Łukasiewicz
Institute of Ceramics
and Building Materials

Kaczmarek

ENVIRONMENTAL PRODUCT DECLARATION
No. 04-05/2024

K2-Dren Drainage pipes

Declaration owner:	Kaczmarek Malewo Sp.K.
Program Owner:	Łukasiewicz– Institute of Ceramics and Building Materials Environmental Engineering Center
Name of program	Environmental Product Declarations – B2B
Release Date:	**22.05.2024**
Declaration valid until:	**22.05.2029**

Łukasiewicz
Institute of Ceramics
and Building Materials

DECLARATION
ENVIRONMENTAL
PRODUCT No. 04-05/2024

Kaczmarek

1. OVERVIEW

Program owner: **Kaczmarek Malewo Sp.K.**	**Products covered by the declaration:** **K2-Dren Drainage pipes**
Program Owner: *Łukasiewicz– Institute of Ceramics and Building Materials Environmental Engineering Center*in Opole. **http://www.icimb.pl/opole/**	**Declaration owner:** Kaczmarek Malewo Sp.K. Malewo 1, 63-800 Gostyń Telefon: +48 65 575 86 00 Adres e-mail: sekretariat@kaczmarek2.pl **https://www.kaczmarek2.pl/**
Date of issue: **22.05.2024**	**Declared Product/Declared Unit:** **1 kg** (1 kilogram) of **K2-Dren** drainage pipes
Declaration valid until: **22.05.2029**	The declaration includes: **K2-Dren** Drainage pipes manufactured in the Kaczmarek Malewo Sp.K. plant. in Malewo. The environmental declaration is based on average data provided by the manufacturer for one production plant for individual products covered by the declaration manufactured by Kaczmarek Malewo Sp.K. The average values of the input and output streams were calculated based on data provided by the manufacturer from one production plant. Contains information about the impact of the declared products on the environment. All data regarding the production cycle were collected by Kaczmarek Malewo Sp.K. from the period from January 1, 2022 to December 31, 2022 (12 months) and correspond to the production technology at that time. The life cycle assessment was developed in accordance with the requirements of the PN-EN ISO 15804+A2:2020, PN-EN ISO 14025 and PN-EN ISO 14040 standards. The product categorization rules were adopted in accordance with the PN-EN 15804 standard. The owner of the declaration is responsible for the underlying information and evidence. Łukasiewicz Research Network - Institute of Ceramics and Building Materials Environmental Engineering Center is not responsible for the manufacturer's information, data and evidence regarding life cycle assessment. Declarations that are the result of different programs or are not performed in accordance with the standard may not be comparable.

Product Categorization (PCR) Rules	According to the standard: PN-EN 15804+A2:2020-03 Sustainability of construction works. Environmental Product Declarations. Basic principles of categorization of construction products.
Representativeness:	Polish product, year 2022
Declared durability:	100 years
Reasons for performing LCA:	B2B
Life Cycle Analysis (LCA):	The LCA analysis includes modules A1-A3, A4, C1-C4 and D according to PN-EN 15804+A2 (Cradle-to-Gate with options)

The Łukasiewicz – Institute of Ceramics and Building Materials Environmental Engineering Center provides access to the Type III environmental declaration for K2-Dren Drainage pipes Kaczmarek Malewo Sp.K. to interested parties.

Authors' team:
Katarzyna Kiprian, M.Eng.
Ewa Głodek-Bucyk, Ph.D.
Patryk Okoń, M.Eng.

Approved:

Joanna Poluszyńska, Ph.D

Director of the Center for Environmental Engineering

Ewa Głodek-Bucyk, Ph.D.

Leader of the Process Engineering Research Group

Review:

CEN standard PN-EN 15804+A2 serves as the main PCR document.
Independent verification of declarations and data according to EN ISO 14025:2010

☐ Internal ☒ External

Katarzyna Grzesik, PhD, DSc

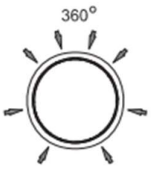
2. MANUFACTURER AND PRODUCT INFORMATION

Figure 1. Production plant in Malewo.

The main profile of the company's activity is the production of plastic products The history of the company dates back to 1985, when its activity began with the production of haberdashery film and technical technology made of softened PVC, was started by PPHT Barbara Kaczmarek Malewo, managed by four brothers. In the following years of activity, on the basis of the experience gained, the scope of production was introduced and expanded to include water, gas and sanitary sewage systems.
For almost 40 years, the Kaczmarek Malewo company has been operating in Malewo in Wielkopolska. Production also takes place in the second production plant in Piaski. The production plant is shown in Figure 1.
Thanks to the principles of loyalty, honesty and building success on trust, the company is still managed as a family.
The company manufactures PVC-you and PE water supply systems, PE gas systems, PVC-U, PP and PE external sewage systems, PP internal sewage systems, as well as gutter systems, drainage systems, cable casing pipes, as well as manholes, tanks and retention and drainage boxes.
The company's latest projects include the implementation of the production of tanks made of K2-Kan XXL structural pipes and PE water supply and sewage pipes with a diameter of up to DN1400.
For the production of systems, the company uses the most modern production lines in Europe.
All manufactured products meet quality standards. The official confirmation of the high quality of products is the ISO 9001 certificate: *production and distribution of plastic products for the construction of gas, water and sewage, sewage, gutter, cable, drainage and hollow slab installations.*

K2-Dren system pipes are pipes with double-layer structural walls with a smooth internal surface and a profiled external surface (type R2 according to DIN 4262-1), made of polyethylene or polypropylene, with nominal diameters from DN/OD 110 to DN/OD 200 and DN/ID150 to DN/ID1000, with stiffness SN8 kN/ m2, may also have stiffness SN10 kN/m2, SN12 kN/m2, SN16 kN/m2, perforated, depending on the pipe type, on the entire pipe surface or only part of it.
K2-Dren drainage pipes are produced depending on the geometry of the perforation holes in the following varieties:

- TP (totally perforated) – a fully seeping pipe, with complete perforation made evenly around the entire circumference. At least four rows of slots along the length of the pipe.



- LP (locally perforated) – partially seeping pipe, with a perforated part. The holes are made on the top of the pipe, symmetrically in relation to the vertical axis of the pipe and evenly around the circumference within an angular range of approximately 220° (±10), and the bottom of the pipe does not have any slots. The pipes have at least three rows of slots.

- MP (multipurpose) – multifunctional seepage and flow pipe. The holes are made at its top, symmetrically to the vertical axis of the pipe and with a maximum angular range of up to 120°. These pipes have at least two rows of slots. The lower part of the multi-function pipe (MP) can serve as a transport channel for water flow.

- UP (unperforated) – pipe without perforation.

The production of **K2-Dren** pipes uses polypropylene (PP) and polyethylene (PE), which are thermoplastics belonging to the group of polyolefins produced from semi-finished products resulting from the processing of crude oil. **K2-Dren** pipes are manufactured by co-extrusion. The pipe has a wall formed in waves (corrugated) by a pulling device. Then the resulting pipe is cooled in a bathtub, where it is directed to perforation in order to make holes as intended. After making the holes, the pipe is cut to the appropriate length and sockets are made to connect the pipes. The finished product is packed and then stored waiting to be picked up by the customer. The K2-Dren drainage pipe is manufactured according to the diagram (Fig. 2).

The production of **K2-Dren Drainage pipes** is carried out according to the scheme (Fig. 2).

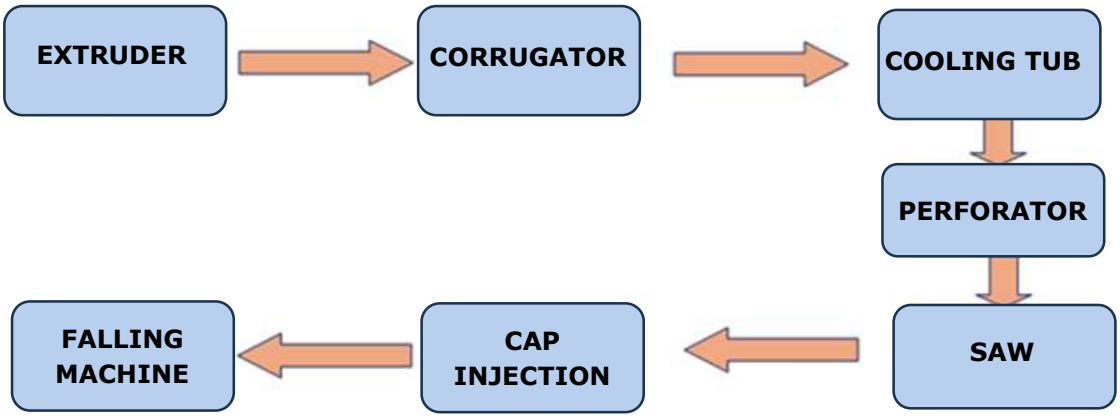


Figure 2: Scheme of the K2-Dren drainage pipe production process.

Technical data:

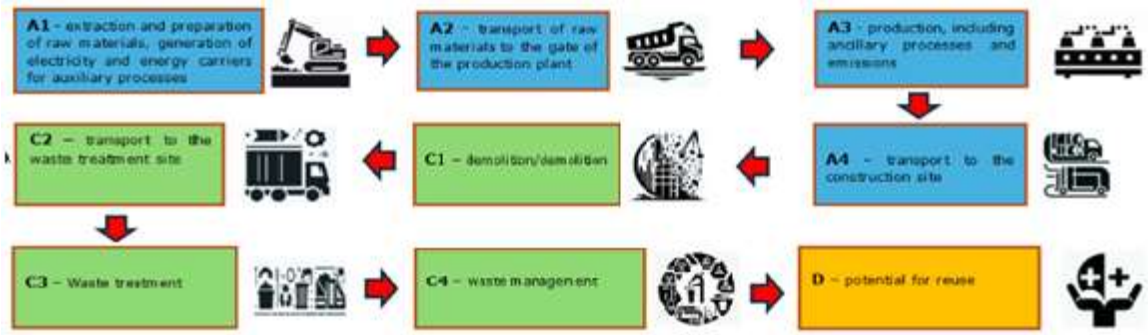
K2-Dren PP		K2-Dren PE	
Material	**Mass participation [%]**	**Material**	**Mass participation [%]**
PolipropylenE (PP)	**99**	**Polietylen (PE)**	**100**
DYE	**1**		

Polypropylene density ≥ 900 kg/m3
Polietylen density ≥ 940 kg/m^3

3. LCA: SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

System Limitations

The life cycle analysis of the tested products includes modules A1-A3, A4, C1-C4 and D (Cradle to Gate whit options) in accordance with PN-EN 15804



Duration of data collection

The data on the production process were provided in 2024 for the period from January 1, 2022 to December 31, 2022.

Declared Unit (DU)

1 kg (1 kilogram) of **K2-Dren** drainage pipe.

Assumptions

A1 - extraction and consumption of raw materials refers to specific mass shares in the production process per declared unit of the product,

A2 – distances from the place of obtaining raw materials to the production plant, individual for each raw material, means of transport varied depending on the method of delivery of raw materials,

A3 – CO_2, NO_x, SO_2 and dust emission values from the production process obtained as a result of measurements carried out at the plant, the rest estimated on the basis of fuel consumption.

A4 - transport - data used for calculations are included in the developed scenario.

C1 -C4 - After completion of use, the fittings are left buried in the ground.

D – refers to the impact and effects of the use of secondary material. The calculations are performed based on the developed scenario.

Cut-off criteria	99% of all bulk streams involved in the production process were taken into account. All the energy used in the process was taken into account in the environmental declaration.
General data	The data for the calculations come from Ecoinvent v. 3.9.2 and KOBiZE. The emission factors for electricity were determined using the actual KOBiZE data. The applied emission factor of Polish electricity (Ecoinvent supplemented with current national data KOBiZE) is 0.685 kg CO_2/kWh. A detailed analysis of data quality was part of an external audit.
Allocation	All data regarding components manufactured at the Kaczmarek Malewo Sp. plant. K. in Malewo were delivered by the manufacturer and were referred to the declared product unit - **1 kg** of the **K2 Dren** drainage pipe. The allocation principles used in this EPD are based on the general principles of ICIMB-PCR A.

4. LCA: SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

For the life cycle analysis of products covered by the cradle to gate with options environmental declaration, scenarios have been developed for modules A4, C1-C4 and D:

Module A4:
Transport is carried out by a vehicle with a load capacity of 16-32 tonnes that meets the EURO 6 emission standards, the average distance from the plant to the customer is 350 km.

Modules C1- C4:
Demolition/demolition, waste transport, waste processing, waste disposal.

After the end of use, K2-Dren drainage pipe are left buried in the ground. As a result, processes related to the demolition, transport, treatment and disposal of waste do not take place, which means that the environmental impact of these modules is zero.

Module D
Module D is zero. This means that no potential benefits or burdens are anticipated for the reuse, recycling or recovery of materials at the end of a product's lifecycle.

5. LCA: RESULTS

The table below shows the LCA modules taken into account in the calculation of the environmental impact categories for the products covered by the declaration.

DESCRIPTION OF SYSTEM BOUNDARIES (X – INCLUDED IN LCA, MND – UNDECLARED MODULE)																
Production Stage			**Construction phase**		**Stage of use**							**End of Life Stage**				**Benefits and flows beyond system boundaries**
Mining & Sourcing	Transport	Production	Transport	Construction Process	Usufruct	Maintenance	Repair	Exchange	Renovation	Energy consumption	Water consumption	Demolition	Transport	Waste Treatment	Waste management	Potential for reuse
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	**X**	**X**	**X**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**X**	**X**	**X**	**X**	**X**

The following tables present the results of the LCA analysis for **K2-Dren** drainage pipe. Explanations of the abbreviations used to describe the impact category are provided below:

GWP-total	Global warming potential
GWP-fossil	Global warming potential fossil fuel
GWP-biogenic	Global warming potential biogenic
GWP-luluc	Global warming potential land use and land change
ODP	Depletion potential of the stratospheric ozone layer

AP	Acidification potential of land and water
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestial	Eutrophication potential, Accumulated Exceedance
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals	Abiotic depletion potential for nonfossil resources
ADP-fossil	Abiotic depletion potential for fossil resources
WDP	Water (user) deprivation potential
PM	Potential incidence of disease due to PM emissions
IRP	Potential Human exposure efficiency relative to U235
ETP-fw	Potential comparative Toxic Unit for ecosystems
HTP-c	Potential comparative Toxic Unit for humans (cancerogenic)
HTP-nc	Potential comparative Toxic Unit for humans (non-cancerogenic)
SQP	Potential soil quality index
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	Use of renewable primary energy resources used as raw materials
PERT	Total use of renewable primary energy resources
PEN-RE	Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials
RE	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water

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MAIN IMPACT INDICATORS: 1 kg of K2 Dren drainage pipe										
	Life Cycle Stage									
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	2,49E+00	1,33E-01	3,60E-01	6,64E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-fossil	kg CO_2 eq.	2,47E+00	1,33E-01	4,32E-01	6,63E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-biogenic	kg CO_2 eq.	1,47E-02	1,09E-04	-7,19E-02	6,22E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	6,59E-04	6,85E-05	4,05E-04	3,22E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ODP	kg CFC11 eq.	1,47E-08	2,73E-09	1,24E-09	1,41E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
AP	mol H+ eq.	8,42E-03	6,72E-04	1,98E-03	1,41E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EP-freshwater	kg PO_4 eq.	2,95E-04	8,69E-06	5,15E-04	4,60E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EP-marine	kg N eq.	1,50E-03	1,68E-04	3,76E-04	3,57E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EP-terrestrial	mol N eq.	1,59E-02	1,81E-03	3,06E-03	3,62E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
POCP	kg NMVOC eq.	7,78E-03	7,05E-04	9,27E-04	2,19E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ADP-minerals & metals	kg Sb eq.	1,08E-05	3,92E-07	6,47E-07	2,11E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ADP-fossil	MJ	8,84E+01	1,82E+00	4,91E+00	9,18E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
WDP	WDP (m^3) świat. ekw	1,86E+00	7,27E-03	3,31E-02	3,84E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ADDITIONAL IMPACT INDICATORS: 1 kg K2 Dren drainage pipe										
	Life Cycle Stage									
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
PM	Disease incidency	8,90E-08	9,03E-09	7,04E-09	4,82E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
IRP	kBq U235 eq.	1,43E-01	2,31E-03	6,11E-03	1,24E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETP-fw	CTUe	2,95E-04	8,69E-06	5,15E-04	4,60E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
HTP-c	CTUh	1,76E-10	2,99E-11	1,97E-11	1,55E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
HTP-nc	CTUh	6,60E-09	4,67E-10	4,99E-10	2,38E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
SQP	-	2,07E+00	1,01E+00	1,58E+00	5,55E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

INDICATORS DESCRIBING RESOURCE CONSUMPTION: 1 kg of K2 Dren drainage pipe										
	Life Cycle Stage									
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,41E+00	2,71E-02	5,52E-01	1,45E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	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	0,00E+00
PERT	MJ	1,41E+00	2,71E-02	5,52E-01	1,45E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PEN-RE	MJ	8,95E+01	1,90E+00	6,36E+00	9,59E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RE	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	0,00E+00
PENRT	MJ	8,95E+01	1,90E+00	6,36E+00	9,59E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
SM	kg	0,00E+00	0,00E+00	2,42E-03	0,00E+00	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	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	0,00E+00
FW	m^3	2,83E-02	2,66E-04	8,61E-03	1,46E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

INDICATORS DESCRIBING OUTPUT STREAMS AND WASTE: 1 kg K2 Dren drainage pipe										
	Life Cycle Stage									
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Amount of hazardous waste	kg	WN	WN	2,89E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Amount of non-hazardous waste	kg	WN	WN	2,45E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Amount of radioactive waste	kg	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Reusable components	kg	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Recyclable Materials	kg	WN	WN	2,42E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Energy Recovery Materials	kg	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ/energy carrier	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Biogenic carbon	
Biogenic carbon content in the product (kg C_{org})	**0.00E+00**
Biogenic carbon content in the package (kg C_{org})	**2,45E-02**

6. INTERPRETATION OF RESULTS

Figure 3 presents a diagram of the shares of individual modules of the life cycle on the basic categories of impact of **K2 Dren** drainage pipe:

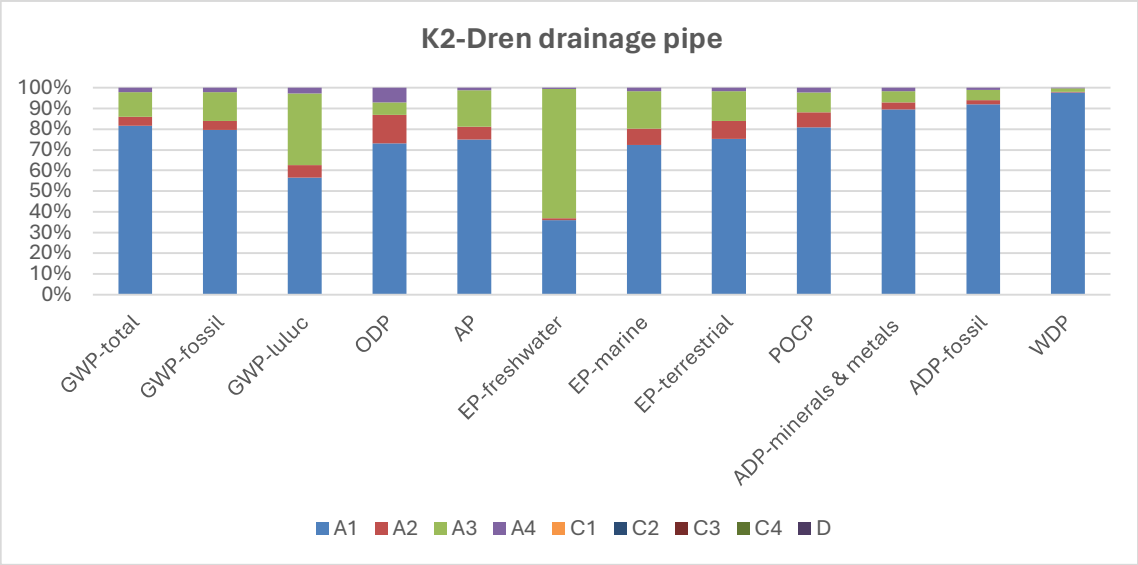

Figure 3 Shares of life cycle modules for the main categories of inflows- **K2 Dren** drainage pipe.

LITERATURE

- ✓ PN-EN ISO 14025:2014-04, Environmental labels and declarations -- Type III environmental declarations -- Rules and procedures.
- ✓ PN-EN 15804+A2:2020, Sustainability of building structures -- Environmental product declarations -Basic principles of categorization of construction products.
- ✓ PN-EN ISO 14040:2009 Environmental management. Life Cycle Assessment. Principles and structure.
- ✓ PN-EN ISO 14044:2009, Environmental management. Life Cycle Assessment. Requirements and guidelines.
- ✓ EN 15942:2012, Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ Data from the company's website: **https://www.kaczmarek2.pl/**

Explanatory material can be obtained by contacting the representative directly
Kaczmarek Malewo Sp.K.

Łukasiewicz Research Network – Institute of Ceramics and Building Materials
31-983 Kraków, Cementowa 8 Str., Poland

CENTER OF ENVIROMENTAL ENGINEERING

Łukasiewicz
Institute
of Ceramics
and Building
Materials

45-641 Opole, Oświęcimska 21 Str., Poland
Phone: +48 77 456 32 01

www.icimb.lukasiewicz.gov.pl
info.opole@icimb.lukasiewicz.gov.pl

PROCESS ENGINEERING RESEARCH GROUP

TYPE III ENVIRONMENTAL DECLARATION CERTIFICATE

no. 04-05/2024

Products:

K2-Dren Drainage pipes

Owner:

Kaczmarek Malewo Sp.K.

Malewo 1, 63-800 Gostyń

The declaration was developed in accordance with the requirements of the standard:

PN-EN 15804+A2: 2020-03

Sustainability of construction works
Environmental product declarations
Core rules for the product category of construction products

The declaration was verified in accordance with the requirements of the standard:

PN-EN ISO 14025:2010

Environmental labels and declarations
Type III environmental declarations. Principles and procedures

The certificate was issued for the first time on **May 22, 2024,** and is valid for 5 years or until the said EPD is amended.

Process Engineering Research Group Leader

Ewa Głodek-Bucyk, PhD Eng.

Director of Center of Environmental Engineering

Joanna Poluszyńska, PhD

Opole, May 2024