Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of declaration:	GMR ENLIGHTS s.r.l.
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Declaration number:	EPD-GMR-201-EN
Issue date:	25.02.2022
Valid until:	24.02.2027

Tarus 400

This Environmental Product Declaration (EPD) is based on the Life Cycle Assessment (LCA) of the floodlight Tarus 400 by GMR ENLIGHTS.

1. General information

GMR ENLIGHTS s.r.l.

Programme operator
Kiwa-Ecobility Experts
Voltastr. 5
13355 Berlin
Germany

Declaration number
EPD-GMR-201-EN

Product category rules
Requirements for Environmental Product Declarations for lighting, Edition 2022-01-13 (draft)

Issue date
25.02.2022

Valid until
24.02.2027

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Tarus 400

Owner of declaration
GMR ENLIGHTS s.r.l.
Via Grande 226
47032 Bertinoro FC
Italy

Declared product / declared unit
1 lighting unit

Scope
The declaration is valid for one street lighting unit Tarus 400 produced by GMR ENLIGHTS in Bertinoro, Italy. LED data (3000 K | 4000 K | 5700 K) of Tarus 400: 340 lm/LED | 180 lm/W | 25 °C [Tj] | ≤ 3 step MacAdam.
The owner of the declaration shall be liable for the underlying information and evidence. Kiwa-Ecobility Experts shall not be liable with respect to manufacturer information, lifecycle assessment data and evidence. The EPD was created according to the specifications.

Verification:
The CEN standard EN 15804:2012+A2:2019 serves as the core PCR.
Independent verification of the declaration and data according to ISO 14025:2010.
☐internal ☒external

Joanna Zhuravlova
(Independent verifier of Ecomatters)

2. Product details

2.1 Product description

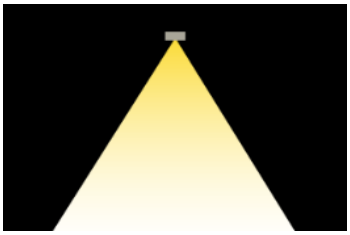
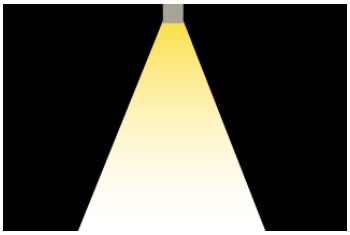
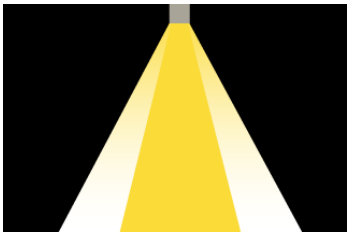
Tarus 400 is a floodlight by GMR ENLIGHTS, which is shown in Figure 1.

Figure 1: Tarus 400

2.2 Application

The various possible applications of the lighting product Tarus 400 depending on the optical system types are shown in Table 1.

Table 1: Some applications of the GMR ENLIGHTS lighting product Tarus 400

Optical systems	Applications
Type 1 	Urban street Residential road Road centre
Type 3 	Pathway Cycle path Suburban road Urban street Residential road
Type 9 	Stadiums Sports areas Industrial areas Floodlight towers Parking areas
Type 10 	Stadiums Sports areas Industrial areas Floodlight towers Parking areas
Type 11 	Stadiums Sports areas Industrial areas Floodlight towers Parking areas

2.3 Technical data

In Table 2 the technical data of the GMR ENLIGHTS lighting product Tarus 400 are listed.

Table 2: Technical specifications

Parameter	Value	Unit
Dimensions	l. 574 x w. 395 x h. 70	mm
Power source	220-240 | 50/60Hz | tolerance +/-10% 120-277 | 50/60Hz | tolerance +/-10%	V
Current supply	525 | 700 | 1050	mA
Operational temperature	-40 to +55 (700 mA) -40 to +50 (1050 mA)	°C
Color temperture	3.000 | 4.000 | 5.700 | CRI ⩾ 70	K

2.4 Placing on the market

Standard:

- EN 60598-1
- EN 60598-2-3
- EN 62471
- EN 55015
- EN 61547
- EN 61000-3-2
- EN 61000-3-3

Conformity:

- ENEC05
- CE

Protection classes:

- IP66
- IK09

2.5 Base materials / Ancillary materials

In Table 3 the main raw materials and their mass-percentages are listed.

Table 3: Raw materials and proportions in mass percent

Raw material	Proportion [m%]
Aluminium	42
Glass	18
Steel, low-alloyed	15
Others	25

2.6 Manufacturing

The assembly and manufacturing take place at the production site of GMR ENLIGHTS s.r.l. in Bertinoro, Italy. The production area consists of the following process areas:

- Component preparation
- Production area with 1 ESD area for LED with 4 assembly lines and a capacity of 5000/6000 complete luminaires per week
- 100 % routine tests
- Automated packaging
- Final check
- Shipping zone

The procedure of the production is shown in the process flowchart in Figure 2.

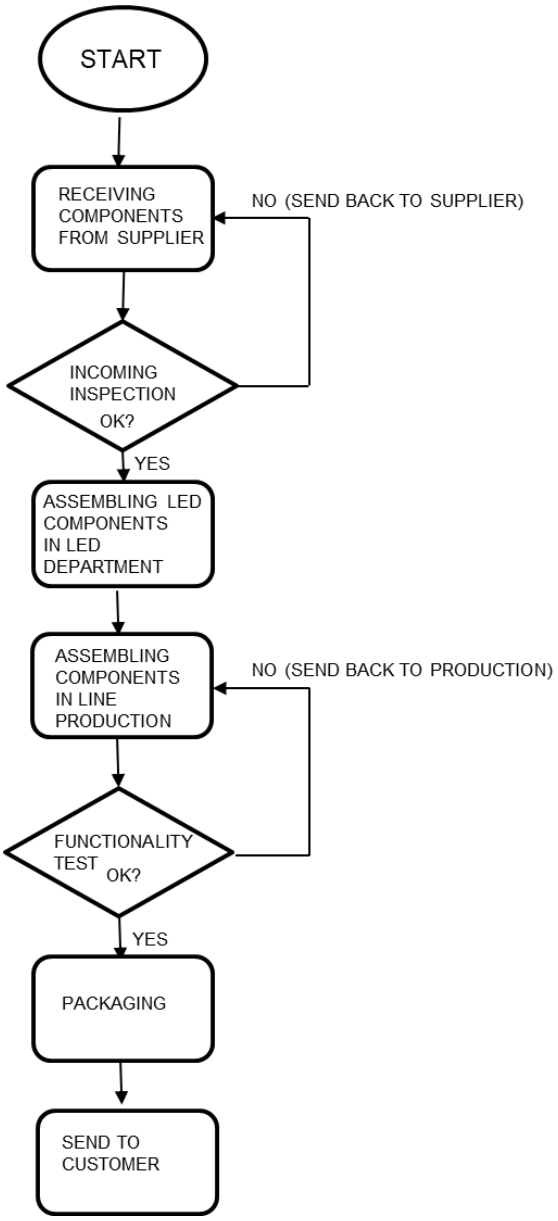


Figure 2: Process flowchart

2.7 Reference service life (RSL)

According to the manufacturer the reference service life (RSL) is more than 100,000 hours, based on an actual ambient temperature Ta of 25 °C and L90B10. L defines the percentage of lumen comparing with the initial lumens. B value means the failure data at the L data.

2.8 Packaging

Since the construction is not considered, the packaging of the final lighting product is not considered, but the packaging that is used by the suppliers of the raw materials. For this paper, polyethylene and wood are used. For the final product only paper (90 % recycled paper) is used. More information about the packaging can be found in the background report of this EPD.

3. LCA: Calculation rules

3.1 Declared unit

According to the PCR B "Requirements for Environmental Product Declarations for lighting, Edition 2022-01-13 (draft)", the declared unit is 1 lighting unit. LED data (3000 K | 4000 K | 5700 K) of Tarus 400: 340 lm/LED | 180 lm/W | 25 °C [Tj] | ⩽ 3 step MacAdam.

The calculation method used in this report was also applied in the calculation for the other luminaires of the product type "Floodlights": Woltron 01, Woltron 02, Woltron 03, Woltron Sport 01, Woltron Sport 02, Woltron Sport 03, Tarus 100, Tarus 200, Tarus 400, Tarus 600, Tarus Tunnel 100, Tarus Tunnel 200, Tarus Tunnel 400, Tarus Tunnel 600, Cube X, Cube, Cube H, Hibra 01, Hibra 02, Hibra 03, Hibra 04

Parameter	Value	Unit
Declared unit	1	lighting unit
Conversion factor to 1 kg	9.0	kg/lighting unit

3.2 System boundaries

This EPD was created in accordance with DIN EN 15804 and monitors the production and the end-of-life stage as well as the benefits and loads beyond the system boundary. According to DIN EN 15804 this corresponds to the product phases A1-A3, C1-C4 and D. Therefore, the type of the EPD is "cradle to gate with options".

The modules include:

- A1: Extraction and processing of the raw materials (Aluminium etc.)
- A2: Transport of the raw materials to the production site by the suppliers
- A3: Manufacturing of the lamps (component preparation, assembly, tests etc.) including electricity; Packaging of the raw materials (paper, Polyethylene, wood)
- C1: No useful information regarding the deconstruction available
- C2: Transport to the waste treatment plants according to the NMD waste scenarios
- C3: Percentages of the waste treatments according to the NMD waste scenarios
- C4: Disposal of the components of the lighting products at the end of life
- D: Loads due to landfill, incineration and recycling; benefits due to incineration and recycling

The production does not contain secondary materials or fuels.

3.3 Assumptions and estimates

For most input data, such as the raw materials and supplier information, the values were provided by the manufacturer GMR ENLIGHTS. According to the manufacturer, the used Aluminium is from 93 % recycled material.

The used production electricity amount per lighting unit is based on the total electricity used for production purposes and the total amount of produced lighting units in the year 2020.

The selection of the waste scenarios for the different materials is based on an educated guess. The waste scenarios are based on the "Nationale Milieudatabase" (NMD), the National Environmental Database of the Netherlands. Therefore, the Dutch electricity grid mix of 2019 is used for the energy recovery in module D. This is due the fact that the used EPD & LCA tool R<THiNK is developed by NIBE in the Netherlands.

Due to privacy reasons, more details are only included in the background report of this EPD.

3.4 Period under review

All process-specific data was collected for the operating year 2021. The quantities of raw and auxiliary materials as well as energy consumption have been recorded and averaged over the entire operating year.

3.5 Cut-off criteria

For process modules A1 to A3, all process-specific data was collected. All flows could be assigned potential environmental impacts through the Ecoinvent database 3.6. Production, supply, disposal, maintenance and end-of-life treatment of capital goods are included. In the used Ecoinvent database 3.6 infrastructure and capital goods are included. All flows that contribute more than 1% of the total mass, energy or environmental impact of the system have been included in the LCA. It can be as-sumed that the neglected processes contributed less than 5% to the impact categories considered. It is assumed that the contribution of capital goods to each individual environmental impact category of the module (A1-A3) is less than 5%.

3.6 Data quality

Overall, the quality of the data can be considered as good. In the operating data survey, all relevant process-specific data could be collected. The data relating to the manufacturing and transports of the lighting products were provided by the manufacturer GMR ENLIGHTS.

Secondary data were taken from the Ecoinvent database version 3.6 (2019). The database is regularly checked and thus complies with the requirements of DIN EN ISO 14044 (background data not older than 10 years). The background data meets the requirements of EN 15804. The quantities of raw materials, consumables and supplies used as well as the energy consumption have been recorded and averaged over the entire year of operation.

The general rule has been complied that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

The selection of the best fitting data sets is based on research and the help of experts. The transport distances for the waste treatments as well as the used environmental profiles for loads and benefits are based on the data from the NMD.

3.7 Allocations

Specific information about allocations within the background data is included in the documentation of the Ecoinvent datasets. There are no allocations during the manufacturing phase at the plant.

3.8 Comparability

In principle, a comparison or assessment of the environmental impact of different products is only possible if they have been produced in accordance with EN 15804. For the assessment of comparability, the following aspects in particular must be taken into account: PCR used, functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for the use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period).

4. LCA: scenarios and further technical information

No scenarios were analysed in this EPD.

5. LCA: Results

The following tables show the results of the life cycle assessment, more precisely for the environmental impact indicators, resource consumption, output flows and waste categories. The results presented here refer to the declared unit of 1 lighting unit.

The results of the environmental impact indicators ETPfw-, HTP-c, HTP-nc, SQP, ADP-f, ADP-mm and WDP must be used with caution, as the uncertainties in these results are high or there is limited experience with the indicator.

The IRP impact category mainly addresses the potential effect of low dose ionising radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposure, nor does it consider the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

The mass of biogenic carbon containing materials in the product is less than 5 % of the mass of the product and therefore the declaration can be omitted according to DIN EN 15804.

The packaging of the final products is not part of the LCA and therefore the biogenic carbon content in accompanying packaging is not considered.

Specification of the system boundaries (X = module declared; - = module not declared)																
PRODUCTION PHASE			**CONSTRUCTION PHASE**		**USE PHASE**							**DISPOSAL PHASE**				**Credits and loads outside the system boundaries**
Raw material supply	Transport	Production	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Conversion / Renewal	Operational energy use	Operational water use	Demolition	Transport	Waste treatment	Landfill	Reuse-, Recovery, Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	X

Table 1: Results of the LCA – Environmental impact indicators: Tarus 400 (1 lighting unit)

Indicator (Impact category)	Unit	A1	A2	A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	6,03E-01	1,29E-03	8,02E-03	0,00E+00	4,74E-04	6,21E-03	7,29E-05	-1,97E-02
GWP-total	kg CO2 eqv.	7,81E+01	2,22E-01	1,66E+00	0,00E+00	8,17E-02	4,23E+00	3,43E-02	-1,49E+00
GWP-b	kg CO2 eqv.	2,04E-01	1,02E-04	-2,92E-01	0,00E+00	3,77E-05	8,65E-03	9,72E-05	6,80E-02
GWP-f	kg CO2 eqv.	7,77E+01	2,22E-01	1,95E+00	0,00E+00	8,17E-02	4,22E+00	3,42E-02	-1,55E+00
GWP-luluc	kg CO2 eqv.	2,23E-01	8,12E-05	3,27E-03	0,00E+00	2,99E-05	8,45E-04	5,78E-06	-1,47E-02
ETP-fw	CTUe	5,32E+03	2,98E+00	3,85E+01	0,00E+00	1,10E+00	7,39E+01	6,97E+01	-2,37E+02
PM	disease in-cidence	4,43E-06	1,99E-08	1,00E-07	0,00E+00	7,35E-09	7,13E-08	1,27E-09	-1,80E-07
EP-m	kg N eqv.	9,19E-02	4,53E-04	1,38E-03	0,00E+00	1,67E-04	1,22E-03	3,00E-05	-2,44E-03
EP-fw	kg PO4 eqv.	9,34E-03	2,24E-06	9,28E-05	0,00E+00	8,24E-07	4,13E-05	2,15E-07	-1,81E-04
EP-T	mol N eqv.	1,06E+00	4,99E-03	1,60E-02	0,00E+00	1,84E-03	1,40E-02	2,46E-04	-3,41E-02
HTP-c	CTUh	9,38E-08	9,67E-11	1,82E-09	0,00E+00	3,56E-11	1,64E-09	6,54E-12	-7,42E-09
HTP-nc	CTUh	3,79E-06	3,26E-09	2,24E-08	0,00E+00	1,20E-09	4,12E-08	2,26E-10	-3,84E-07
IR	kBq U235 eqv.	4,30E+00	1,40E-02	9,57E-02	0,00E+00	5,16E-03	4,65E-02	7,56E-04	2,25E-01
SQP	Pt	3,38E+02	2,90E+00	3,82E+01	0,00E+00	1,07E+00	9,14E+00	3,73E-01	4,30E+00
ODP	kg CFC 11 eqv.	5,01E-06	4,89E-08	3,53E-08	0,00E+00	1,80E-08	1,83E-07	2,33E-09	-2,41E-07
POCP	kg NMVOC eqv.	3,42E-01	1,43E-03	6,12E-03	0,00E+00	5,25E-04	3,89E-03	7,72E-05	-8,98E-03
ADP-f	MJ	9,90E+02	3,34E+00	3,08E+01	0,00E+00	1,23E+00	1,11E+01	1,92E-01	-2,19E+01
ADP-mm	kg Sb-eqv.	1,82E-02	5,61E-06	1,17E-04	0,00E+00	2,07E-06	2,38E-05	7,98E-08	1,39E-02
WDP	m^3 world eqv.	1,54E+03	1,20E-02	1,41E+01	0,00E+00	4,41E-03	2,60E-01	4,24E-03	1,00E+03

AP = Acidification potential, Accumulated Exceedance (Acidification); GWP-total = Global warming potential total (Climate change total); GWP-b = Global warming poten-tial biogenic (Climate change biogenic); GWP-f = Global warming potential fossil (Climate change fossil); GWP-luluc = Global warming potential land use and land use change (Climate change land use and land use change); ETP-fw = Potential Comparative Toxic Unit for ecosystems (Ecotoxicity freshwater); PM = Po-tential incidence of disease due to PM emissions (Particulate Matter emissions); EP-m = Eutrophication potential, fraction of nutrients reaching marine end compartment (Eutrophication aquat-ic marine); EP-fw = Eutrophication potential, frac-tion of nutrients reaching freshwater end compartment (Eutrophication aquatic freshwater); EP-T = Eutrophication poten-tial, Accumulated Exceedance (Eutrophication terrestrial); HTP-c = Potential Comparative Toxic Unit for humans (Human toxicity, cancer effects); HTP-nc = Potential Compara-tive Toxic Unit for humans (Human toxicity, non-cancer effects); IR = Potential Human exposure efficiency relative to U235 (Ionising radiation, human health); SQP = Poten-tial soil quality in-dex (Land use related impacts/Soil quality); ODP = Depletion potential of the stratospheric ozone layer (Ozone depletion); POCP = Formation potential of tropospheric ozone (Photochemical ozone formation); ADP-f = Abiotic depletion for fossil resources potential (Depletion of abiotic resources, fossils); ADP-mm = Abiotic depletion potential for non-fossil resources (Depletion of abiotic resources, minerals and metals); WDP = Water deprivation potential, deprivation-weighted water consump-tion (Water use)

Table 2: Results of the LCA – Resource consumption, output streams & waste categories: Tarus 400 (1 lighting unit)

Parame-ter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	MJ	1,10E+02	4,18E-02	1,13E+01	0,00E+00	1,54E-02	2,22E-01	1,72E-02	2,69E+00
PERM	MJ	0,00E+00	0,00E+00	1,46E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,10E+02	4,18E-02	1,28E+01	0,00E+00	1,54E-02	1,16E+00	6,09E-03	6,23E+00
PENRE	MJ	1,03E+03	3,55E+00	1,40E+01	0,00E+00	1,31E+00	1,93E+00	3,40E-01	-5,42E+01
PENRM	MJ	2,76E+01	0,00E+00	1,76E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-3,95E+00
PENRT	MJ	1,05E+03	3,55E+00	3,25E+01	0,00E+00	1,31E+00	1,19E+01	2,04E-01	-2,46E+01
SM	kg	4,94E+00	0,00E+00	1,88E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	3,61E+01	4,07E-04	3,25E-01	0,00E+00	1,50E-04	9,61E-03	1,94E-04	2,33E+01
HWD	kg	3,13E-03	8,47E-06	2,69E-04	0,00E+00	3,12E-06	2,32E-02	2,28E-07	2,85E-02
NHWD	kg	8,88E+00	2,12E-01	2,13E-01	0,00E+00	7,81E-02	4,12E-01	8,54E-01	-6,87E-01
RWD	kg	2,54E-03	2,19E-05	7,42E-05	0,00E+00	8,09E-06	4,92E-05	1,08E-06	-9,85E-06
CRU	kg	0,00E+00	0,00E+00	1,61E-04	0,00E+00	0,00E+00	1,61E-01	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	4,67E-02	0,00E+00	0,00E+00	6,48E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE-total	MJ	0,00E+00	0,00E+00	8,29E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,03E+00
EET	MJ	0,00E+00	0,00E+00	5,24E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,71E+00
EEE	MJ	0,00E+00	0,00E+00	3,04E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,32E+00

PERE = Renewable primary energy ex. raw materials; PERM = Renewable primary energy used as raw materials; PERT = Renewable primary energy total; PENRE = Non-renewable primary energy ex. raw materials; PENRM = Non-renewable primary energy used as raw materials; PENRT = Non-renewable primary energy total; SM = Use of secondary material; RSF = use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water; HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE-total = Exported energy, total; EET = Exported energy thermic; EEE = Exported energy electric

For an easier understanding, the results are processed graphically, in order to recognize relationships and connections between the data more clearly.

The following figure shows the percentage of the product phases in the environmental impact categories.

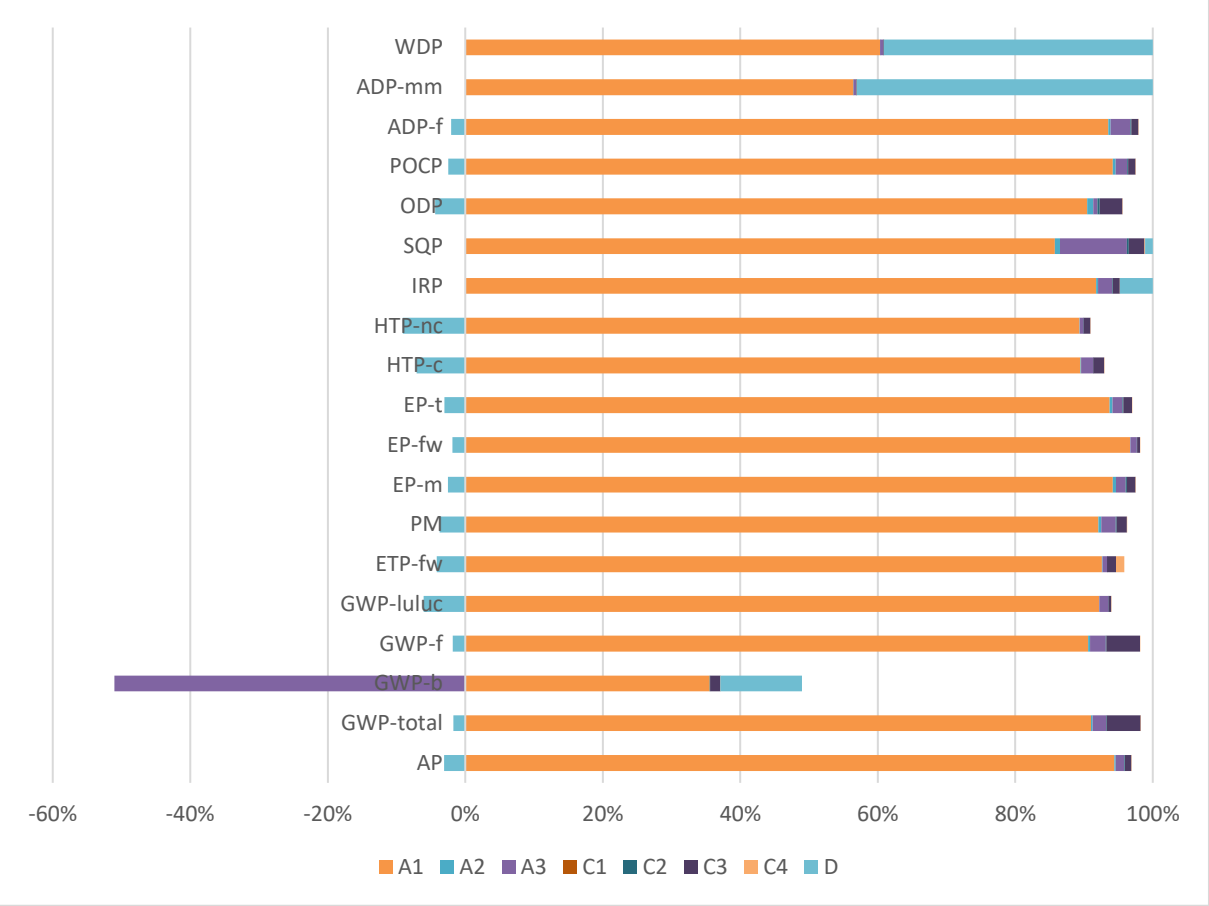


Figure 3: Figure 3: Percentage of the product phases in the environmental impact categories of Tarus 400

The figure shows that for all the environmental impact categories the raw material supply A1 during the production phase has the highest percentages. It can also be seen that the benefits in D predominate, represented by the negative percentage values of D.

7. References

CML, 2012	Centrum voor Milieuwetenschappen Leiden (CML); CML-IA (Baseline) version 4.1 (2012); Characterization factors by the Institute of Environmental Sciences of the Faculty of Science at the Leiden University in the Netherlands; https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors
DIN EN ISO 14040	DIN EN ISO 14040: 2009-11: Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006)
DIN EN ISO 14044	DIN EN ISO 14044: 2018-05: Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006 + Amd 1:2017)
DIN EN ISO 15804	DIN EN ISO 15804:2014-07: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction.
Ecoinvent, 2019	Ecoinvent database version 3.6 (2019)
EN ISO 14025	EN ISO 14025:2011-10: Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)
PCR A	General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.0
PCR B	Product Category Rules for lighting products from the EPD programme of Kiwa-Ecobility Experts; Requirements for Environmental Product Declarations for lighting, Edition 2022-01-13 (draft)
R<THiNK, 2022	R<THiNK: EPD & LCA tool by NIBE (2022)

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