925 - A statement (expert judgement) on the emissions to sea of antifouling  
926 chemicals (either as % of the antifouling chemicals used or as a total  
927 number).

928

929 **3.11 Limitations**

930 This section presents the most important limitations of this PEFCR and the use of  
931 results from applying this PEFCR.

932

933 **3.11.1 Comparisons and comparative assertions**

934 Comparability is addressed in section 3.3.

935

936 **3.11.2 Data gaps and proxies**

937 Solutions for frequently encountered data gaps for company-specific data are  
938 presented in Chapter 5.

939

940 Processes excluded from this PEFCR due to missing datasets that shall not be filled-  
941 in by the user of the PEFCR are:

- 942 - Emissions from antifouling chemicals on vessels and farming equipment. As  
943 of February 2025, the EF impact assessment method does not include  
944 marine ecotoxicity.
- 945 - Use and production of medicines and other micro-ingredients administered  
946 through the feed.
- 947 - Fish vaccines and antibiotics.
- 948 - For combustion of fuel in fishing vessel, no EF-specific dataset was available  
949 at the time of publication (March 2025). The proxy dataset indicated shall  
950 be used until a more specific EF dataset is available.

951 A list of processes for which the user of the PEF CR shall apply ILCD entry level (ILCD-  
952 EL) compliant proxies are presented in Chapter 5.

953

### 954 3.12 Sensitivity analysis

955 Sensitivity analysis shall be carried out in alignment with the PEF method [1]. The  
956 reliability of the results shall be checked with respect to uncertainty in inventory  
957 data, allocation methods (mass allocation), values for allocation and calculation of  
958 impacts.

## 959 4 Most relevant impact categories, life cycle stages, 960 processes, and elementary flows

961 This chapter presents conclusions based on a PEF study of the representative  
962 products specified in section 3.4. The results of this study are used to determine  
963 the most relevant impact categories, stages, processes, and flows. In this  
964 document, only the most relevant impact categories and stages are presented. The  
965 Excel file “Marine Fish PEF-RP Results” presents the complete hotspot analysis. This  
966 file can be downloaded at: [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources).

967

### 968 4.1 Most relevant EF impact categories

969 Table 4-1, Table 4-2 and Table 4-3 present the most relevant impact categories for  
970 overarching representative product (marine fish) and the wild and farmed  
971 representative products of the two sub-categories as they are identified by the  
972 hotspot analysis defined by the PEF method (i.e. the categories that when listed  
973 from largest to smallest add up to 80% of the normalized and weighted results).

974

975 *Table 4-1 Most relevant impact categories according to hotspot analysis for the overarching product category*  
976 *marine fish*

<b>Impact category</b>	<b>% of normalised and weighted results</b>
Climate change	24%
Resource use, fossils	15%
Particulate Matter	13%
Ecotoxicity, freshwater	11%
Eutrophication, marine	11%
Photochemical ozone formation	6%
Acidification	6%
Eutrophication, terrestrial	5%
Water use	3%
Land use	2%
Sum of selected categories to total normalized and weighted result	80%

977

978

979

980

981

Table 4-2 Most relevant impact categories according to hotspot analysis for wild marine fish products

<b>WILD FISH MOST RELEVANT IMPACT CATEGORIES</b>	
Impact categories	% of normalised and weighted results
Climate change	25%
Resource use, fossils	20%
Particulate Matter	18%
Photochemical ozone formation	9%
Acidification	7%
Eutrophication, terrestrial	6%
Sum of selected categories to total normalized and weighted result	84%

982

983

Table 4-3 Most relevant impact categories according to hotspot analysis for farmed marine fish products

<b>FARMED FISH MOST RELEVANT IMPACT CATEGORIES</b>	
Impact categories	% of normalised and weighted results
Climate change	22%
Ecotoxicity, freshwater	21%
Eutrophication, marine	20%
Resource use, fossils	9%
Particulate Matter	6%
Land Use	4%
Sum of selected categories to total normalized and weighted result	83%

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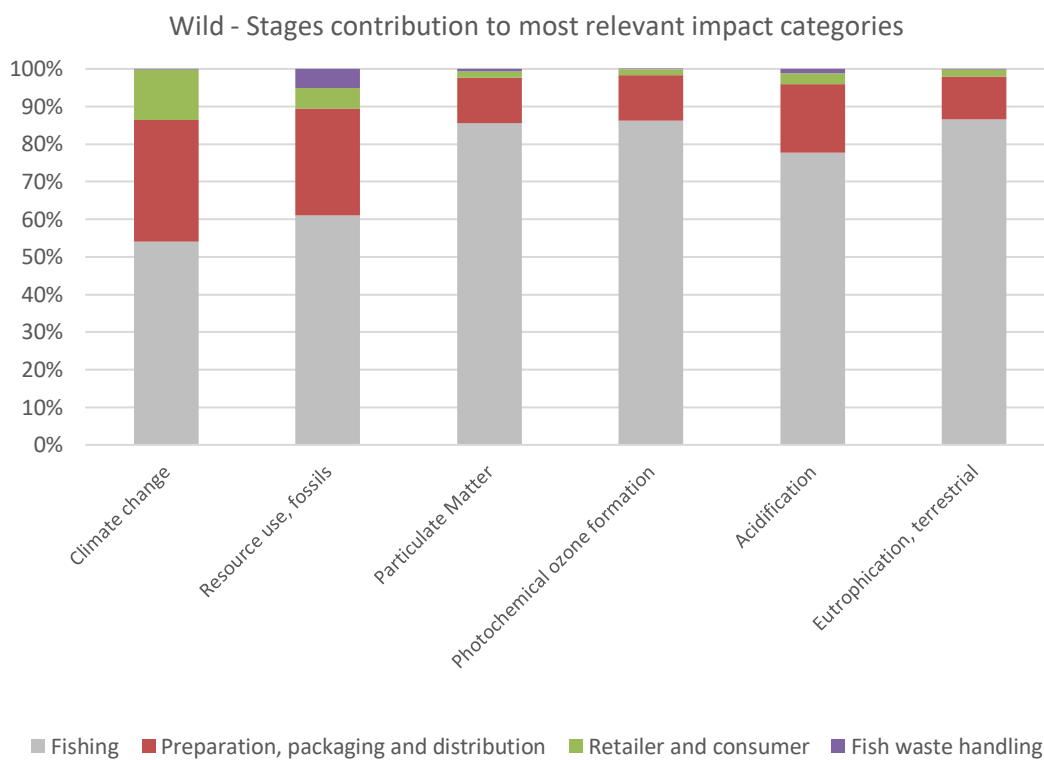
998

999



1000 4.2 Most relevant life cycle stages

1001 Figure 4-1 and Figure 4-2 present how the different stages of the wild and the  
1002 farmed RPs contribute to their respective most relevant impact categories.  
1003



1004  
1005  
1006  
1007

Figure 4-1 Wild RP: Stages contribution to most relevant impact categories

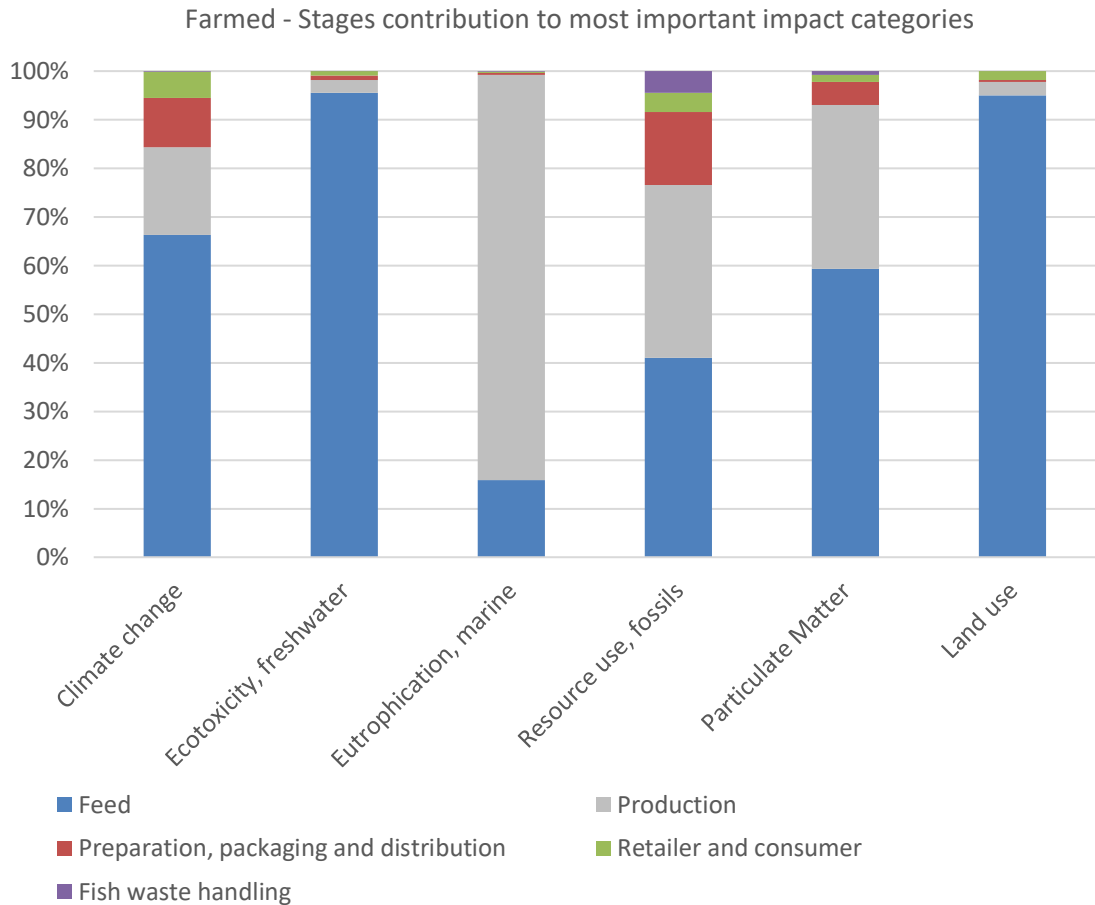


Figure 2-2 Farmed RP: Stages contribution to most relevant impact categories

1008  
1009  
1010  
1011

### 4.3 Most relevant processes and flows

The Excel file “Marine Fish PEF-RP Results” presents the complete hotspot analysis. This file is available at: [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources).

1015

## 5 Life Cycle Inventory

This section introduces the rules regarding the data that the PEF study shall include and the data quality requirements.

1019

### 5.1 Periodicity of data collection

Primary data should be an average of data collected for a period of the **last three years**. This includes the data used for allocation.

1023

If data that are used are only representative for a period less than three years, this shall be clearly stated and reflected in the data quality rating.

1026

These specifications apply, if applicable, also to Additional technical and Additional environmental information (see 3.9 and 3.10).

1029

1030 **5.2 Data sampling**

1031 If sampling is needed, it shall be conducted as specified in this PEFCR. However,  
1032 sampling is not mandatory and any user of this PEFCR may decide to collect the  
1033 data from all the plants or farms, without performing any sampling. A full  
1034 description of the PEF requirements regarding sampling are available in section  
1035 A.4.2.5 of the PEF Method [1].

1036  
1037 In some cases, a sampling procedure is needed to limit the data collection to only a  
1038 representative sample. For marine fish products, a typical situation that requires  
1039 sampling is when multiple fishing vessels or multiple farms sites are involved in the  
1040 sourcing of the fish.

1041  
1042 If sampling is needed, a stratified sample shall be used (i.e. one that ensures that  
1043 sub-populations (strata) of a given population are each adequately represented  
1044 within the whole sample of a research study). This should consider geography, feed  
1045 composition, farm type, species, and capture method. With this type of sampling, it  
1046 is guaranteed that subjects from each sub-population are included in the final  
1047 sample, whereas simple random sampling does not ensure that sub-populations  
1048 are represented equally or proportionately within the sample.

1049  
1050 When sampling is used the user of this PEFCR shall report:

- 1051 - Farmed products:
- 1052     ○ The percentage of the total mass of fish to harvest that is covered
  - 1053     with sampling.
  - 1054     ○ The percentage of total farming sites/farms that are involved that
  - 1055     are covered with sampling.
  - 1056     ○ The sampling of feed shall cover 95 % of the feed used.
- 1057 - Wild products:
- 1058     ○ The percentage of mass of fish landed that are covered with
  - 1059     sampling.
  - 1060     ○ The percentage of vessels involved in the sourcing that are covered
  - 1061     with sampling.

1062 When sampling is used this shall also be reflected in the Data Quality Rating (DQR)  
1063 score (section 5.5).

1064

1065 **5.3 List of mandatory company-specific data**

1066 This section presents the data that shall be modelled with data that are specific for  
1067 the products that are studied (i.e. company-specific data). Without these company-  
1068 specific data the results cannot be presented as compliant with this PEFCR. Section  
1069 5.5 and 5.6 provide more on data requirements of this PEFCR. Chapter 6 presents  
1070 more detail on these processes and the data that shall be collected for them.

1071

1072

1073

Table 5-1 Mandatory company-specific data for farmed products

<b>Data</b>	<b>Comment</b>
BFCR (biological feed conversion ratio)	Mass of feed per mass of fish farmed
Fish mass balance over the farming stage	A complete mass balance for all fish that enter the fish farm <sup>20</sup> . This includes a quantification of all flows and clear definition of their fate. This includes escapees, losses, commercial products, and all other fish biomass.
The PEF profile of the feed used	According to the PEFCR Feed for food-producing animals <a href="#">[3]</a>
Direct emissions from the fish farm	This includes nutrients from uneaten feed, faeces, and combustion of fuels.
Use of freshwater in fish grow out and juvenile production	

1074

---

<sup>20</sup> Excluding fish that is part of the feed and live fish used in parasite treatment.

1075

*Table 5-2 Mandatory company-specific data wild products*

<b>Data</b>	<b>Comment</b>
Energy (fuel, electricity) use efficiency in fishery	Energy input per unit of fish landed
Fish mass balance of fishery	Complete mass balance for all fish that are retrieved from the sea (fished). This includes all fish that are caught independent of how it is classified. Each mass flow shall be specified in terms of species and fate after it is fished, and quantified. If the fishing includes onboard preparation the preparation yields shall be company specific.
Emission of refrigerants from fishing vessel	Specify type and mass emitted per unit of catch.

1076

1077

*Table 5-3 Mandatory company-specific data farmed and wild products*

<b>Data</b>	<b>Comment</b>
Fish mass balance for the preparation stage	Complete mass balance for the fish that enters preparation and how it leaves. This includes specification of the fate of each mass flow, unambiguous definition of state (e.g. fillet, head off gutted) and the fate of all mass flows.
Transport to market	Transport from preparation or landing to retailer/market shall be included with company-specific data on transport type (road, air or sea) and distances (transport route).

1078

1079

#### 5.4 List of processes expected to be run by the company

1080

1081

Farmed products:

1082

- Energy use at the fish farm and by vessels supporting fish grow out and transport of fish from grow out to preparation.

1083

- Management of wastewater and sludge from land-based systems.

1084

- Relative price of the fish co-products from the fish farm (co-product price relative to the price of the main product).

1085

1086

1087

Wild products:

1088

- Relative price of the fish products from fishing (co-product price relative to the price of the main product). This includes all fish biomass that are landed, independent of how they are classified by regulations, etc.

1089

1090

1091

All products (wild and farmed):

1092

- Energy use in preparation stage.

1093

- Relative price of the fish co-products from preparation (co-product price relative to the price of the main product).

1094

- 1095 - Water consumption, including water source and emissions to water from  
 1096 the plant.  
 1097 - Type of refrigerants used in preparation plant and leakage rate.  
 1098 - Packaging materials (Bill of Materials). This includes packaging used during  
 1099 production, distribution, and consumer stage.

1100 See [Annex 3](#) for detailed instructions.

1101

## 1102 5.5 Data quality requirements

1103 The data quality of each dataset and the total PEF study shall be calculated and  
 1104 reported according to section B.5.3 of the PEF Method [\[1\]](#).

1105

1106 The following presents a short description of the procedure. The Excel file “Marine  
 1107 Fish PEFCR DQR” includes two sheets with a prepared setup for the DQR of  
 1108 company specific (“17) Product-specific data DQR”) and generic (“18) Secondary  
 1109 data DQR”) data. This document is available at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources).

1110

1111 The calculation of the DQR shall be based on the following formula with four  
 1112 criteria:

1113

$$1114 \quad DQR = \frac{TeR+GeR+TiR+P}{4} \quad \text{Equation 1}$$

1115

1116 where TeR is technological representativeness, GeR is geographical  
 1117 representativeness, TiR is time representativeness, and P is precision. The  
 1118 representativeness (technological, geographical and time-related) characterizes to  
 1119 what degree the processes and products selected are depicting the system  
 1120 analysed, while the precision indicates the way the data is derived and the related  
 1121 level of uncertainty.

1122

### 1123 5.5.1 DQR company-specific datasets

1124 The DQR shall be calculated at level-1 disaggregation before any aggregation of  
 1125 sub-processes or elementary flows is performed. The DQR of product-specific  
 1126 datasets shall be calculated as following:

- 1127 1) Select the most relevant activity data and direct elementary flows: most  
 1128 relevant activity data are the ones linked to sub-processes (i.e.  
 1129 secondary datasets) that account for at least 80% of the total  
 1130 environmental impact of the product-specific dataset, listing them from  
 1131 the most contributing to the least contributing one. Most relevant direct  
 1132 elementary flows are defined as those direct elementary flows  
 1133 contributing cumulatively at least with 80% to the total impact of the  
 1134 direct elementary flows.
- 1135 2) Calculate the DQR criteria TeR, TiR, GeR and P for each most relevant  
 1136 activity data and each most relevant direct elementary flow. The values  
 1137 of each criterion shall be assigned based on

- 1138 3) Table 5-4.
- 1139 a. Each most relevant direct elementary flow consists of the amount
- 1140 and elementary flow named (e.g. 40 g carbon dioxide). For each
- 1141 most relevant elementary flow, the user of the PEFCR shall evaluate
- 1142 the 4 DQR criteria named TeR-EF, TiR-EF, GR-EF, PEF. For example,
- 1143 the user of the PEFCR shall evaluate the timing of the flow
- 1144 measured, for which technology the flow was measured and in
- 1145 which geographical area.
- 1146 b. For each most relevant activity data, the 4 DQR criteria shall be
- 1147 evaluated (named TiR-AD, PAD, Gr-AD, Ter-AD) by the user of the
- 1148 PEFCR.
- 1149 c. Considering that the data for the mandatory processes shall be
- 1150 company-specific, the score of P cannot be higher than 3, while the
- 1151 score for TiR, TeR, and GR cannot be higher than 2 (The DQR score
- 1152 shall be  $\leq 1.5$ ).
- 1153 4) Calculate the environmental contribution of each most relevant activity
- 1154 data (through linking to the appropriate sub-process) and direct
- 1155 elementary flow to the total sum of the environmental impact of all
- 1156 most-relevant activity data and direct elementary flows, in % (weighted,
- 1157 using all EF impact categories). For example, the newly developed
- 1158 dataset has only two most relevant activity data, contributing in total to
- 1159 80% of the total environmental impact of the dataset:
- 1160 a. Activity data 1 carries 30% of the total dataset environmental
- 1161 impact. The contribution of this process to the total of 80% is 37.5%
- 1162 (the latter is the weight to be used).
- 1163 b. Activity data 2 carries 50% of the total dataset environmental
- 1164 impact. The contribution of this process to the total of 80% is 62.5%
- 1165 (the latter is the weight to be used).
- 1166 5) Calculate the TeR, TiR, GeR and P criteria of the newly developed dataset
- 1167 as the weighted average of each criterion of the most relevant activity
- 1168 data and direct elementary flows. The weight is the relative contribution
- 1169 (in %) of each most relevant activity data and direct elementary flow
- 1170 calculated in step 3.
- 1171 6) The user of the PEFCR shall calculate the total DQR of the newly
- 1172 developed dataset using Equation B.2, where  $\overline{TeR}$ ,  $\overline{GeR}$ ,  $\overline{TiR}$ ,  $P$  are the
- 1173 weighted average calculated as specified in point 4.
- 1174
- 1175

Table 5-4 How to assess the value of the DQR criteria for datasets with company-specific information

	<b>P<sub>EF</sub> and P<sub>AD</sub></b>	<b>T<sub>IR-EF</sub> and T<sub>IR-AD</sub></b>	<b>T<sub>ER-EF</sub> and T<sub>ER-AD</sub></b>	<b>G<sub>R-EF</sub> and G<sub>R-AD</sub></b>
<b>1</b>	Measured/calculated and externally verified	The data refers to the most recent annual administration period with respect to the EF report publication date	The elementary flows and the activity data exactly the technology of the newly developed dataset	The activity data and elementary flows reflect the exact geography where the process modelled in the newly created dataset takes place
<b>2</b>	Measured/calculated and internally verified, plausibility checked by reviewer	The data refers to maximum 2 annual administration periods with respect to the EF report publication date	The elementary flows and the activity data is a proxy of the technology of the newly developed dataset	The activity data and elementary flows) partly reflects the geography where the process modelled in the newly created dataset takes place
<b>3</b>	Measured/calculated /literature and plausibility not checked by reviewer OR Qualified estimate based on calculations plausibility checked by reviewer	The data refers to maximum three annual administration periods with respect to the EF report publication date	Not applicable	Not applicable
<b>4</b> - <b>5</b>	Not applicable	Not applicable	Not applicable	Not applicable
<p><b>P<sub>EF</sub></b>: Precision for elementary flows; <b>P<sub>AD</sub></b>: Precision for activity data; <b>T<sub>IR-EF</sub></b>: Time Representativeness for elementary flows; <b>T<sub>IR-AD</sub></b>: Time representativeness for activity data; <b>T<sub>ER-EF</sub></b>: Technology representativeness for elementary flows; <b>T<sub>ER-AD</sub></b>: Technology representativeness for activity data; <b>G<sub>R-EF</sub></b>: Geographical representativeness for elementary flows; <b>G<sub>R-AD</sub></b>: Geographical representativeness for activity data.</p>				

1177

## 1178 5.5.2 DQR when default values are used

1179 For the datasets that include the use of default values presented in this PEFCR the  
1180 DQR cannot be less than 3.

1181

## 1182 5.5.3 DQR score “not applicable” for company-specific data

1183 If one of the criteria in the DQR for company-specific data are rated as “not  
1184 applicable” that means that the dataset is not sufficiently company specific. Data  
1185 quality then must be improved to be compliant with this PEFCR.

1186 one of the criteria in the DQR for company-specific data are rated as “not  
1187 applicable” that means that the data set is not sufficiently company specific. Data  
1188 quality then must be improved to be compliant with this PEFCR.

1189



1190 5.5.4 DQR secondary data sets

1191 This section describes the procedure to calculate the DQR of secondary datasets  
1192 used in a PEF study. This means that the DQR of the EF compliant secondary  
1193 dataset (calculated by the data provider) shall be re-calculated, when they are used  
1194 in the modelling of most relevant processes, to allow the user of the PEF method to  
1195 assess the context specific DQR criteria (i.e. TeR, TiR and GeR of most relevant  
1196 processes). The TeR, TiR and GeR criteria shall be re-evaluated based on

1197 Table 5-5. It is not allowed to modify any criteria. The total DQR of the dataset shall  
1198 be recalculated using:  
1199

$$1200 \quad DQR = \frac{TeR+GeR+TiR+P}{4} \quad \text{Equation 1}$$

1201  
1202  
1203

Table 5-5 How to assign the values to DQR criteria when using secondary datasets

Rating	T <sub>IR</sub>	T <sub>ER</sub>	Ge <sub>R</sub>
1	The EF report publication date happens within the time validity of the dataset	The technology used in the EF study is exactly the same as the one in scope of the dataset	The process modelled in the EF study takes place in the country the dataset is valid for
2	The EF report publication date happens not later than 2 years beyond the time validity of the dataset	The technologies used in the EF study is included in the mix of technologies in scope of the dataset	The process modelled in the EF study takes place in the geographical region (e.g. Europe) the dataset is valid for
3	The EF report publication date happens not later than 4 years beyond the time validity of the dataset	The technologies used in the EF study are only partly included in the scope of the dataset	The process modelled in the EF study takes place in one of the geographical regions the dataset is valid for
4	The EF report publication date happens not later than 6 years beyond the time validity of the dataset	The technologies used in the EF study are similar to those included in the scope of the dataset	The process modelled in the EF study takes place in a country that is not included in the geographical region(s) the dataset is valid for, but sufficient similarities are estimated based on expert judgement.
5	The EF report publication date happens later than 6 years after the time validity of the dataset, or the time validity is not specified	The technologies used in the EF study are different from those included in the scope of the dataset	The process modelled in the EF study takes place in a different country than the one the dataset is valid for

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## 5.6 Data needs matrix (DNM)

1208

All processes required to model the product and outside the list of mandatory

1209

company-specific data (listed in section 5.3) shall be evaluated using the Data

1210

Needs Matrix (DNM)<sup>21</sup> (see Table 5-6). These evaluations shall be documented.

<sup>21</sup> Described in section B.5.4 of the PEFCR guidance document [\[1\]](#).

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The DNM indicates the level of influence the company has on the process and if product-specific or generic data are used. The following three cases are found in the DNM and are explained in the following sections:

1. Situation 1: the process is run by the company applying the PEFCR;
2. Situation 2: the process is not run by the company applying the PEFCR but the company has access to (company-)specific information;
3. Situation 3: the process is not run by the company applying the PEFCR and this company does not have access to (company-)specific information.

The user of the PEF method shall:

1. Determine the level of influence (Situation 1, 2 or 3) the company has for each process in its supply chain. This decision determines which of the options in Table 5-6 is pertinent for each process;
2. Provide a table in the PEF report listing all processes and their situation according to the DNM;
3. Follow the data requirements indicated in Table 5-6;
4. Calculate/re-evaluate the DQR values (for each criterion + total) for the datasets of the most relevant processes and the new ones created.

*Table 5-6 Data Needs Matrix (DNM). The options described in the DNM are not listed in order of preference. \*Disaggregated datasets shall be used.*

	Option	Most relevant processes	Other processes
Situation 1: process run by the company using the PEFCR	I	Provide company-specific data (as requested in the PEFCR) and create a company-specific dataset, in aggregated form (DQR≤1.5) <sup>110</sup> Calculate the DQR values (for each criterion + total)	
	II		Use default secondary dataset in PEFCR, in aggregated form (DQR≤3.0) Use the default DQR values
Situation 2: process not run by the company using the PEFCR but with	I	Provide company-specific data (as requested in the PEFCR) and create a company-specific dataset, in aggregated form (DQR≤1.5) Calculate the DQR values (for each criterion + total)	
	II	Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR≤3.0)* Re-evaluate the DQR criteria within the	

		product specific context	
	III		Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR≤4.0)* Use the default DQR values.
Situation 3: process not run by the company using the PEFCR and without access to company- specific information	I	Use default secondary data set in aggregated form (DQR≤3.0) Re-evaluate the DQR criteria within the product specific context	
	II		Use default secondary data set in aggregated form (DQR≤4.0) Use the default DQR values

1236

1237

1238 5.6.1 Situation 1: The process is run by the company applying the PEFCR

1239

1240 For each process in situation 1 there are two possible options:

1241

1242 1. The process is in the list of most relevant processes as specified in the

1243 PEFCR or is not in the list of most relevant process, but still the company

1244 wants to provide company-specific data (option 1);

1245 2. The process is not in the list of most relevant processes and the company

1246 prefers to use a secondary dataset (option 2).

1247

1248 *Situation 1/Option 1*

1249 For all processes run by the company and where the user of the PEFCR applies

1250 company-specific data. The DQR of the newly developed dataset shall be evaluated

1251 as described in section 5.5.

1252

1253 *Situation 1/Option 2*

1254 For the non-most relevant processes only, if the user of the PEFCR decides to model

1255 the process without collecting company-specific data, then the user shall use the

1256 secondary dataset listed in the PEFCR together with its default DQR values listed

1257 here. If the default dataset to be used for the process is not listed in the PEFCR, the

1258 user of the PEFCR shall take the DQR values from the metadata of the original

1259 dataset.

1260

1261 *Example: A fish farmer that uses generic data to cover the emissions of refrigerants*  
1262 *from the harvesting plant will be in situation 1/option 2.*

1263

1264 5.6.2 Situation 2: the process is not run by the company applying the PEFCR but  
1265 the company has access to (company-)specific information

1266

1267 When a process is not run by the user of the PEFCR, but there is access to company-  
1268 specific data, then there are three possible options:

- 1269 1. The user of the PEFCR has access to extensive supplier-specific information  
1270 and wants to create a new EF compliant dataset;  
1271 2. The company has some supplier-specific information and wants to make  
1272 some minimum changes;  
1273 3. The process is not in the list of most relevant processes and the company  
1274 wants to make some minimum changes.

1275 *Situation 2/Option 1*

1276 For all processes not run by the company and where the user of the PEFCR applies  
1277 company-specific data, the DQR of the newly developed dataset shall be evaluated  
1278 as described in section 5.5.

1279

1280 *Situation 2/Option 2*

1281 The user of the PEFCR shall use company-specific activity data for transport and  
1282 shall substitute the sub-processes used for electricity mix and transport with  
1283 supply-chain specific PEF compliant datasets, starting from the default secondary  
1284 dataset provided in the PEFCR.

1285

1286 Please note that the PEFCR lists all dataset names together with the UUID of their  
1287 aggregated dataset. For this situation, the disaggregated version of the dataset is  
1288 required.

1289

1290 The user of the PEFCR shall make the DQR context specific by re-evaluating TeR and  
1291 TiR using Table 5-6. The criteria GeR shall be lowered by 30%<sup>22</sup> and the criteria P  
1292 shall keep the original value.

1293

1294 *Situation 2/Option 3*

1295 The user of the PEFCR shall apply company-specific activity data for transport and  
1296 shall substitute the sub-processes used for electricity mix and transport with  
1297 supply-chain specific PEF compliant datasets, starting from the default secondary  
1298 dataset provided in the PEFCR.

1299

---

<sup>22</sup> In situation 2, option 2 it is proposed to lower the parameter GeR by 30% to incentivise the use of company-specific information and reward the efforts of the company in increasing the geographic representativeness of a secondary dataset through the substitution of the electricity mixes and of the distance and means of transportation.

1300 Please note that the PEFCR lists all dataset names together with the UUID of their  
1301 aggregated dataset. For this situation, the disaggregated version of the dataset is  
1302 required.

1303

1304 In this case, the user of the PEFCR shall use the default DQR values. If the default  
1305 dataset to be used for the process is not listed in the PEFCR, the user of the PEFCR  
1306 shall take the DQR values from the original dataset.

1307

### 1308 5.6.3 Situation 3

1309 If a process is not run by the company using the PEFCR and the company does not  
1310 have access to company-specific data, there are two possible options:

1311

- 1312 1. It is in the list of most relevant processes (situation 3, option 1);
- 1313 2. It is not in the list of most relevant processes (situation 3, option 2).

1314

#### 1315 *Situation 3/Option 1*

1316 In this case, the user of the PEFCR shall make the DQR values of the dataset used  
1317 context specific by re-evaluating TeR, TiR and GeR. The criteria P shall keep the  
1318 original value.

1319

#### 1320 *Situation 3/Option 2*

1321 For the non-most relevant processes, the user of the PEFCR shall apply the  
1322 corresponding secondary dataset listed in the PEFCR together with its DQR values.  
1323 If the default dataset to be used for the process is not listed in the PEFCR, the user  
1324 of the PEFCR shall take the DQR values from the original dataset.

1325

## 1326 5.7 Which datasets to use?

1327 According to section A.4.4.2 of the PEF Method [1], whenever a dataset needed to  
1328 calculate the PEF profile is not among those listed in this PEFCR, then the user shall  
1329 choose data from among the following options (in hierarchical order):

- 1330 • Use an EF compliant<sup>23</sup> dataset available on one of the nodes of the Life  
1331 Cycle Data Network <http://eplca.jrc.ec.europa.eu/LCDN/>
- 1332 • Use an EF compliant dataset available in a free or commercial source.
- 1333 • Use another EF compliant dataset considered to be a good proxy. In  
1334 such case this information shall be included in the “limitations” section  
1335 of the PEF report.
- 1336 • Use an ILCD entry level (EL) compliant dataset. These datasets shall be  
1337 included in the “limitations” section of the PEF report. A maximum of  
1338 10% of the total environmental impact may be derived from ILCD-EL  
1339 compliant datasets (calculated cumulatively from lowest to largest  
1340 contribution to the total EF profile).

---

<sup>23</sup> Compliant with quality requirements and coherence in terms of Methodology, Documentation, and Nomenclature, for the two compliance systems allowed (ILCD entry level and PEF/OEF).  
[https://eplca.jrc.ec.europa.eu/permalink/Guide\\_EF\\_DATA.pdf](https://eplca.jrc.ec.europa.eu/permalink/Guide_EF_DATA.pdf) .

1341                   • If no EF compliant or ILCD-EL compliant proxy is available, it shall be  
1342                   excluded from the PEF study. This shall be clearly stated in the PEF  
1343                   report as a data gap and validated by the PEF study and PEF report  
1344                   verifiers.

1345

## 1346 5.8 Naming of elementary flows

1347 Elementary flows shall be identified by their UUID that can be found here:

1348 <https://eplca.jrc.ec.europa.eu/EF-node/elementaryFlowList.xhtml>

1349

## 1350 5.9 Allocation rules

1351 Allocation refers to, “partitioning the input or output flows of a process or a  
1352 product system between the product system under study and one or more other  
1353 product systems” (ISO 14040:2006). The general rule for allocation is that economic  
1354 allocation shall be used when allocation cannot be avoided. The TS chose to use  
1355 economic allocation to ensure consistency with the use of economic allocation  
1356 required for various aspects of animal husbandry (European Commission, 2021)  
1357 and with the requirement of economic allocation by the PEFCR for Feed for Food  
1358 Producing Animals [3].

1359

1360 The rules for allocation are set according to section 4.5 in the PEF Method [1]. **The**  
1361 **first allocation rule** is that wherever possible, allocation shall be avoided by  
1362 dividing the unit process to be allocated into sub-processes and collecting the input  
1363 and output data related to these sub-processes; system expansion with  
1364 substitution shall be avoided because it can lead to arbitrary choices.

1365

1366 Table 5-7 presents different stages/processes where allocation is necessary and the  
1367 allocation rules to use. The reason that there are some exceptions from the general  
1368 rule of economic allocation is that the Technical Secretariat considers that the  
1369 general PEF rule provides very good instruction on how to handle allocation for  
1370 important processes such as transport.

1371

1372 Fish flows that have no positive economic value for the operator shall not be  
1373 attributed any of the environmental footprint up to the point of allocation. For  
1374 example, fish that is lost or just a waste flow, with no economic value for the  
1375 producer, shall not be attributed any of the environmental footprint up to the point  
1376 of allocation.

1377

1378 Section 5.10 on how fish waste flows shall be handled also includes instructions on  
1379 when allocation can be used and when the CFF (Circular Footprint Formula) shall be  
1380 used.

1381

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1385

Table 5-7 Allocation rules

Process/stage	Allocation rule
Fishing, allocation of fishing effort between products landed.	Economic allocation
Aquaculture fish farm, allocation of products for human consumption and other products.	
Feed production.	
Preparation, allocation between main products and by-products.	
Transport	Allocation according to section 4.4.3.1 of the PEF Method <a href="#">[1]</a> .

1386

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If the applicant multi-functional processes are **not** listed in *Table 5-7*, allocation shall be done according to the hierarchy presented in section 4.5 of the PEF Method [\[1\]](#):

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- 1) wherever possible, allocation should be avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes; system expansion should be avoided because it can lead to arbitrary choices. System expansion by substitution should be avoided because it entails arbitrary choices leading to high uncertainty.
- 2) where allocation cannot be avoided and subdivision cannot be applied, the inputs and outputs of the system shall be partitioned between its different products in a way that reflects relevant underlying physical relationships between them.
- 3) Allocation based on some other relationship may be possible. For example, economic allocation refers to allocating inputs and outputs associated with multi-functional processes to the co-product outputs in proportion to their relative market values.

1405

### 5.9.1 Economic allocation rules

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The allocation factor for each co-product shall be calculated based on the value ratio between the different co-products at the stage where the allocation is done. It shall be documented how this is achieved. The basic principle is that the allocation factor shall reflect the value of the co-product flow for the producer and thus these values are mandatory company-specific data.

1412

1413

1414

The data that is used to set the economic allocation factor shall be representative for the last 3-year average.

1415

1416

1417

One way of determining the economic allocation factor is to use the market price of the co-product. Since it is the value ratio between the co-products that are relevant it does not matter which currency this ratio is defined in, but the values that are

1418 used for each co-product shall be representative for the same market/situation and  
 1419 time-period. When there is no market price, it can be an intermediate product, the  
 1420 value ratio can be set based on the company’s assessment of their profitability and  
 1421 value creation. Even though at the point of allocation one of the co-products might  
 1422 be an intermediate product it will in the end be sold and thus it can be given a  
 1423 value relative to the other co-products. How these allocation factors are set shall  
 1424 be clearly documented.

1425  
 1426 Equation (2) presents how the economic allocation factor (AF) to “product a” shall  
 1427 be calculated using the market price or in other ways defined economic value ratio  
 1428 ( $V_a$  and  $V_b$ ) and mass yield of “co-products a and b” ( $M_a$  and  $M_b$ ).

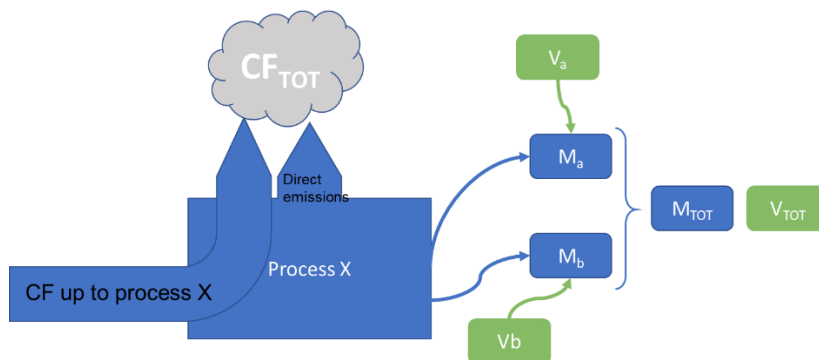
1429  
 1430 Both the unit value ( $V_a$  and  $V_b$ ) and the mass yield ( $M_a$  and  $M_b$  in equation) shall be  
 1431 documented.

1432  
 1433 *Allocation factor (AF) for product a:*  $A_a = \frac{M_a * V_a}{(M_a * V_a + M_b * V_b)}$  Equation 2

1434  
 1435 The following figure and equation present a generic example of how economic  
 1436 allocation is done at stage/process X among the co-products a and b. The example  
 1437 uses the carbon footprint (CF) with the reference substance CO<sub>2</sub>-equivalents (CO<sub>2</sub>e)  
 1438 as an example, but the principle is the same for all impact categories of the  
 1439 complete PEF:  
 1440  
 1441

1442 
$$CF_a \left( \frac{kgCO_2e}{kg \text{ product } a} \right) = \frac{CF_{TOT} * A_a}{M_a} = \frac{CF_{TOT} * \frac{M_a * V_a}{(M_a * V_a + M_b * V_b)}}{M_a}$$

1443  
 1444



1445  
 1446 *Figure 5-1 Example of economic allocation, the illustration uses the carbon footprint (CF) as an example of*  
 1447 *impact*

1448  
 1449 **5.9.2 Allocation - farmed products**  
 1450 The PEF up to the stage where fish leaves the fish farm shall be allocated among **all**  
 1451 **products with a documented commercial value**. The value that is used for each  
 1452 product shall reflect the value for the fish farmer.  
 1453

1454 Aquaculture can include the output of products other than fish (e.g. utilization of  
1455 sludge to grow vegetable in aquaponics). If these products present an income to  
1456 the producer, they can be attributed a share of the environmental footprint by  
1457 applying economic allocation.

1458

1459 **If product-specific yields and values are not available, all shall be allocated to the**  
1460 **product for which the PEF profile is calculated.**

1461

1462 A flow chart with mass flows and values per flow shall be included in the report,  
1463 including the fate of each flow.

1464

### 1465 5.9.3 Allocation - wild products

1466 The fishery can include the process of catching the fish and onboard preparation of  
1467 the fish. Preparation ranges from the simple process of bleeding the fish to a  
1468 complete fillet factory with freezing and meal/oil production.

1469

1470 The following rules apply for allocation of the fishery:

1471 1. If possible, allocation should be avoided (e.g. only products that are  
1472 prepared onboard carry the impacts from preparation).

1473 The following rules are valid for the case where such measurements/data are  
1474 not available:

1475 2. The complete activity of the fishing vessel shall be allocated among the  
1476 products that are landed and have a commercial value. Outputs with no  
1477 value shall not be assigned any of the fishing activity.

1478 3. The value assigned to each product shall reflect the value of the product as  
1479 is at landing.

1480 **If product-specific yields and values are not available, all shall be allocated to the**  
1481 **product for which the PEF profile is calculated.**

1482

1483 A flow chart including all mass flows and values per flow shall be included in the  
1484 report, including the fate of each flow. The flow chart shall include all flows so that  
1485 the mass balance can be controlled.

1486

### 1487 5.9.4 Allocation - onshore preparation

1488 This applies for both fished and farmed products.

1489

1490 **If product-specific yields and values are not available, all shall be allocated to the**  
1491 **product for which the PEF profile is calculated.**

1492

1493 A flow chart with mass flows and values per flow shall be included in the report,  
1494 including the fate of each flow.

1495

1496 **5.10 End-of-life, waste handling and recycling**

1497 “End of life” includes the process from when the mass is discarded and ends when  
1498 the product is returned to nature as a waste product or enters another product’s  
1499 life cycle (i.e. as a recycled input). The inventory data file presents default data for  
1500 the application of the CF formula on fish and other relevant waste flows for marine  
1501 fish systems.

1502  
1503 The CF formula (section 5.10.2) shall be applied for all waste flows. The waste  
1504 handling of products used during the manufacturing, distribution, retail, use, or  
1505 after use stage shall be included. These processes/flows shall be modelled and  
1506 reported at the life cycle stage where the waste occurs.

1507  
1508 To separate between products and waste flows the following distinction shall be  
1509 used:

- 1510 - “Products” are mass flows that represent an income to the producer (quantified  
1511 by market price) : value > 0. Products are handled according to the allocation  
1512 rules (section 5.9).
- 1513 - “Waste” are mass flows that represent a zero income or expenses to the  
1514 producer: value ≤ 0.

1515 Waste flows will include fish and other materials. These flows shall be modelled  
1516 and included at the life cycle stage where they occur following the instructions for  
1517 the use of the end-of-life formula.

1518  
1519 Figure 5-2 illustrates how fish/biomass from a marine fish farm shall be handled.

1520  
1521 The following processes shall be taken into consideration:

- 1522 • Collection and transport to end of life treatment facilities;
- 1523 • Sorting and other types of processing;
- 1524 • Storing, including emissions from degradation during storing;
- 1525 • Wastewater of products used/dissolved in or with water;
- 1526 • Composting or other organic waste-treatment methods;
- 1527 • Incineration and disposal of bottom ash; and
- 1528 • Landfilling and landfill operation and maintenance.

1529  
1530

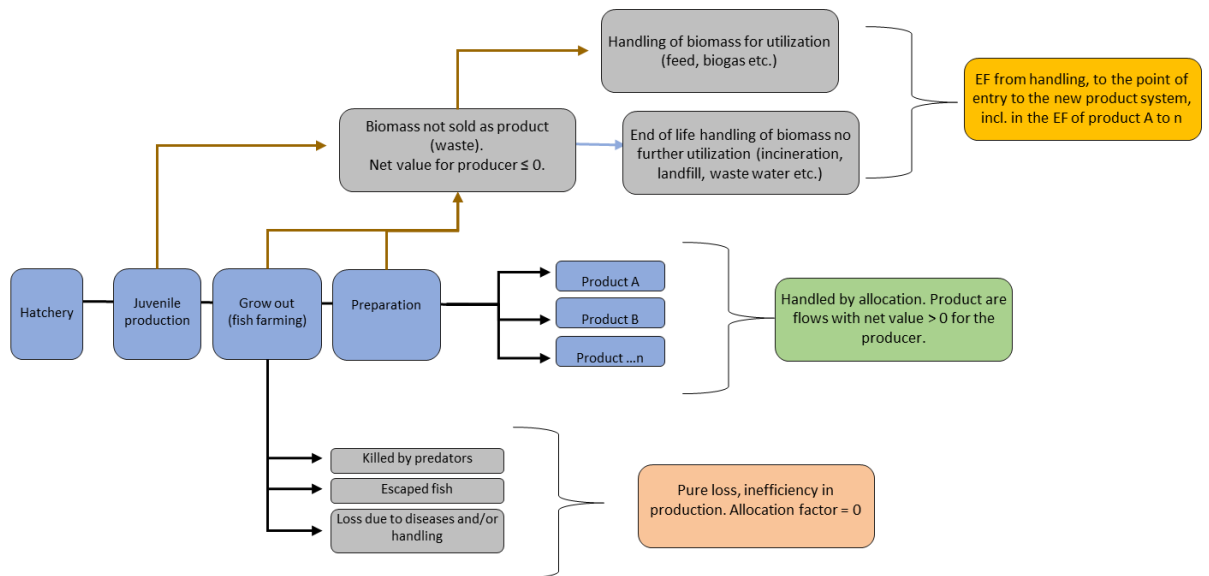


Figure 5-2 Illustration of biomass flows in marine aquaculture and handling of products and waste

1531  
1532  
1533

#### 5.10.1 Fish biomass and sludge carbon and energy content

1534  
1535 Waste handling of fish biomass and sludge shall be included. If information  
1536 regarding the waste treatment is available this shall be used. Annex C<sup>24</sup> of the PEF  
1537 method (sheet R3 data MunicipalWaste), showing the share of treatment methods  
1538 for municipal waste per country, or data in the sheet “**Fish and sludge CFF data**” of  
1539 the “Marine Fish PEFCR Inventory Data” file (see also the Excel file, “Marine Fish  
1540 PEFCR Feed emission mass balance model”) shall be used if specific data are not  
1541 available.

1542

#### 5.10.2 Circular Footprint Formula (End of life formula)

1543  
1544 The end-of-life stage shall be modelled using the Circular Footprint Formula (CFF)  
1545 from section 4.4.8 of the PEF Method [1]. The Circular Footprint Formula is an  
1546 equation that incorporates the full life cycle of a product and material and energy  
1547 recovery, final disposal and how burdens and benefits are shared among the actors  
1548 in the life cycle.

1549

1550 Users of the PEF Method shall report all the parameters used. Default values for  
1551 some parameters (A, R1, R2, R3 and Qs/Qp for packaging) are available in Annex C  
1552 of the PEF Method [1]. This list is periodically reviewed and updated by the  
1553 European Commission; therefore, users shall use the most updated values, and  
1554 shall refer to the version of Annex C they are using. Annex C is available at  
1555 <https://eplca.jrc.ec.europa.eu/>

1556

1557 The sheet “**Fish and sludge CFF data**” in the inventory data file presents the  
1558 parameters that shall be used **if primary data is not available**. For waste flows that  
1559 are not listed here, section 4.4.8 of the PEF Method [1] shall be used.

24

[https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fep.lca.jrc.ec.europa.eu%2Fpermalink%2FAnnex\\_C\\_V2.1\\_May2020.xlsx&wdOrigin=BROWSELINK](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fep.lca.jrc.ec.europa.eu%2Fpermalink%2FAnnex_C_V2.1_May2020.xlsx&wdOrigin=BROWSELINK)

1560

1561 The following presents the CFF:

1562

1563

$$CFF = \text{material} + \text{energy} + \text{disposal}$$

1564

$$\text{Material: } (1 - R_1)E_v + R_1 \left( AE_{rec} + (1 - A)E_v \frac{Q_{Sin}}{Q_p} \right) \\ + (1 - A)R_2 \left( E_{recEoL} - E^*_v \frac{Q_{Sout}}{Q_p} \right)$$

1567

$$\text{Energy: } (1 - B)R_3 * (E_{ER} - LHV * X_{ER,heat} * E_{SE,heat} - LHV * X_{ER,elec} * E_{SE,elec})$$

1569

$$\text{Disposal: } (1 - R_2 - R_3)E_D$$

1570

$$\text{CFF with "cut off approach": } (1 - R_1)E_v + R_1E_{rec} + R_3E_{ER} + (1 - R_2 \\ - R_3)E_D$$

1573

1574

1575

Parameters of the CFF

1576

**A:** allocation factor of burdens and credits between supplier and user of recycled materials.

1577

1578

**B:** allocation factor of energy recovery processes. It applies both to burdens and credits.

1579

1580

**Q<sub>sin</sub>:** quality of the ingoing secondary material, i.e. the quality of the recycled material at the point of substitution.

1581

1582

**Q<sub>sout</sub>:** quality of the outgoing secondary material, i.e. the quality of the recyclable material at the point of substitution.

1583

1584

**Q<sub>p</sub>:** quality of the primary material, i.e. quality of the virgin material.

1585

**R<sub>1</sub>:** it is the proportion of material in the input to the production that has been recycled from a previous system.

1586

1587

**R<sub>2</sub>:** it is the proportion of the material in the product that will be recycled (or reused) in a subsequent system. R2 shall therefore take into account the inefficiencies in the collection and recycling (or reuse) processes. R2 shall be measured at the output of the recycling plant.

1588

1589

1590

**R<sub>3</sub>:** it is the proportion of the material in the product that is used for energy recovery at EoL.

1591

1592

**E<sub>recycled</sub> (E<sub>rec</sub>):** specific emissions and resources consumed (per functional unit) arising from the recycling process of the recycled (reused) material, including collection, sorting and transportation process.

1593

1594

**E<sub>recyclingEoL</sub> (E<sub>recEoL</sub>):** specific emissions and resources consumed (per functional unit) arising from the recycling process at EoL, including collection, sorting and transportation process.

1595

1596

1597

1598

**E<sub>v</sub>:** specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin material.

1599

1600

1601 **E<sub>v</sub>\***: specific emissions and resources consumed (per functional unit) arising from  
1602 the acquisition and pre-processing of virgin material assumed to be substituted by  
1603 recyclable materials.

1604 **E<sub>ER</sub>**: specific emissions and resources consumed (per functional unit) arising from  
1605 the energy recovery process (e.g. incineration with energy recovery, landfill with  
1606 energy recovery, etc.).

1607 **E<sub>SE,heat</sub> and E<sub>SE,elec</sub>**: specific emissions and resources consumed (per functional unit)  
1608 that would have arisen from the specific substituted energy source, heat and  
1609 electricity respectively.

1610 **E<sub>D</sub>**: specific emissions and resources consumed (per functional unit) arising from  
1611 disposal of waste material at the EoL of the analysed product, without energy  
1612 recovery.

1613 **X<sub>ER,heat</sub> and X<sub>ER,elec</sub>**: the efficiency of the energy recovery process for both heat and  
1614 electricity.

1615 **LHV**: lower heating value of the material in the product that is used for energy  
1616 recovery.

1617

### 1618 5.11 Electricity modelling

1619 The use of electricity shall be included following the requirements of section B.5.8  
1620 of the PEF Method [\[1\]](#).

1621

### 1622 5.12 Climate change modelling

1623 The impact category climate change shall be modelled according to section B.5.9 of  
1624 the PEF Method [\[1\]](#).

1625

### 1626 5.13 Capital goods – infrastructure and equipment

1627 Infrastructure and equipment shall be included for the following:

- 1628 • Fishing vessel (wild fish)
- 1629 • Fishing gear(s) (wild fish)
- 1630 • Infrastructure and equipment for sea water farming stage (farmed fish)
- 1631 • Infrastructure for juvenile production stage (farmed fish)

1632

1633 All life-cycle stages shall be included: production, transport,  
1634 maintenance/replacement, and end-of-life handling. Default data from the EF3.1  
1635 database and proxies can be used when specific data are not available.

1636

### 1637 5.14 Biogenic methane

1638 A simplified approach can be used, see “Feed emission model” and the sheet “**Fish  
1639 and sludge CFF data**” in the “Marine Fish PEFCR Inventory Data” file. Only the  
1640 emission ‘methane (biogenic)’ is modelled, while no further biogenic emissions and  
1641 uptakes from atmosphere are included. If methane emissions can be both fossil or  
1642 biogenic, the release of biogenic methane shall be modelled first and then the  
1643 remaining fossil methane.

1644

- 1645 Biogenic methane emissions shall be considered for at least:  
1646  
1647 Farmed products:  
1648 - Biogenic methane from anaerobic degradation of sludge. This includes both  
1649 sludge that is built up under the sea cage fish farms and sludge that is collected  
1650 and stored (e.g. from land-based farms).  
1651 - Biogenic methane from anaerobic degradation of fish waste.
- 1652 Wild products:  
1653 - Biogenic methane from anaerobic degradation of fish waste. Section 5.10.1  
1654 references default values for the calculation of potential biogenic carbon  
1655 emission from fish biomass and sludge.  
1656

## 1657 6 Life Cycle Stages (Data collection instructions)

1658 This chapter presents the different processes/data that shall or should be included  
1659 for each life cycle stage. While this PEFCR tries to cover all major flows and  
1660 activities that are included in the life cycle of unprocessed marine fish, it is still up  
1661 to the integrity of the conductor of the PEF to explore this system and make sure  
1662 that the PEF includes the major flows and activities, and that the resulting PEF gives  
1663 a responsible and honest understanding of the PEF profile of the product.

1664  
1665 Figure 6-1 presents the different stages, processes, and flows that shall be taken  
1666 into consideration when performing a PEF of a wild marine fish product.

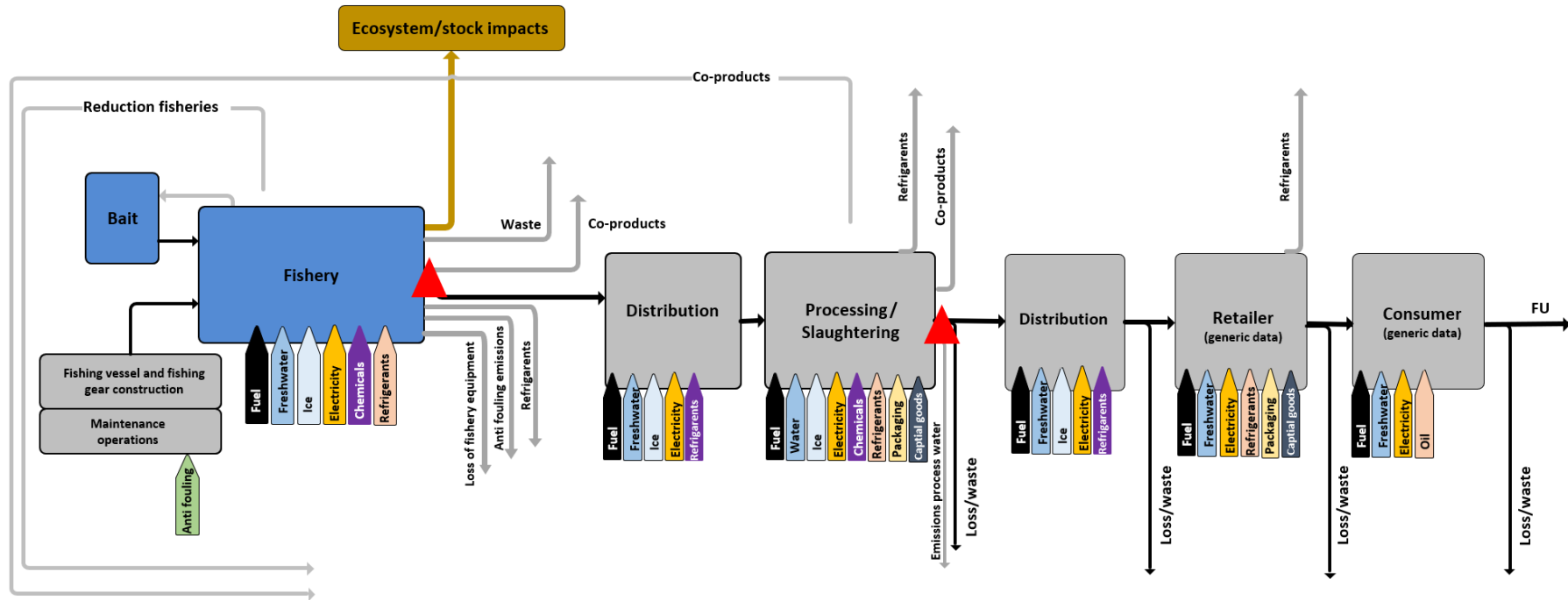
1667  
1668 Figure 6-2 presents the different stages, processes, and flows that shall be taken  
1669 into consideration when performing a PEF of a farmed marine fish product.

1670  
1671 This chapter refers to an Excel file that presents a data collection sheet and the  
1672 default data that shall be used to include the different inputs and outputs. This file,  
1673 the Excel file “Marine Fish PEFCR Inventory Data” is referred to as the “inventory  
1674 data file”.

1675  
1676



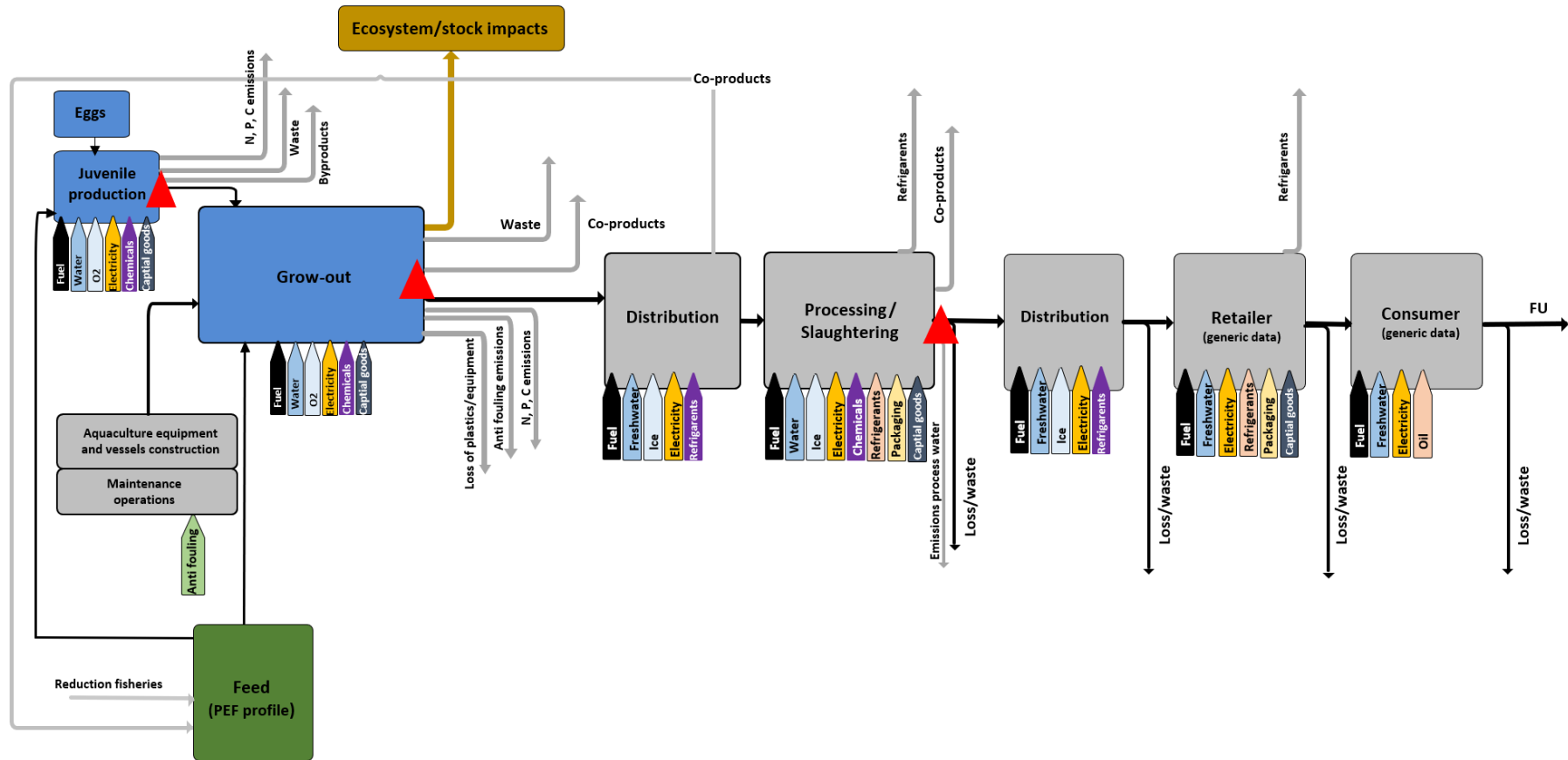
1677  
1678



1679  
1680  
1681

Figure 6-1 Wild product flow chart with important flows indicated; the red triangle indicates an important point of allocation.

1682



1683  
1684  
1685

Figure 6-2 Farmed product flow chart with important flows indicated; the red triangle indicates an important point of allocation.

1686

1687 6.1 Fishing

1688 Fishing includes all activities that the fishing vessel goes through to be able to  
1689 deliver fish to shore. Table 6-1 presents an example of activities that are part of the  
1690 fishing activity.

1691

1692 The sheet “**Fishing**” in the inventory data file lists the activities and direct  
1693 elementary flows that shall be quantified and the default datasets for the sub-  
1694 processes linked to the activity data within this process.

1695

1696 Primary data for transport of fishing vessel and catch to and from fishing ground  
1697 can in many cases not be available and can for many companies fall below situation  
1698 2 (option 1 or 2) or situation 3 (option 1) according to the Data Needs Matrix (DNM,  
1699 section 5.6). Data sampling/modelling shall be done according to section 5.2 to  
1700 ensure a stratified sample.

1701

1702 The following methods can be used for modelling fuel use of vessels:

1703 1) Modelling based on estimated hours in operation, fuel use and catch. The  
1704 modelling may be done based on the following components:

1705

a. Estimated hours per vessel;

1706

b. Estimated hours in different operational modes; and

1707

c. Fuel/electricity use in different modes distinguished by type of  
1708 vessel and gear used.

1709

1710 The practitioner shall ensure a stratified sample, which accounts for  
1711 variations in gear, seasonality, vessels etc.

1712

1713 2) Modelling based on datasets for fuel/electricity use per kg catch as  
1714 explained in section 5.7.

1715 The DQR shall be adjusted accordingly as described in section 5.7.

1716

1717 Sections 3.9 and 3.10 state additional information that shall be reported for this  
1718 stage.

1719

1720 If the fishery includes on-board preparation this shall be included according to  
1721 section 6.3.6.

1722

1723 *Table 6-1 Activities that are part of fishing (non-exhaustive list).*

Transport of fishing vessel and catch to and from fishing ground
Maintenance operations and transport of fishing vessel to maintenance
Catching of fish
Onboard preparation of fish
Onboard refrigeration and ice production
Harbour activities and onshore ice production

1724

1725 *6.1.1.1 Handling of mixed catch and mixed gear*

1726 Fisheries can include landing of many different species and/or fishing with different  
1727 gears during the period of data collection. The data shall be collected for a period  
1728 that will cover several seasons.

1729

1730 Data to model the fishery shall be collected so that they are as specific as possible  
1731 for the product that is studied. The DQR shall reflect this precision. If the product  
1732 that is analysed is the result of fisheries using different gears the data should be  
1733 collected per trip. To allocate the fishing effort among the landings of each trip,  
1734 section 5.9.3 presents the allocation rules.

1735

1736 If multiple vessels are used simultaneously (pair trawling) the total fuel use and  
1737 total catch of all vessels shall be accounted for.

1738

1739 *6.2 Feed input*

1740 The feed intensity and the feed EF is part of the mandatory company-specific data  
1741 (section 5.3). The feed shall be included with its environmental footprint calculated  
1742 according to the PEFCR Feed for food-producing animals [\[3\]](#). The DQR score for the  
1743 feed shall also be calculated.

1744

1745 These instructions apply for all feed that is used. When several different types of  
1746 feed are used their contributions shall be weighted according to the share of the  
1747 total mass of feed that is used up to the point of harvest.

1748

1749

1750 *6.3 Manufacturing*

1751

1752 *6.3.1 Transport of inputs to manufacturing*

1753 Transport from raw material acquisition to the preparation and transport of inputs  
1754 to farming shall be included according to section 4.4.3 of the PEF Method [\[1\]](#).

1755

1756 The sheet “**Transport and distribution**” in the inventory Excel file presents the  
1757 transports that shall be included and the default data to be used if primary data are  
1758 not available.

1759

1760 *6.3.2 Aquaculture: Juvenile production*

1761 This stage covers juvenile production in land-based systems, but the requirements  
1762 are also relevant for full grow out of fish in land-based systems. This stage includes  
1763 all activities and inputs that are necessary to operate the plant. Water input to the  
1764 land-based system shall be included in the PEF. The source of raw water (surface  
1765 water, ground water, desalination), as well as energy use and other inputs required  
1766 for potential treatment and supply of water to the plant shall be included.

1767

1768 The output and handling of sludge shall be included until this stage. If the sludge  
1769 presents an income to the producer of juveniles, this shall be included as a product  
1770 using economic allocation.

1771

1772 The sheet **“Juvenile production”** in the inventory data file lists the activities and  
1773 direct elementary flows that shall be quantified and the default datasets for the  
1774 sub-processes linked to the activity data within this process.

1775

1776 It is important to note that juvenile production can include the production of small  
1777 juveniles that have reached only a small percentage of their harvest weight (e.g.  
1778 salmon juveniles of 100 g that are grown out to 4-5 kg at harvest), as well as fish  
1779 that are brought up to a considerable percentage of their final harvest weight.  
1780 However, regarding for example salmon, operators may choose to postpone  
1781 placing the fish into the sea by feeding them in onshore sites keeping them in water  
1782 with increasing salinity until a weight of up to 1 kg. Nevertheless, the completion of  
1783 smoltification marks the end of the juvenile stage and the start of the grow out  
1784 stage.

1785

1786 For some species and aquaculture production systems, juveniles are acquired by  
1787 catching wild juveniles that are placed in sea cages for grow out. In these cases, the  
1788 data regarding juveniles shall be included according to section 6.1 Fishing.

1789

### 1790 6.3.3 Aquaculture: Grow-out of fish contained in seawater

1791 The growing of fish in sea water includes the system from when juvenile fish are  
1792 released into the fish farm and until they are ready for harvest. The fish are kept in  
1793 open or covered enclosed structures (e.g. open net-pens, cages, etc.) The grow-out  
1794 here includes all activities that are necessary to keep the fish farm operating and to  
1795 handle the fish. For example, this includes the different vessels that are used, as  
1796 well as those operated by sub-contractors, see Table 6-2.

1797

1798 The sheet **“Farming grow out”** in the inventory data file lists the activities and  
1799 direct elementary flows that shall be quantified and the default datasets for the  
1800 sub-processes linked to the activity data within this process.

1801

1802 Section 3.10 states additional information that shall be reported for this stage.

1803

1804 *Table 6-2 Activities that are considered part of the grow out of fish in marine sea cages (non-exhaustive list).*

Feeding and all handling of feed
Maintenance operations of fish cages, mooring systems and all other equipment
Transport of fish
Handling of fish such as grading and veterinary treatment
Use of cleaner fish including breeding, feeding and disposal
Transport of personnel and materials between land and fish farm
Energy used by equipment on the fish farm (e.g. generators, pumps, communication and monitoring systems, lighting and monitoring, oxygen production, cleaning systems and facilities for the operators).

1805

#### 1806 6.3.3.1 *Cleaner fish*

1807 Some operators are using various species of marine cleaner fish as a measure to  
1808 control ectoparasites by introducing a certain number of these fish into the cages.  
1809 The quantity of cleaner fish used, their feed, and the disposal or onward sale of the  
1810 fish shall be documented.

1811

#### 1812 6.3.4 Direct emissions to water

1813 During the feeding of fish, nutrients are emitted from feed spills, faeces, and  
1814 individual dead fish before they are removed from the cage. Emissions to water of  
1815 nitrogen, phosphorus, carbon from the salmon cage shall be included. The Excel file  
1816 “Marine Fish PEFCR Feed Emission Mass Balance model” presents a model of a  
1817 feeding mass balance that shall be used to calculate these emissions based on the  
1818 content of the feed, feeding efficiency and retention in the fish. Note that this  
1819 model estimates emissions per unit of on-growth and must be implemented in the  
1820 analysis with respect to the mass balance considering mortality etc.

1821

1822 If other representative values are available (direct measurements from the  
1823 company or literature values representing actual measurements in representative  
1824 conditions), these can be used.

1825

1826 The subsequent potential degradation of carbon to methane emissions and  
1827 nitrogen to N<sub>2</sub>O is highly uncertain and depends on the specific conditions.  
1828 Potential emissions shall at minimum be included based on factors in the feed  
1829 emission model which is currently the best available data. Methane emissions are  
1830 set to zero (based on Yuan et al. (2019) [4]), as anaerobic conditions are not likely  
1831 occurring. While N<sub>2</sub>O-N/kg N input is set to 0,018 based on Hu et al. (2012) [5].

1832

1833 Carbon emissions from respiration shall not be included.

1834

#### 1835 6.3.5 Aquaculture sludge handling

1836 If sludge is collected, this handling shall be included. This shall include the energy  
1837 used to process the sludge, emissions of biogenic methane from the sludge, and  
1838 transport of the sludge to EoL handling.

1839

1840 Sludge consists of feed loss and faeces, containing nutrients, organic matter, and  
1841 metals. Collection of sludge will lead to a reduction of carbon, nitrogen and  
1842 phosphorus bound to particles, which shall be accounted for in the modelling of  
1843 emissions to water.

1844

#### 1845 6.3.6 Preparation

1846 Preparation includes transformation of the fish such as gutting, filleting, freezing,  
1847 etc., and this process shall be included using company-specific data. See section 3.1  
1848 for more information on the difference between preparation and processing. For  
1849 fished products, preparation can happen both on the fishing vessel and on shore.

1850 For preparation on the fishing vessel, this process shall be included in the data for  
1851 the fishery as stated in section 6.1.  
1852  
1853 The sheet “**Preparation**” in the inventory data file lists the activities and direct  
1854 elementary flows that shall be quantified and the default datasets for the sub-  
1855 processes linked to the activity data within this process.  
1856  
1857 The source of raw water (surface water, ground water, desalination), as well as  
1858 energy use and other inputs required for potential treatment and supply of water  
1859 to the plant shall be included.  
1860  
1861 Emissions to water shall be included and the treatment methods applied shall be  
1862 described. The following parameters shall be included in the quantification of the  
1863 emissions to water: the total organic carbon (TOC), the chemical oxygen demand  
1864 (COD), the total nitrogen (TN), the total phosphorus (TP), the total suspended solids  
1865 (TSS) and the biochemical oxygen demand (BOD).  
1866  
1867 **6.3.7 Waste from manufacturing**  
1868 Waste generated during manufacturing (i.e. both fish and other materials) shall be  
1869 included in the modelling. The waste handling shall be modelled using the  
1870 Circular Footprint Formula (section 5.10).  
1871  
1872 **6.4 Distribution stages**  
1873 The distribution stage shall include the transport activity, packaging and product  
1874 loss and waste handling.  
1875  
1876 **6.4.1 Transport and storing of the marine fish product**  
1877 Fish is distributed in many ways from the point where it is landed to final  
1878 consumption.  
1879  
1880 The following distribution processes shall be included (non-exhaustive list):  
1881 - Transports from landing to preparation  
1882 - Transports from preparation to retailer  
1883 - Storage and distribution hubs  
1884 - Transport to consumer  
1885  
1885 Systems may include numerous iterations of sequences of preparation and storage  
1886 and all transport of fish shall be included.  
1887  
1888 In general, these distribution processes shall be included according to section  
1889 4.4.3.5 of the PEF Method [\[1\]](#). The sheet “**Transport and distribution**” in the  
1890 inventory data file presents the transport and distribution activities that shall be  
1891 included and default datasets.  
1892

1893 Transport of the fish before it is landed shall be included in the fishing or farming  
1894 stages.

1895

1896 All storage during distributions shall be included. If company-specific data is not  
1897 available, the sheet “**Retail and use**” in the inventory data file presents data that  
1898 can be used to include the storage. The same data can be used for chilled storage in  
1899 distribution, at retailer and consumer.

1900

#### 1901 6.4.2 Packaging production and waste handling

1902 Packaging shall be included with production of materials, transport, and end-of-life  
1903 handling (waste handling) according to the CFF formula (section 5.10.2). Packaging  
1904 used in all distribution stages shall be included (transport and consumer packaging).

1905

1906 The sheet “**Packaging**” in the inventory data file presents data that can be used for  
1907 the production of different packaging materials if primary data is not available (the  
1908 full PEF profile of the product-specific packaging). The mass of the different  
1909 materials in the packaging shall be explicitly documented as well as the parameters  
1910 used in the CFF calculation for the packaging material.

1911

#### 1912 6.4.3 Waste at distribution

1913 The waste of products during distribution and retail shall be included in the  
1914 modelling. (Waste refers to all fish biomass that leaves the value chain without a  
1915 value for the producer.) Waste handling shall be included according to section 5.10.

1916

#### 1917 6.5 Retailer and consumer

1918 The retailer and the consumer stage shall be included. The sheet “**Retail and use**”  
1919 in the inventory data file presents the data that shall be included and default data  
1920 that can be used if primary data are not available. The following processes shall be  
1921 included:

- 1922 • Chilled storage at retailer;
- 1923 • Transport from retailer to consumer; and
- 1924 • Use phase at consumer.

1925

1926 The default data for the retailer stage are based on data from the Retail OEFSR<sup>25</sup>  
1927 and the consumer stage based on data from PEF Annex II, part D [1].

1928

1929 Waste at retailer and consumer stage shall be included. If primary data is not  
1930 available, default data shall be used. The food waste will be the combination of  
1931 default loss rates and yield data. Default data are default loss rates per type of  
1932 product from PEF Annex II, part F [1]. Waste handling shall be included according to  
1933 section 5.10. See inventory file for default data.

---

<sup>25</sup> Retail OEFSR: [https://wayback.archive-it.org/org-1495/20221006222603mp/https://ec.europa.eu/environment/eussd/smgp/pdf/OEFSR-Retail\\_15052018.pdf](https://wayback.archive-it.org/org-1495/20221006222603mp/https://ec.europa.eu/environment/eussd/smgp/pdf/OEFSR-Retail_15052018.pdf)



1934

## 1935 6.6 End-of-life fish consumer product

1936 Waste handling of the fish products that are not consumed and their packaging  
1937 materials shall be included according to section 5.10.

1938

1939 According to PEF Annex II, part F, if primary data on waste handling is not available,  
1940 the food losses at the distribution centre, during transport, at retail place, and at  
1941 home shall be modelled as: 50% trashed (i.e. incinerated and landfilled), 25%  
1942 composted and 25% anaerobically digested.

1943

## 1944 7 PEF results

1945

### 1946 7.1 Benchmark values

1947 The Excel file “Marine Fish PEF-RP Results” presents the complete hotspot analysis  
1948 and benchmark results (available at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources)).

1949

### 1950 7.2 PEF profile

1951 The user of the PEFCR shall calculate the PEF profile of its product in compliance  
1952 with all requirements included in this PEFCR. **The impact assessment method that**  
1953 **shall be used is presented in section 3.8.** The following information shall be  
1954 included in the PEF report:

- 1955 • full life cycle inventory;
- 1956 - characterised results in absolute values for all impact categories (as a table);
- 1957 - normalised results in absolute values for all impact categories (as a table);
- 1958 - weighted results in absolute values for all impact categories (as a table);
- 1959 • the aggregated single overall score in absolute values;
- 1960 - the stock sustainability assessment and the indicator of the impact on the  
1961 seabed (section 3.10);
- 1962 • other additional environmental information (section 3.10) and  
1963 additional technical information (section 3.9); and
- 1964 • the contribution from “GWP – land use change” shall be reported  
1965 separately<sup>26</sup>, and results shall be reported including and excluding its  
1966 contribution.
- 1967 • the contribution from potential CH<sub>4</sub> and N<sub>2</sub>O emissions from sludge,  
1968 waste and accumulation of feed losses, faeces, etc. underneath open  
1969 farming systems shall be reported separately<sup>27</sup>, and results shall be  
1970 reported including and excluding its contribution.

---

<sup>26</sup> As the contribution from GWP – land use change to GWP – total is typically larger than 5 % the subcategory shall be reported separately as according to the PEF Method section A.4.2.8.3.

<sup>27</sup> The reporting of these emissions shall be done separately due to the current uncertainty and the difficulty of measuring.

1971 Together with the PEF report, the user of the PEFCR shall develop an aggregated EF  
1972 compliant dataset of its product in scope. This dataset shall be made available to  
1973 the European Commission. The disaggregated version may remain confidential or  
1974 be shared with the European Commission.  
1975

## 1976 8 VERIFICATION

1977 A PEF study carried out in compliance with this PEFCR shall be verified according to  
1978 section B.8. of the PEF Method [\[1\]](#).  
1979

## 1980 9 REFERENCES

- 1981 [1] European Commission, “Commission recommendation (EU) 2021/2279 on  
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1996  
1997  
1998

1999 **10 ANNEXES**

2000

2001 **10.1 Annex 1: Review Panel**

2002

2003 LCA expert, **Dr. Angel Avadí** graduated in Computer Systems Engineering in 2002,  
2004 from the Catholic University of Guayaquil (Ecuador). He obtained in 2006 a MSc in  
2005 e-Business (International University of Japan), in 2008 a MSc. in International  
2006 Cooperation Policy (Ritsumeikan Asia Pacific University - Japan), and in 2010 a  
2007 MEng. in International Material Flow Management (University of Applied Science  
2008 Trier - Germany). Between 2011 and 2014, he worked on his PhD thesis (University  
2009 of Montpellier - France) focused on the sustainability of value chains associated  
2010 with Peruvian fisheries, including aquaculture. Since 2015, he is a researcher at the  
2011 French Agricultural Research Centre for International Development (CIRAD). He has  
2012 contributed to various projects focused on seafood systems, including a project  
2013 funded by Sustainable Recycling Industries (SRI) during which he provided dozens  
2014 of LCI datasets to ecoinvent (2018); and two European Value Chain Analysis for  
2015 Development (VCA4D) projects focused on Zambian aquaculture (2018) and  
2016 Gambian fisheries and aquaculture (2020). Angel has contributed dozens of life  
2017 cycle inventory datasets to the French AGRIBALYSE agricultural LCA database. Angel  
2018 has also reviewed projects and methodological guidelines focused on seafood  
2019 systems, such as VCA4D projects on Cambodian aquaculture (2017) and Malian  
2020 inland fisheries (2020), as well as several project proposals submitted to the  
2021 German Research Foundation (2017) and the Research Council of Norway (2020).  
2022 He has published 35 scientific papers to date, with nine additional pieces currently  
2023 under review.

2024

2025 LCA expert, **Dr. Ian Vázquez-Rowe** graduated in Biology in 2006 at the University of  
2026 Texas at Arlington. He then continued his graduate studies in Environmental  
2027 Engineering at the University of Santiago de Compostela – USC (2006-2008), with a  
2028 short Erasmus period at the University La Sapienza in Rome where he developed his  
2029 master thesis. In October 2008 he initiated his research career at USC, where he  
2030 obtained his PhD in Chemical Engineering in July 2012. Currently, Dr. Vázquez-Rowe  
2031 is an Associate Professor at the Department of Engineering at the Pontificia  
2032 Universidad Católica del Perú. He has participated in numerous research projects at  
2033 a European, Spanish, Galician, Luxembourgish and Peruvian level, as well as recent  
2034 projects with UN Environment. Dr. Vázquez-Rowe has published over 110 articles in  
2035 international journals. Currently, he is also the editor for Ocean Resources and  
2036 Marine Conservation at the International Journal of Life Cycle Assessment and for  
2037 Journal of Environmental Management. One of his main research lines has been  
2038 linked to analyse the environmental sustainability of seafood products, mainly from  
2039 wild fisheries. He has contributed to various projects focused on seafood systems,  
2040 including a project funded by Sustainable Recycling Industries (SRI) during which he  
2041 provided dozens of LCI datasets to ecoinvent (2018), together with Ángel Avadí.  
2042 More recently, he has started working on the environmental impacts related to the  
2043 dissipative release of plastic fragments to the ocean and the associated effects on

2044 human health and (ocean) ecosystem quality. Since 2019 he co-chairs the Marine  
2045 impacts in Life Cycle Assessment (MarILCA) projects, which aims at establishing  
2046 novel characterization factors and impact categories to compute environmental  
2047 impacts and damages associated to marine plastics in Life Cycle Impact Assessment.

2048

2049 Industry expert, **Tom Maidment** graduated with a MEng degree in Automotive  
2050 Engineering with Sustainability from the University of Warwick (UK) in 2017 and  
2051 became a Chartered Engineer in 2022 with the Institution of Engineering and  
2052 Technology. Mr. Maidment currently works for Hilton Foods as Group Product  
2053 Sustainability Senior Manager (since 2021) and is an Associate at Oxford Net Zero  
2054 (since 2023). Prior to this he worked at Jaguar Land Rover (2014-2021) on  
2055 Environmental Lifecycle Assessment and before that in a number of product  
2056 development roles and was Technical Director of E.Mission (2018-2023), a business  
2057 which he founded to improve public understanding of the carbon footprint of food.  
2058 During his career Tom has worked on a number of lifecycle assessment related  
2059 projects across sectors including completing a lifecycle assessment for the  
2060 production of insect derived livestock feed, developing a tool which used natural  
2061 language processing to automatically calculate the carbon footprint of online  
2062 recipes and supporting Seafish in the development of a carbon measurement tool.

2063

## 2064 10.2 Annex 2: Description of how the representative product was developed

2065 The PEF study of the representative products (section 3.4) are documented in the  
2066 report, “Marine Fish PEF-RP Report” (available at  
2067 [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources)).

2068

## 2069 10.3 Annex 3: Default datasets

2070 The inventory data file presents the relevant default datasets (available at  
2071 [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources)).

2072

## 2073 10.4 Annex 4: Public Review Reports

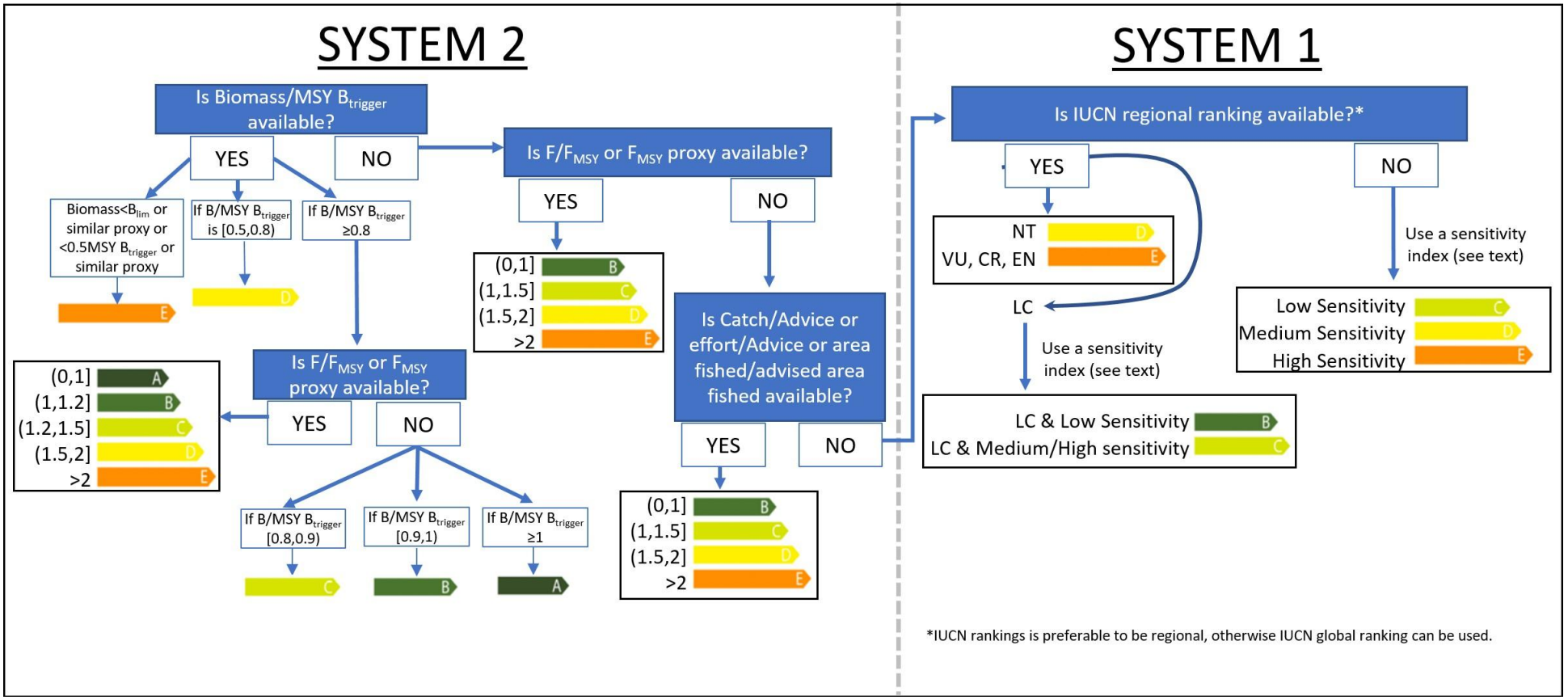
2074 The following review reports (Excel files) provide comments received and responses  
2075 from the TS (available at [www.marinefishpefcr.eu/resources](http://www.marinefishpefcr.eu/resources)):

2076 1) Review Reports for 1<sup>st</sup> Draft PEFCR and PEF-RP (August-October 2021)

2077 2) Review Report for 2<sup>nd</sup> Draft PEFCR and PEF-RP (July-August 2024)

2078 3) Review Report for Final Draft PEFCR and PEF-RP (October 2024)

## 2079 10.5 Annex 5: Section 3.1.8 of the STECF report *Marketing standards: review* 2080 *of fishery criteria and underlying methodologies* (EWG 22-12)



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2083 Figure 2. Decision tree to evaluate sustainability level according to fishing pressure (LC: Least Concerned; NT: Near Threatened; VU: Vulnerable; EN: Endangered; CR: Critically Endangered). See text for the description of System 2 (steps 1 and 2) and System 1 (step3). The specific limits between the grades B/C/D should be further analysed (see text on step 2).

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2089 **Step 1 (system 2).** The grading of a stock will be based only on Table 6 in the case the evaluation of  $F/F_{MSY}$  or proxies (e.g., short-  
 2090 lived species) are not available. If  $F/F_{MSY}$  or proxies are available, the stock will be graded according to step 1 and step 2. However,  
 2091 in the case the stock is graded as D or E according to Table 6 (step 1), step 2 is not considered.

2092 It is important to stress that, while  $B_{lim}$  and  $MSY B_{trigger}$  are only used by ICES (see as example: <https://sid.ices.dk/Default.aspx>),  
 2093 other RFMOs use similar indicators to identify overfished stocks and management action is to be taken to reduce fishing pressure  
 2094 (e.g., in the US, 0.5  $B/B_{MSY}$  can be used depending on the stock, [https://www.fisheries.noaa.gov/national/sustainable-  
 2095 fisheries/status-stocks-2020#the-science-behind-stock-status](https://www.fisheries.noaa.gov/national/sustainable-fisheries/status-stocks-2020#the-science-behind-stock-status)).  
 2096  
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2098 Table 6. Grading system according to biomass in step 1 (System 2). The specific limits between the grades B/C/D should be further  
 2099 analysed (see text on step 2).  
 2100

Grade	Biomass / $MSY B_{trigger}$ (or proxies) average over 6 years
A	Biomass / $MSY B_{trigger}$ (or proxies) greater than or equal to 1*
B	Biomass / $MSY B_{trigger}$ (or proxies) in the interval [0.9-1)*
C	Biomass / $MSY B_{trigger}$ (or proxies) in the interval [0.8-0.9)*
D	Biomass / $MSY B_{trigger}$ (or proxies) in the interval [0.5-0.8)
E	Biomass < $B_{lim}$ (or proxies)** or Biomass < 0.5 $MSY B_{trigger}$ (or proxies)

2101 \* Use this grade only when stocks have no estimate of  $F/F_{MSY}$  or proxies (e.g. short- lived species). When  $F/F_{MSY}$  is  
 2102 available, use ranking from step 2.

2103 \*\* In the case Biomass <  $B_{lim}$ , ranking according to  $MSY B_{trigger}$  should not occur.  
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**Step 2 (system 2).** This step grades  $F/F_{MSY}$  or catch/advice according to Table 7 (see as example: <https://sid.ices.dk/Default.aspx>).

Table 7. Grading system according to exploitation level in step 2 (System 2). The specific limits between the grades B/C/D should be further analysed (see text on step 2).

Grade	Biomass / MSY $B_{trigger}$ (or proxies) <u>available</u> and above 0.8, $F/F_{MSY}$ (or proxies) average over 6 years <u>available</u>	Biomass / MSY $B_{trigger}$ (or proxies) <u>not available</u> and $F/F_{MSY}$ (or proxies) average over 6 years <u>available</u>	Biomass / MSY $B_{trigger}$ (or proxies) <u>not available</u> and $F/F_{MSY}$ (or proxies) average over 6 years <u>not available</u> Catch / Catch Advice or Effort / Effort Advice or area fished / advsd area fished average over 6 years <u>available</u>
A	(0, 1]	-	-
B	(1, 1.2]	(0, 1]	(0, 1]
C	(1.2, 1.5]	(1, 1.5]	(1, 1.5]
D	(1.5-2]	(1.5-2]	(1.5-2]
E	> 2	> 2	> 2

2112

2113 It uses catch/advice only when  $F/F_{MSY}$  is not available. Grade A can only be attained for stocks when  $B / MSY B_{trigger}$ , or a proxy for  
2114 this, is available. The specific limits between the grades B/C/D presented both in Tables 6 and 7 should be further evaluated in  
2115 the future to ensure an even distribution of the three categories. In general, the equal distribution of stocks within the three  
2116 groups would indicate appropriate levels for the grading efficiency, however this topic should be further discussed and analysed  
2117 in a dedicated meeting using real data.  
2118

2119 Would it be the case of adding here as STEP 3 the situation where the approach of the worst assessment level should be applied?  
2120 (system 1). If yes, it could be:

2121 **Step 3 (system 1).** The evaluation is being carried out under system 1 when there is no available grading according to biomass and  
2122 fishing mortality for the stock used or the information on the specific area is lacking.

2123 In this case, if the wide marine region is known and assessments for other stocks of the same species occurring in the region are  
2124 available, the worst assessment level is assigned.

2125 **Step 4 (system 1).** The fourth option can be applied when there is no available grading according to biomass and fishing mortality  
2126 for any stock of the considered species in the wide marine region, but an IUCN ranking and sensitivity analyses for the species (e.g.,  
2127 fishbase.org, sealifebase.org, etc.) are available.

2128 If available, the IUCN ranking at regional level (regional as defined in IUCN website) is important to consider to score a stock under  
2129 system 1, otherwise the global ranking can be used. The process will follow the suggestion provided in Table 8.

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Table 8. Grading system according to system 1 based on sensitivity to fishing pressure. Data Deficient (DD), Not Evaluated (NE) or Not Applicable (NA).

Grade	IUCN ranking	Sensitivity ranking for NE, NA and DD stock or species
A	-	-
B	LC (low sensitivity)	-
C	LC (medium or high sensitivity)	Low sensitivity
D	NT	Medium sensitivity
E	VU, EN, CR	High sensitivity

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2144 [Appendix 1 PEF study template](#)

2145 The PEF study template as provided in Annex II (part E) of the PEF guidance (European Commission, 2021).

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2172

2173 Product Environmental Footprint Category Rules for Unprocessed Marine Fish Products

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2175 Review panel members:

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Category	Name	Affiliation
Industry expert	Tom Maidment	Hilton Foods
LCA expert	Angel Avadí	CIRAD
LCA expert	Ian Vázquez-Rowe	PUCP

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2178 The members of the Review Panel confirm not to have conflicts of interest with respect to concerned products and any involvement in previous work  
2179 (PEFCR development, Technical Secretariat membership, consultancy work carried out for the user of the PEF method) during the last three years.

2180 The objective of this validation is to check whether the Product Environmental Footprint Category Rules for Unprocessed Marine Fish has been  
2181 developed in compliance with the most updated version of the PEF method (2021) and that the information and data included in the study are reliable,  
2182 credible, and correct.

2183 The Review Panel members consider that:

2184

2185 • The Marine Fish PEFCR has been developed in accordance with the latest PEF guidance (2021).

2186 • The data collection requirements (i.e. for company specific and secondary datasets) are appropriate.

2187 • The hotspot analysis is applied, and reported upon, correctly.

2188 • The identified LCA data and additional technical and environmental information give descriptions of the significant technical and environmental

2189 impacts associated with this product.

2190 • The PEFCR gives suggestions for improvements and limitations of the PEFCR study itself and the studies on two representative products.

2191 • The comments given on the draft PEFCR were seriously considered and worked on, leading to changes in the documents or explanations.

2192 • Overall, the Technical Secretariat of the Marine Fish PEFCR has addressed the concerns raised by the Review Panel with clear and sufficient

2193 responses.

2194 Points of attention and/or limitations of the PEFCR are as follows:

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- We fully support TS's recommendation for the addition of impact categories for marine ecotoxicity, biotic impacts, and plastic pollution to the PEF method.
- As stated in the PEFCR, biodiversity impact cannot yet be fully taken into account, so we support the PEFCR's inclusion of biotic and seabed impact indicators under additional environmental information. It is important to improve this in the future. We recommend that the TS and EF Team discuss the results of a consultancy done for the JRC on the inclusion of biotic stock depletion and seabed damage. We also recommend that the TS and EF Team look into the recently published GLAM method (<https://www.lifecycleinitiative.org/activities/life-cycle-assessment-data-and-methods/global-guidance-for-life-cycle-impact-assessment-indicators-and-methods-glam/>). This could be a way to further improve the Marine Fish PEFCR, as ocean-related indicators are critical in the understanding of these systems, even if historically understudied. In fact, GLAM has included a first impact category on plastic pollution that could be eventually incorporated to the Marine Fish PEFCR.
- EF background data does not currently support accurate company-specific modelling of fuel. This should be addressed as soon as possible. For example, the promotion of "Diesel combustion in construction machine {GLO}" instead of a process representing diesel burned in a marine engine seems problematic, and easy to improve if the right datasets are included in the EF database.
- In a revised version of the PEF-RP, enough data should be gathered from around the EU to calculate EU-specific datasets (e.g. regarding annual catch, which is currently based on data from the Norwegian fishing fleet).
- It would be helpful to include more information regarding the composition of the feed. While we understand that the assessment of feed impacts corresponds to another PEFCR, the lack of information on its composition is a setback to interpreting the results. Although tables 36 and 37 of the PEF-RP provide the composition of the feeds that were considered, it would be relevant to include the breakdown of impacts of each item, to detect whether there could be any inconsistencies.
- Considering that the benchmark is now largely based on non-existent, virtual products, the benchmark will improve over time as more studies have been performed and more high-quality data becomes available. As insights develop and the benchmark is improved, the Marine Fish PEFCR should adapt to the emerging benchmark accordingly.