Flood control waterworks

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Developed in collaboration with

Summary

Date	Rev.	Status	Publication date	Notes
2025/10/23	0	Published	2025/10/23	First issue

1 FOREWORD

1.1 Introductory aspects

This document has been prepared for use within the EPDItaly[1] Program, in technical collaboration with CFI – Carbon Footprint Italy (https://www.carbonfootprintitaly.it/it/), in accordance with EPDItaly Regulations, in their latest version, which can be downloaded from www.epditaly.it.

The main aim of the EPDItaly Program is to provide a tool to enhance the value of the commitment made by an Organization, whether in Italy or abroad, working in any market sector, to reduce the environmental impact associated with the products or services they supply. This is achieved through the *Environmental Product Declaration* (EPD), which enables the organization to communicate the environmental performance of its products to the market in an understandable and credible way. This is because every EPD published on EPDItaly is subject to verification/validation by an independent third party, consisting of Auditors from Accredia-accredited Verification/Validation Bodies, in accordance with UNI CEI EN ISO/IEC 17029.

The Environmental Product Declarations contain information on the environment impact of a product, in accordance with the requirements of ISO 14025[2], determined and quantified on the basis of a *Life Cycle Assessment* (LCA), based on the requirements of ISO 14040[3] and ISO 14044[4] and the framework rules regarding the category of product analysed. These rules are called Product Category Rules (PCRs).

PCRs define a set of rules to ensure, for each individual product belonging to a given category, a uniform approach is taken when performing the LCA and the subsequent EPD is created.

The Product Category Rules are prepared by a promoter, submitted to public consultation and approved to be used and then periodically reviewed through a public investigation process, open to all EPDItaly Program Stakeholders. The document is reviewed every 5 years or on market input, to adapt it if necessary. Any comments on the document can be sent to info@epditaly.it or to the PCR moderator.

If the PCR is a document transposing an international standard, the public consultation process is not envisaged.

The process for developing a PCR is ensured by the Program Operator in accordance with EPDItaly Regulations in their latest version, which can be downloaded from www.epditaly.it.

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1 EPDItaly is operationally and financially managed by ICMQ Società Benefit S.p.A. (hereinafter referred to as ICMQ), Via G. De Castillia, 10 - 20124 Milan, Italy

2 ISO 14025, *Environmental labels and declarations – Type III Environmental declarations – Principles and procedures*

3 ISO 14040:2006/Amd 1:2020, Environmental management – Life cycle assessment – Principles and framework

4 ISO 14044:2006/Amd 2:2020, Environmental management – Life cycle assessment – Requirements and guidelines

1.2 Information about this PCR

PCR Title	Flood control waterworks	
Type of PCR	Core PCR	
CPC of reference	53234, “flood control waterworks”	
Identification code	EPDItaly050	
Program Operator	EPDItaly - info@epditaly.it	
PCR Committee	Rev. 0	ICMQ S.p.A. Green Energy & Environmental Research Laboratories, Industrial Technology Research Institute (ITRI) Water Resources Agency, Ministry of Economic Affairs, Taiwan
Moderator	Rev.0	Jose Daniel Tapia Galvan Industrial Technology Research Institute ITRI 195, Sec. 4, Chung Hsing Rd., Chutung, Hsinchu, Taiwan 310401, R.O.C.
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Valid until	2030/10/23	
Geographic field of application	Global	
EPDItaly Regulations	EPDItaly Regulations (last version)	
DEVELOPMENT PROCESS		
Research and analysis of existing PCRs developed by other Program Operators	The PCR Committee has reviewed the availability of PCRs developed by other Program Operators (e.g., the International EPD® System, EPD Norge, and NSF International) and has identified an equivalent PCR currently under development by the International EPD® System: **PCR Under development - Levee, Dykes and Embankments (c-PCR under PCR 2019:14)**	
Reasons for the development of the PCR in the EPDItaly Program	The PCR developed within the International EPD® System has been structured with a focus on construction products. However, considering the specific framework adopted by EPDItaly, which defines Construction Products in a distinct manner, a decision has been made to develop a Core-PCR. This new document is intended to cover not just a single construction product, but the	

	broader category of civil engineering waterworks, while remaining aligned with EN 15804+A2.	
Public investigation start date	Rev.00	2025/06/06
Public investigation end date	Rev.00	2025/07/206
PCR Review Panel	Information on the PCR Review Panel can be obtained from info@epditaly.it	
Review start date	Rev.00	2025/07/08
Review end date	Rev.00	2025/07/27

TABLE 1: INFORMATION ON THE PCR

1.3 Purpose and scope of application

This document represents a Core PCR - Product Category Rules that intends to be used as reference to prepare and assess a globally valid Environmental Product Declaration through the verification of the environmental performance of the use and construction of the products falling in the category of “Flood control waterworks".

The present Core PCR provides all the mandatory requirements for the development of any additional Sub-PCRs for product groups falling in the general category “Flood control waterworks”.

Sub-PCRs may provide additional technical and regulatory requirements to be applied, on a mandatory basis, to products of specific groups falling in the general category “Flood control waterworks”.

This PCR intends to address infrastructure elements related to water flow control, flood prevention and tide protection. Particularly, referring to “Flood control waterworks” or embankments. Commonly used materials and primary components of levees include, but are not limited to, the following:

1. Primary materials: Essential raw materials required for the production process, such as reinforcing steel bars, cement, concrete, asphalt and earthwork materials.
2. Secondary materials: Additional raw materials used in the production process aside from the primary materials such as stone, gabions, geotextiles and steel sheet piles
3. Consumables: Materials necessary for carrying out the production process but which do not become part of the final product, such as equipment consumables, cleaning materials for machinery, formwork, curing agents, and anti-corrosion coatings.
4. Packaging materials: Materials used for packaging during the levee construction process and raw material transportation, such as steel straps, steel cables, plastic bands and sandbags.

The technical performance expected in this product category refer to the particular applications of the following:

- River levees
- Sea levees
- Slopes and supporting facilities

- Foundation
- Slope Protection
- Stand/Berm
- Floodwalls
- Apron
- Groyne
- Water Gate
- Flood Protection Road
- Drainage Facility
- Consolidation works
- Energy dissipators
- Other Temporary Facilities

For the sake of clarity and consistency, the term “Flood control waterworks” will hereafter be used to represent the target product described in this PCR. Further information and details are provided in the following sections.

2 NORMATIVE REFERENCES

This paragraph lists the normative references to the documents used to develop this PCR.

For the undated documents referred to below, the latest available version shall be considered:

Standard ID	**Description**
ISO 14020:2023	Environmental labels and declarations - General principles
ISO 14021:2021	Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling)
ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14040:2006/Amd 1:2020	Environmental management - Life cycle assessment – Principles and framework
ISO 14044: 2006/Amd 2:2020	Environmental management - Life cycle assessment - Requirements and guidelines
ISO 14067:2018	Greenhouse gases – Carbon Footprint of Products – Requirements and guidelines for quantification
CEN ISO/TS 14027:2018	Environmental labels and declarations - Development of product category rules

Water Resources Engineering Technical Specifications-River Management Volume (Parts I & II)	Specifications on technical aspects required for the construction of flood control waterworks e.g., Levees
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

TABLE 2: REFERENCES TO DOCUMENTS USED TO DEVELOP THE PCR

3 TERMS, DEFINITIONS AND ABBREVIATIONS

3.1 Terms and definitions

As regards the definitions of terms referred to in this PCR, reference should be made to the regulations given in the previous paragraph. In addition to these, the following terms are given in the table below:

Term	Definition
Core PCR	Document containing all the information needed to draft EPDs and which can be used without additional documents
Sub-PCR	Document containing additional information with respect to the Core PCR and which cannot be used without it
PCR Part A	See Core PCR
PCR Part B	See Sub-PCR
Foundation	A facility installed at the base of a levee to support the levee structure and prevent sliding or settling (refer to CIRE "The International Levee Handbook")
Slope Protection	Protective structures designed to safeguard riverbanks and stabilize slopes from water erosion (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Stand/Berm	A feature installed midway on the slope of a levee, particularly for tall levees, to prevent slope collapse and facilitate construction, flood prevention, and emergency rescue (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Working Platform	When a levee is excessively high, this facility is installed at the mid-slope of the revetment to prevent slope collapse, facilitate construction, and support flood control and emergency response operations. (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)

Floodwall	A vertical structure designed to prevent water intrusion, stabilize riverbanks, and protect coastlines (refer to ASCE Flood Resistant, Design and Construction Manual section 1.2 Definitions)
Groyne	A structure extending from the riverbank toward the river center, used to trap sediment, create sandbars, direct water flow, or protect riverbanks (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Revetments	A protective structure installed downstream of a hydraulic structure to prevent severe scouring of the riverbed (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Water Gate	A controllable gate installed on a levee to regulate and manage the inflow and outflow of water (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Flood Protection Road	Roads built to facilitate flood control and emergency rescue transportation (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Drainage Facility	Infrastructure designed to channel rainwater, reduce surface water accumulation, and prevent erosion of flood protection roads (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Consolidation work	Protective structures designed to prevent riverbeds from erosion and scouring caused by water flow (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Energy dissipators	Energy dissipation structures are engineering facilities designed to reduce excessive flow energy and protect downstream channels and hydraulic works. (refer to R.O.C. Water Resource Agency "Commonly used definitions for Water Conservancy Projects table" available online)
Other Temporary Facilities	Miscellaneous facilities managed by the engineering department (refer to CIRE "The International Levee Handbook")
Auxiliary facilities	Necessary facilities to ensure the integrity of the infrastructure (refer to CIRE "The International Levee Handbook")
May or Can	The terms "may" or "can" are used to indicate an option that is permissible.

Should	The term “should” is used to indicate a recommendation. Any deviation from a recommendation shall be justified in the EPD development process.
Shall	The term “shall” is used to indicate what is obligatory, i.e., a requirement.

TABLE 3: TERMS AND DEFINITIONS

3.2 Abbreviations

To ease readability, the acronyms most frequently used in this PCR are given below:

Acronym	Definition
CPC	Central Product Classification
EPD	Environmental Product Declaration
LCA	Life Cycle Analysis or Assessment
LCIA	Life Cycle Impact Assessment
PCR	Product Category Rules
RSL	Reference Service Life
SI	International System of Units

TABLE 4: LIST OF ABBREVIATIONS

4 FUNCTIONAL/DECLARED UNIT

The Functional Unit is defined as a quantified performance of a product system for use as a reference unit [EN15804+A2]. The functional unit defines the way in which the identified functions or performance characteristics of the product or service are quantified.

The Functional Unit is the product category unit to be referred for the determination of environmental impacts. For the product category analyzed in this PCR, the functional unit is defined as one meter of standard cross-sectional area of flood control waterwork infrastructure calculated based on actual finished product state and expressed in square meters including auxiliary facilities. The standard design life for this infrastructure product category is generally set at 100 years, therefore the service life of this facilities is established as 100 years.

EPDs developed using this PCR for the product category flood control waterworks are comparable across same design and service life .

5 REFERENCE SERVICE LIFE (RSL)

The Reference Service Life (RSL) refers to the service life of a product, in this case of a “Flood control waterwork”, under certain particular set of in-use conditions. These conditions shall be defined and documented in the Environmental Product Declaration (EPD) and represent the basis for estimating the service life.

The RSL specified in this PCR shall be based on the functional unit serving as the basis for calculating the maintenance and renovation requirements of the given Flood control waterworks covered by the scope of this PCR.

6 SYSTEM BOUNDARIES

6.1 GENERAL

According to EPDItaly Regulations, it is stated that the life cycle stages must refer to segmentation in the following three processes:

1. Upstream process: includes all relevant Supply chain processes that are part of the product system and can be classified as upstream processes in terms of raw material supply and transport.
2. Core process: includes all relevant processes managed by the organization proposing the EPD.
3. Downstream process: stage that includes all relevant processes that take place beyond the gate of the site of the Organization proposing the EPD and benefits and loads beyond the system boundary.

The following table illustrates the modules defined and allocated according to each stage.

	Life Cycle Stages and Modules															
	Upstream			**Core**		**Downstream**										
	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundary
	Raw material acquisition and processing	**Transport**	**Manufacturing**	**Transport**	**Construction**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Energy Use**	**Water Use**	**De-construction Demolition**	**Transport**	**Waste Processing**	**Disposal**	**Reuse, recovery, recycling potential**
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C4	C4	D
Cradle to gate with options , modules A1-A3,C1-C4 and module D	**X**	**X**	**X**	**X**	**X**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**	**Opt**

TABLE 5: MANDATORY LIFE CYCLE MODULES PROPOSED BY THIS PCR (X= MANDATORY; OPT=OPTIONAL)

This PCR describes modules A1 to A3, A4 to A5, B1 to B7, C1 to C4 and module D.

Levees can be used over an extended period and, with proper maintenance, are capable of maintaining 100% functionality throughout their Reference Service Life (RSL).

Additional boundaries that should be considered in the development of an EPD are:

- Temporal Boundary: Defines the timeframe for data collection in the life cycle assessment.
- Geographical Boundary: Defines the geographic scope of the life cycle assessment. It shall reflect the physical reality of the product under study and consider the representativeness of technology, material inputs, and energy inputs.
- Boundaries towards other Technical Systems: Boundary with other technical systems shall be defined as the exchange of materials and components between the studied product system and other systems. Inflows towards the studied system shall be considered as inputs and all outflows shall be considered as outputs.

The following figure presents a flow diagram representing the life cycle of the infrastructure product, including thelife cycle stages and system boundaries, as defined by the nature of the product.

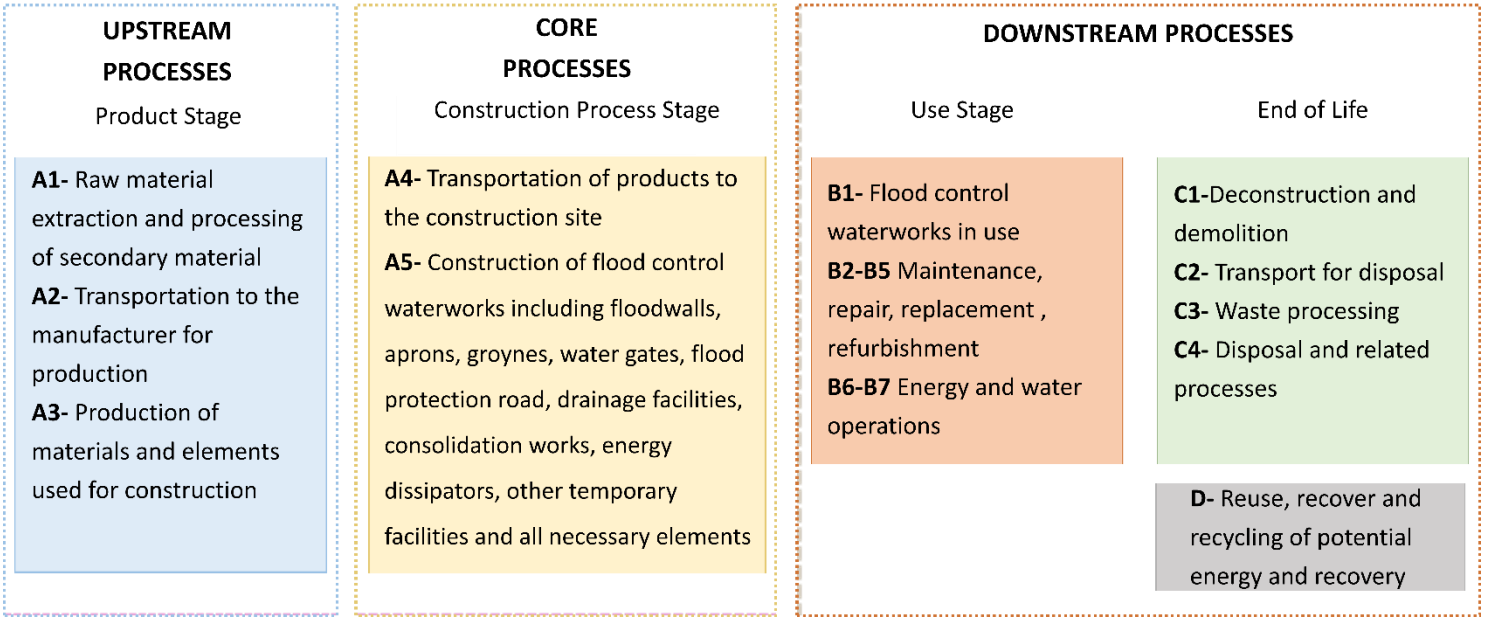

Figure 1. Representation of the processes and stages included within the system boundaries

6.2 PRODUCT STAGE

For the Product stage, the following aspects must be considered in particular:

- **Module A1.** Raw material extraction and processing. Module A1 shall include the processing of secondary materials as well e.g., soil, aggregates, steel.
- **Module A2.** Raw material transportation to the manufacturer for production of construction elements e.g., gabions, steel rebars, cement, concrete, and others
  Module A3. Production of materials and elements used for the construction of a levee such as gabions, steel rebars, cement, gravel, asphalt and other relevant materials.This module shall follow the specifications regarding provision of materials, products and energy specified in EN15804+A2.

This list is a non-exhaustive set of examples for the Product Stage, meaning that other Product stage processes can be included in this module if relevant.

The Product Stage processes shall not include:

- Services related to personnel (on-site offices, sanitary services, transport)
- Research and development activities.
- Machinery production

6.3 CONSTRUCTION STAGE

For the Construction stage, the following aspects and description must be considered:

- **Module A4-** This module includes the transportation of products to the construction site ready for use..
- **Module A5-** Construction of the infrastructure which shall include:
    - Ground works and earthworks
    - Construction process related to the composition of the main parts and components of the infrastructure
    - Construction of foundation
    - Installation of temporary facilities include, but are not limited to, construction access roads and temporary earthwork storage.
    - Construction of slope protection, floodwall, aprons, groin, flood gates, drainage facilities.
    - Water supply and energy consumption related to the construction process.
    - Includes any direct and indirect emission related to the construction process.
    - Transportation and waste treatment generated during the construction process.

6.4 .USE STAGE

Regarding the use, operation and management stages, it is considered that the structure will have the ability of effectively protect from regular water flow. This use period requires to consider the potential environmental impacts observed after the conclusion of the construction stage (A5) until the beginning of End of Life Stage.

Module B1- Optional This module refers to the use of the constructed flood control waterworks which encompasses all the functions and procedures required for the infrastructure usage.

For Module B1 the following is required to be declared:

- Declaration of the reference conditions of use according to the proper operation of a Flood control waterworks infrastructure product

Module B2-B5- Optional. These modules cover and include all the functions and procedures required for the maintenance, repair, reconstruction of elements as well as replacing facilities or components relevant for the correct function of the infrastructure.

Module B2-Optional. Maintenance covers the combination of planed technical and associated administrative actions during the service life to maintain the infrastructure at an optimal functional and technical performance. Shall be declared:

- How maintenance phase takes place
- Number of maintenance activities required
- Type and quantity of auxiliary materials such as water or energy
- Type and quantity of emissions to water, air, soil and waste produced during these phases

Module B3- Optional. Repair refers to corrective and responsive actions taken to address issues with the infrastructure element. For this particular module, the following shall be declared: Repair activities and estimated number of interventions in terms of the RSL

- Type and quantity of auxiliary products and energy required
- Emissions to water, air, soil and waste production
- Destination of waste

Module B4 and B5-Optionals. Module B4 considers replacements of the infrastructure product and Module B5 considered refurbishments of the infrastructure product.

Module B6 and B7-Optionals. These modules consider the use of energy and water needed for operation the infrastructure. The following shall be declared:

- Consumption of ancillary materials
- Water consumption
- Energy consumption e.g., lighting
- Cleaning related activities

6.5 END OF LIFE STAGE

The End-of-Life (EOL) phase begins when it is replaced, dismantled or deconstructed from the site and cannot provide any further functionality [EN15804+A2]. The EOL includes the following modules:

Module C1-Optional. Deconstruction and demolition of the infrastructure.

Module C2-Optional. Considers transport for disposal or waste processing. Transportation of dismantled waste to final disposal and/or recycling site. Transport of waste to final disposal.

Module C3-Optional. Waste processing at the first-stage location from the deconstruction and waste processing of material flows intended for recycling, reuse and energy recovering [EN15804+A2]. Materials considered as materials for energy recovery shall reach a rate of 60% or higher in accordance with EN15804+A2. Materials from which energy is recovered with an efficiency rate below 60% are not considered materials for energy recovery [EN15804+A2]. Materials considered in this module shall be clearly stated.

Module C4-Optional. Waste disposal including physical pre-treatment. Quantities of waste and recyclable resources generated after construction use should be estimated based on the available local waste treatment and recycling alternatives or refer to secondary available data. Levees are products that can be used over a long period. With appropriate maintenance, levees can continuously provide their intended services.

6.6 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY [D]

See section of 6.3.5.6 of EN 15804+A2.

7 LIFE CYCLE INVENTORY (LCI) AND CALCULATION RULES

7.1 DATA SELECTION AND DATA QUALITY REQUIREMENT

The EPDItaly Regulation applies with the following additions:

- as regards specific or primary data, the LCA study should use as much as possible data relating to the manufacturing phase of construction of the "Flood Control Water work": composition and weight of materials and components, quantity of energy consumed, quantity of waste and emissions produced, etc.

Where specific data are not available, other data deemed representative of the actual process may be used. For example, for electricity: if the energy supplier indicates its specific mix, the LCA study will refer to the latter. In the absence of such information, reference must be made to the national energy residual mix. Therefore, specifically, reference must be made, where relevant and available, to the following sources, in order of priority:

- guarantee of origin of the electricity supply by the supplier (for example RECs, Renewable Energy Certificates);
- electricity mix indicated by the supplier, for the residual part of the supply;
- national energy residual mix, for the residual part of the supply.

The Energy Mix must be documented in the EPD.

As regards the selected generic data, the use of such types of data shall meet the following general criteria:

- geographical representativeness, in particular in relation to the energy mix;
- technological coherence with the actual process.

As regards generic data, i.e. data coming from other sources not included in the previous paragraphs, as a general rule the use of such data should be limited as much as possible.

7.2 UNIT OF MEASUREMENT

The EPDItaly Regulation applies with the following additions:

In accordance to EN15804+A2, the following requirements apply for units and quantities:

Basic units are:
meter (m), kilogram (kg), molecular weight in grams (mol).

With the following exceptions:

- Resources used for energy input (primary energy), which are expressed as kWh or MJ, including renewable energy sources e.g. hydropower, wind power.
- Water use, which is expressed in m^3 cubic meters.
- Temperature is expressed in degrees Celsius.

- Time can be expressed in the units that is most practical for the situation, e.g., seconds, minutes, hours, days or years.

- Power and Energy:
  - Power units: watt (W), kilowatt (kW), etc.
  - Energy units: joule (J), kilojoule (kJ), etc.

7.3 ALLOCATION RULES- (CO-PRODUCT ALLOCATION)

The EPDItaly Regulation applies with the following specification:

- where a process leads to the production of multiple co-products, the impacts of this process must be distributed across the various products generated. The process is divided into sub-process units, each with its own Input-Output flows; for each sub-process, the various input and output flows will be allocated across the various co-products following the physical laws that govern each sub-process. Only in cases where it is not possible to define a physical rule to allocate the Input-Output flows, an allocation between the products based on different assessments can be used, such as the corresponding economic value.

7.4 ALLOCATION RULES- (RECOVERY AND RECYCLING OPERATIONS)

The EPDItaly Regulation applies with the following specifications:

- the final waste treatment processes (landfill and incineration) whose production is linked to the life cycle of the product shall be included in the study; where this is not possible due to lack of information, it is necessary to declare the quantity of waste produced and define realistic scenarios;
- for recovery and recycling processes, only the impacts related to the transport of the waste itself to the treatment platform shall be taken into account; the impacts of the recycling processes (including for example composting or anaerobic degradation for the production of biogas) and thermal recovery, as well as the benefits deriving from these, must be counted in the life cycle respectively where the recycled materials are reused and where the heat produced is recovered; however, it is possible to indicate the potential advantages deriving from the recycling and/or recovery of waste in the section regarding additional environmental information of the EPD.

8 CUT-OFF RULES

The EPDItaly Regulation applies with the following specifications:

- the definition of the cut-off criteria allows some data to be ignored from the inventory, when these are considered irrelevant for the purposes of the study and would only represent an unnecessary burden in the data collection, without significantly shifting the final result;
- according to Section 6.3.6 of EN 15804+A2;

9 LIFE CYCLE IMPACT ASSESSMENT (LCIA)

The following specifies how the environmental impact indicators shall be reported in an EPD

9.1 ENVIRONMENTAL IMPACT DESCRIPTIVE PARAMETERS

The potential impacts associated to the emissions of the various pollutants shall be reported through the appropriate characterization factors. In accordance to EN15804+A2 the information on environmental impacts and aspects relating to modules A1-A3, A4-A5, B1-B7, C1-C4 and D shall be included in all EPD.

The following table presents information on environmental impacts expressed with the impact category indicators of LCIA using characterization factors [EN15804+A2].

The LCA report and the EPD shall include the following environmental parameters, declared separately for each module. The A1, A2 and A3 modules, in addition to being reported individually for each module, can also be declared as a single aggregate A1-3 module.

TABLE 6: CORE ENVIRONMENTAL IMPACT INDICATORS

Impact category	Impact Categories	Unit of measurement
Climate change - total[5]	Global Warming Potential total (GWP-total)	kg CO_2 eq.
Climate change – fossil	Global Warming Potential total (GWP-fossil)	kg CO_2 eq.
Climate change – biogenic	Global Warming Potential total (GWP-biogenic)	kg CO_2 eq.
Climate change – land use and land use change	Global Warming Potential total (GWP-luluc)	kg CO_2 eq.
Ozone Depletion	Depletion potential of the stratospheric ozone layer (ODP)	kg di CFC-11 eq.
Acidification	Acidification potential, Accumulated Exceedance (AP)	mol di H+ eq.
Eutrophication aquatic freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.
Eutrophication aquatic marine	Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.
Eutrophication terrestrial	Eutrophication potential, Accumulated Exceedence (EP-terrestrial)	mol N eq.
Photochemical ozone formation	Formation potential of tropospheric ozone (POCP)	kg di NMVOC eq.

[5] The total GWP is the sum of fossil, biogenic and land use contributions.

Depletion of abiotic resources – minerals and metals*	Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.
Depletion of abiotic resources – fossil fuels*	Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ, net calorific value
Water use*	Water deprivation potential, deprivation-weighted water consumption (WDP)	m^3 eq.

**Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator*

Additional environmental impact indicators of EN15804+A2 can be included in the LCA project report. These additional environmental impact indicators are not mandatory in the EPD report (optional). The following are the optional environmental impact indicators:

TABLE 7: OPTIONAL ENVIRONMENTAL IMPACT INDICATORS

Impact category	Impact Categories	Unit of measurement
Potential incidence of disease due to PM emissions (PM)	Particulate matter emissions	Disease incidence
Potential Human exposure efficiency relative to U235 (IRP)	Ionising radiation, human health	kBq U235 eq.
Potential Comparative Toxic Unit for ecosystems (ETP-fw)	Ecotoxicity (freshwater)	CTUe
Potential Comparative Toxic Unit for humans (HTP-c)	Human toxicity, cancer effects	CTUh
Potential Comparative Toxic Unit for humans (HTP-nc)	Human toxicity, non-cancer effects	CTUh
Potential Soil quality index (SQP)	Land use related impacts / soil quality	dimensionless

Obtained results shall be interpreted in the LCA Report. Optionally, the interpretation may be reported in the EPD.

9.2 PARAMETERS DESCRIBING RESOURCE USE

The LCA report and the EPD can include the following environmental parameters, declared separately for each module. The A1, A2 and A3 modules, in addition to being reported individually for each module, can also be declared as a single aggregate A1-3 module.

TABLE 8: PARAMETERS DESCRIBING RESOURCE USE

Parameters	Unit of measurement
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE)	MJ
Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE)	MJ

Use of non-renewable primary energy resources used as raw material (PENRM)	MJ
Use of renewable primary energy resources used as raw material (PERM)	MJ
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ
Use of secondary materials (MS)	kg
Use of renewable secondary fuels (RSF)	MJ
Use of non-renewable secondary fuels (NRSF)	MJ
Net use of fresh water (FW)	m^3

9.3 WASTE PRODUCTION DESCRIPTIVE PARAMETERS

The LCA report and the EPD can include the following environmental parameters, declared separately for each module. The A1, A2 and A3 modules, in addition to being reported individually for each module, can also be declared as a single aggregate A1-3 module.

TABLE 9: WASTE PRODUCTION DESCRIPTIVE PARAMETERS

Impact category	Unit of measurement
Hazardous waste disposed (HWD)	kg
Non-hazardous waste disposed (NHWD)	kg
Radioactive waste disposed (RWD)	kg
Materials for energy recovery (MER)	kg
Material for recycling (MFR)	kg
Components for reuse (CRU)	kg
Exported thermal energy (ETE)	MJ
Exported electricity energy (EEE)	MJ

9.4 POLLUTER PAYS PRINCIPLE

The polluter pays principle shall be applied, with reference to CEN/TR 16970.

9.5 ADDITIONAL ENVIRONMENTAL INFORMATION

The LCA report and EPD may include additional environmental information not LCA-based (e.g., other environmental certifications).

10 CONTENT OF AN EPD

EPD shall be prepared in accordance with Annex 1 of the EPDItaly Regulations.

11 BIBLIOGRAPHY

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[7] ISO 14050:2020, Environmental management – Vocabulary

[8] EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

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[11] American Society of Civil Engineering ASCE 24-14 Flood Resistant Design and Construction Manual.