EUGEOS' 15804-IA DATABASE VERSION 1.2

EuGeos' 15804-IA Database Version 1.2 is a version of ecoinvent v3_2 extended to allow calculation of the indicators required in construction product EPD to meet European standard EN 15804. It has been used to produce verified EPD published in ISO14025-compliant EPD Programmes and registered on ECO Platform; it is not a pre-verified EPD tool.

The base ecoinvent version is that with "cut-off" allocation applied. This allocation is preserved in the 15804-IA Database; no data point present in the base ecoinvent version is altered in any way.

The 15804-IA Database uses ecoinvent's nomenclature; it can be used in openLCA v1.4 or v1.5.

EN 15804 OVERVIEW

European standard EN 15804:2012+A1:2013 is a core product category rule for environmental product declarations (EPD) of construction products and construction services. It has been widely adopted by EPD programmes in Europe to harmonise many aspects of the production and presentation of EPD for these goods.

EN 15804 requires compliant EPD to report a number of indicators (see below), not all of which are calculated by the standard LCIA methods supplied by the ecoinvent centre as part of the ecoinvent database package.

The 15804-IA Database therefore includes impact assessment methods that may be used to calculate all of the indicators required by EN 15804, except the PERM and PENRM indicators (Primary energy, renewable or non-renewable, used as raw material (feedstock)). According to CEN TC350 guidance, these two indicators are counted as the relevant part of the net calorific value (NCV, also LHV) of the product. These indicators thus relate to an inherent property of the product and will normally be obtained outside an LCA. The included impact assessment methods are outlined below; additional details are provided in the 15804-IA Database.

ENVIRONMENTAL INDICATORS FOR EN 15804

EN 15804 requires publication of a number of indicators. These may be considered in 4 groups:

- Group 1: Indicators derived from LCA
- Group 2: Energy indicators
- Group 3: Material and waste indicators
- Group 4: Flows leaving the product system

GROUP 1: INDICATORS DERIVED FROM LCA

Indicator	Abbreviation	Units
Climate change - GWP100	GWP	kg CO_2 eq
Ozone layer depletion - ODP steady state	ODP	kg CFC-11 eq
Acidification potential - average Europe	AP	kg SO_2 eq
Eutrophication - generic	EP	kg PO_4^{3-} eq
Photochemical oxidant creation potential	POCP	kg ethylene eq
Depletion of abiotic resources - elements, ultimate reserves	ADPE	kg Sb eq
Depletion of abiotic resources - fossil fuels	ADPF	MJ

EN 15804 specifies:

Characterisation Factors for Group 1 indicators are provided in the standard; they are taken from the CML Impact Assessment method version 4.1, published November 2012.

Our implementation:

The relevant impact assessment method name is "**CML 2012 baseline w/o LT (EN 15804 categories)**"

Characterisation factors are from CML- IA v 4.1, 2012. Nomenclature is ecospold 2, as implemented in ecoinvent v3.2. Only the impact categories specified in EN 15804 are included: global warming, stratospheric ozone depletion, eutrophication, acidification of soil and water, abiotic resource depletion (elements and fossil fuels) photochemical ozone creation. Also as specified in EN 15804, only the variants designated by CML as "baseline" are included.

GROUP 2: ENERGY INDICATORS

Indicator	Abbreviation	Units
Renewable primary energy as energy carrier	PERE	MJ
Renewable primary energy resources as material utilisation	PERM	MJ
Total renewable primary energy use (sum of the two parameters above)	PERT	MJ
Non-renewable primary energy as energy carrier	PENRE	MJ
Non-renewable primary energy resources as material utilisation	PENRM	MJ
Total non-renewable primary energy use (sum of the two parameters above)	PENRT	MJ

EN 15804 specifies:

Most of the Group 2 indicators may be calculated using a Cumulative Energy Demand (CED) method, but guidance on the implementation of EN 15804 from the relevant CEN Technical Committee states that the "*primary energy as material utilisation*" indicators should be derived from the lower heating value (LHV or net calorific value, NCV) of the product itself.

Different implementations of the CED method use different values for the calorific values of various fuels, and indeed some are based on Gross Calorific Value (GCV or Higher Heating Value, HHV) while others use LHV.

Our implementation:

The relevant impact assessment method names are: "**cumulative energy demand - renewable**" and, "**cumulative energy demand - non-renewable**". An alternative method is provided for the latter: "cumulative energy demand - alternative non-renewable".

The overall PE(N)RT indicator value is the sum of the total indicator values for the non-renewable and renewable categories. The methods are based on the cumulative energy demand (CED) method as implemented in ecoinvent.

PE(N)RT is the total of PE(N)RM and PE(N)RE.

According to CENTC350 guidance, the PE(N)RM indicator (Primary energy, renewable or non-renewable, used as raw material (feedstock)) is counted as the net calorific value (NCV, also LHV) of the product; these indicator values should be obtained outside of the LCA.

GROUP 3: MATERIAL AND WASTE INDICATORS

EN 15804 specifies:

The first four indicators in Group 3 are items from the life cycle inventory.

Guidance on the interpretation of the net use of fresh water indicator draws on ISO 14046:2015; for example water consumed is said to be "*the sum of water which evaporates, transpires from biomass, is incorporated into products or is discharged to a different drainage basin*".

The last three indicators are intermediate flows within the modelled system; some potential environmental impacts associated with their management are included in the indicators in Groups 1 and 2.

Indicator	Abbreviation	Units
Use of secondary material	SM	kg
Net use of fresh water	FW	m^3
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	TRWD	kg

Our implementation:

The relevant impact assessment method name is "**Material + Waste Indicators (EN 15804)**".

This LCIA method calculates several of the indicators required by EN 15804 that do not emerge from conventional life cycle impact assessment methods.

NON-HAZARDOUS AND HAZARDOUS WASTES

Wastes flowing into final treatment processes are classified as either non-hazardous or hazardous; the category indicator result in each case is the total waste being treated across the product system. The classification of wastes into hazardous or non-hazardous already present in the ecoinvent database is retained in almost all cases. Exceptions are documented and justified.

There is significant uncertainty associated with the classification of wastes from generic processes as "hazardous" or "non-hazardous"; many wastes with similar descriptions can be either hazardous or non-hazardous, and the European Waste Catalogue contains numerous mirror waste codes, where the same code (i.e. waste with the same description from the same source activity) can apply to either hazardous or non-hazardous waste according to the waste's exact properties. Therefore, in the database users can change the classification of individual wastes as hazardous or non-hazardous changed if required.

RADIOACTIVE WASTE ARISINGS (AS MASS)

The radioactive waste indicator is calculated from the life cycle inventory item "volume of final storage occupied".

(cont'd)

NET USE OF FRESH WATER

This is calculated as the difference between inflows of water resources and outflows of water returned to the water environment that are registered in the life cycle inventory (LCI). Classification of water types as "used" water follows CEN TC350 guidance, and ISO 14046:2014.

SECONDARY MATERIAL

This indicator records the quantity of material that has passed the "end-of-waste" state and that is used in the modelled system as a material input. Flows cut off by cut-off allocation in ecoinvent are assumed to meet this criterion.

SECONDARY FUEL (RENEWABLE AND NON-RENEWABLE)

These indicators reflect the quantities of material that have passed the "end-of-waste" state and are used in the modelled system as fuel inputs. Flows cut off by cut-off allocation in ecoinvent and almost certainly used as fuel (rather than material) are assumed to meet the criterion. Flows originally of plant origin (e.g. wood) are classed as renewable.

GROUP 4: FLOWS LEAVING THE PRODUCT SYSTEM

Indicator	Abbreviation	Units
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy	EE	MJ per energy carrier

EN 15804 specifies:

Group 4 indicators are reported where the relevant items leave the modelled system boundary. Flows such as production scrap sent for recycling or "waste" heat exported from production facilities for use may be included, as well as specific flows defined in scenarios covering the use and end-of-life phases of product life cycles.

Refer to Life Cycle Stages (see below) for more detail on how the life cycle is characterised in EN 15804; the standard itself should be consulted for exact information about flows covered by these indicators.

Our implementation:

The relevant impact assessment method name is "**Output flows (EN 15804)**"

Methods are provided here to generate an aggregated quantity for each type of qualifying non-elementary flows leaving the modelled product system.

LIFE CYCLE STAGES (INFORMATION MODULES) IN EN 15804

The product category rules for environmental product declarations of construction products and construction services as brought forward by EN 15804:2012+A1:2013 adopt an “information modules” approach with respect to the life cycle stages covered by an EPD.

The environmental information in a cradle to grave EPD shall therefore be subdivided into the following life cycle stages and information module groups:

THE 'PRODUCT STAGE'

comprising: A1 – raw material supply, including processing of secondary material input

A2 – transport of raw material and secondary material to the manufacturer

A3 – manufacture of the construction products, and all upstream processes from cradle to grave

Modules A1-A3 thereby account for all upstream processes for the production stage of a given building material, including raw material extraction, manufacture and transport of intermediate products, processing of secondary input materials once they have past the "end-of-waste state" and their transport to the production plant, provision of all auxiliary and operation materials and energy, the actual manufacturing process of the product at hand, as well as for the complete waste treatment or landfilling of waste streams arising along the entire production phase (cradle to gate). The "product stage" (modules A1-A3) represents the minimum number of processes that must be covered by an EPD.

Note: modules A1, A2, and A3 may be declared as one aggregated module A1 - A3.

THE 'CONSTRUCTION PROCESS STAGE'

comprising: A4 – transport of construction products to the building site

A5 – the building installation/ construction

THE 'USE STAGE' - RELATED TO THE BUILDING FABRIC

comprising: B1 – use of the installed product, service or appliance (refers to e.g. the release of substances from painted surfaces over the use phase; emissions arising during assembly/ application phase – e.g. emissions during application of facade paints – are counted in module A5)

B2 – maintenance of the product

B3 – repair of the product

B4 – replacement of the product

B5 – refurbishment of the construction product

THE 'USE STAGE' – RELATED TO THE OPERATION OF BUILDING

comprising: B6 – operational energy

B7 – operational water use

This use stage also includes processing and transportation of any waste arising on site from the use of energy/water.

THE 'END-OF-LIFE STAGE'

comprising: C1 – demolition of the building/building product

C2 – transport of the demolition waste or the end-of-life construction product to waste processing facility

C3 – waste processing operations for reuse, recovery or recycling

A further module, "Module D", allows the potential benefits that may arise when the product or its constituent materials are recycled to be presented.

EuGeos Limited
www.eugeos.co.uk
tel: +44(0)1625 434423
email: lca@eugeos.co.uk