NUPI INDUSTRIE ITALIANE S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

Product names:

POLYPROPYLENE MONOLAYER PIPES FOR HOT AND COLD WATER TYPE NIRON, NIRON BETA AND POLYSYSTEM

Site Plants:

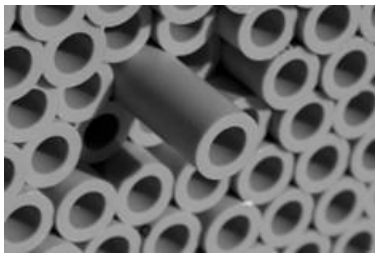
Castel Guelfo (BO)

in compliance with ISO 14025 and EN 15804+A2:2019

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	2026PCPPMONO
Registration Number	EPDITALY1356

Issue Date	15/09/2026
Valid to	15/09/2031





General information

EPD OWNER:	Nupi Industrie Italiane S.p.A., Piazza San Marco n. 1, 20121 – Milano (MI) Italy
PLANT INVOLVED in the declaration:	Castel Guelfo: Via dell'Artigianato n. 13 - 40023 Castel Guelfo di Bologna (BO), Italy
SCOPE OF APPLICATION:	This Environmental Product Declaration (EPD) is valid for NIRON AND POLYSYSTEM pipes in polypropylene. The involved production plant is the one located in Castel Guelfo (BO). The type of declaration is related to an average pipe product. The life cycle assessment is representative for the product introduced in the declaration for the given system boundaries.
PROGRAM OPERATOR:	EPDITALY, via Gaetano De Castillia 10, 20124 Milano, Italia.
INDIPENDENT CHECK:	This declaration has been developed referring to EPDItaly, following the General Programme Instruction; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries according to sales market conditions. CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 rev.3.2; 03/11/2025). PCR review was conducted by Daniele Pace. Contact via info@epditaly.it Independent verification of the declaration and data, according to EN ISO 14025:2010. Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it) ☐EPD process certification (Internal)☑ EPD verification (External) ***Accredited by: Accredia***
CPC CODE:	3632 - Tubes, pipes and hoses, and fittings therefor, of plastics
CORPORATE CONTACT:	info@nupinet.com
TECHNICAL SUPPORT:	Sphera https://www.sphera.com
COMPARABILITY:	Environmental product declarations published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804+A2.

ACCOUNTABILITY:	Nupi Industrie Italiane S.p.A relieves EPDItaly from any non-compliance with environmental legislation. The EPD owner will be responsible for the information and supporting evidence; EPDItaly declines all responsibility for the manufacturer's information, data and results of the life cycle assessment.
REFERENCE DOCUMENT:	This declaration has been developed following the EPDItaly Program Regulations and Annexes of EPDItaly, available at www.epditaly.it.
PRODUCT CATEGORY RULES (PCR):	PCR ICMQ-001/15 rev. rev.3.2 – 03/11/2025 EN 15804+A2:2019 is the framework reference for PCRs. EN 16904:2025
EPD PROJECT REPORT	2026_08_10_mono NIRON

Company

OUR MISSION – FOR OVER 50 YEARS

Cutting edge solutions for any kind of installation

The primary goal of Nupi Industrie Italiane S.p.A. corporate strategy is not only the production of systems that meet performance requirements and comply with the use for which they are intended, but above all general customer satisfaction. Producing better and faster are goals that technology makes more and more compatible.

In 2022, Nupi Industrie Italiane S.p.A. celebrated its 50th anniversary! In October 2015, it took over from Nupigeco S.p.A., founded in October 2008 from the merger of NUPI S.p.A. and GECO System S.p.A., to form a single large company. Combining their many years of experience and constant growth, the two firms decided to create a new flexible and advanced company, ready to play its role to satisfy the demands of the market whilst being environmentally astute.

The goal was to combine the expertise in the development and production of piping systems for plumbing, industrial applications, gas, irrigation and heating, with the experience in the production of polymer pipes specifically dedicated to oil, chemical and petrochemical fields.







Management System and Certifications

Nupi Industrie Italiane S.p.A. submits its management and production systems to external audits performed by third party certification bodies.
Audit frequency depends on the procedure established by the specific standard and by each certification body. Nupi Industrie Italiane S.p.A. is certified in compliance with the standards for quality (EN ISO 9001), environment (EN ISO 14001) and Health and Safety of workers (ISO 45001).
Thanks to the synergy between the phases of research, production, quality control and after-sales service, the company obtained several international quality company and product certifications.

UNI EN ISO 9001
UNI EN ISO 14001
ISO 45001



MANAGMENT UNI EN ISO 9001:2015 QUALITY

POLICY UNI EN ISO 14001:2015 ENVIRONMENTAL

SAFETY UNI ISO 45001:2018 AT WORK

Product Certifications

The company leadership is based on these solid foundations in a competitive and high technology industry such as plastics processing. A record that NUPI Industrie Italiane S.p.A. maintains thanks to high quality products and constant attention to customers' needs through an efficient after-sales service, a precise and timely technical assistance and installers' training.
NUPI products are of high quality, complying with regulations and conforming to the most stringent standards and certifications schemes. The full updated list is available on the website: www.nupiindustrieitaliane.com.

EPD Goal and scope

The entire life cycle of the product is considered (Type of EPD: cradle to grave and module D) and the modules described below are declared in this EPD:

*Modules **A1-A3** include those processes that provide energy and material input for the system (A1), transport up to the factory gate of the plant (A2), manufacturing processes as well as waste processing and emissions to air (A3).*

*Module **A4** includes the transport from the production site to the customer or to the point of installation of the products.*

*Module **A5** considers all pipe systems installation steps (negligible), the installation is done inside building mainly manually performed) plus packaging waste processing (recycling, incineration, disposal). Credits from energy substitution are declared in module D. During this phase, a specific leftover has been considered.*

*Module **B1** considers the use of the installed product. During the use of plastic piping systems, a scenario of zero impact is considered.*

*Module **B2** includes the maintenance of the product. A scenario of zero impact is considered.*

*Modules **B3-B4-B5** are related to the repair, replacement and refurbishment of the products. If the products are properly installed no repair, replacement or refurbishment processes are necessary. A scenario of zero impact is then considered.*

*Module **C1** considers deconstruction, including dismantling or demolition of the product from the building.*
For products installed inside buildings a scenario of zero impact is considered.

*Module **C2** considers transportation of the discarded piping system to a recycling or disposal process.*

*Module **C3** considers waste processing for products sorting, recycling and incineration.*

*Module **C4** includes all waste disposal processes, including pre-treatment and management of the disposal site.*

*Module **D** includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. Benefits from packaging incineration (electricity and thermal energy) are declared within module D.*

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	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	X	X	X	X	X	X	X	X	X

X = modules included in the study

The emission factor for the electricity used in A3 is 0.247 KgCO2eq/kWh.

According to the PCR ICMQ-001/15 rev. 3.2 this EPD is a “cradle to grave and module D” Type. it is an average EPD for the product NIRON AND POLYSYSTEM pipes produced in NUPI INDUSTRIE ITALIANE S.p.A. plant located in Castel Guelfo (BO). All data refer to the 2024 production and sales.

All manufacturing activities and packaging/auxiliary’s production are in module A3, while energy production and input materials are in A1. Transport to clients (A4) is included together with end-of-life scenarios (benefits and loads included according to D module).

The declaration is a Type 3 EPD (product EPD based on a qualified LCA-Tool) according to /REGULATIONS OF THE EPDItaly PROGRAMME 6/.

Geographical validity: EU+GLO

Time Representativeness: The primary data cover a period of 12 months, reference 2024.

Database: MLC Database 2024.2

NUPI LCA Tool v.5 25.01.2025: The LCA model is created using the Sphera LCA for Expert (previously GaBi Professional) Software system for life cycle engineering, developed by Sphera. The /MANAGED LCA CONTENT (GABI DATABASES)/ provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

EPD realized by means of a validated algorithm:
In 2019 NUPI Industrie Italiane S.p.A. implemented and certified a Process for EPD generation by using an algorithm that has been validated and certified by ICMQ S.p.A., in agreement with EPDItaly’s requirements. The process is based on an automatic data collection from different manufacturing plants that have been integrated, verified and validated in compliance with internal procedures. The validated algorithm allows the automatic calculation of the indicators reported into the current EPD coming from an LCA model implemented into the NUPI LCA process tool.
In 2025, after the five years period of validity, the NUPI LCA tool has been updated and validated by ICMQ S.p.A. The LCA tool enables the creation of partly verified LCA results for pipes, fittings and piping systems produced by NUPI

Product description

Detailed product description

POLYSYSTEM, NIRON and NIRON BETA pipes are polypropylene random copolymer (PP-R and PP-RCT) piping products manufactured by Nupi Industrie Italiane S.p.A. for the conveyance of hot and cold water and other technical fluids in building services and industrial applications. The pipes are produced in a range of diameters and pressure classes and are designed for use in plumbing, heating, cooling and HVAC systems. POLYPROPYLENE pipes are joined by thermal fusion, creating homogeneous and leak-tight connections. The PP-RCT material provides enhanced long-term hydrostatic strength and temperature resistance compared to conventional PP-R materials. The products are manufactured in accordance with the applicable requirements of EN ISO 15874 and related product specifications.

Production processes description

PIPE EXTRUSION (Castel Guelfo)

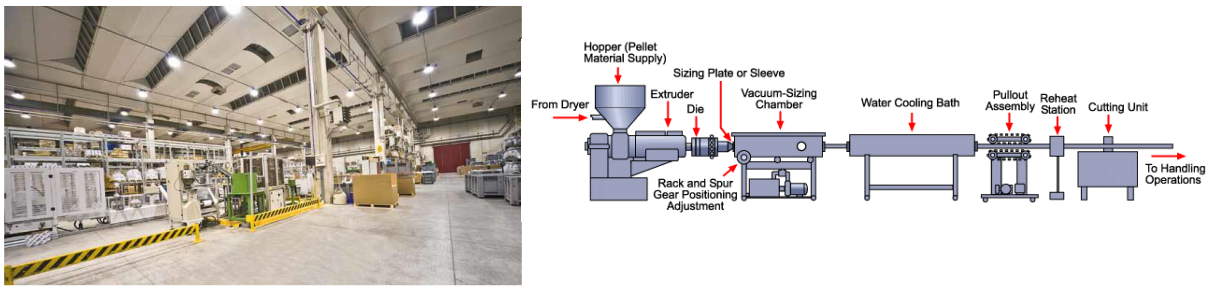


Figure 1 Pipes extrusion process

Nupi Industrie Italiane S.p.A. manufactures both solid wall (monolayer) plastic pipes, in diameter sizes ranging from 16 mm to 1000 mm, and coextruded multilayer (from two to five layers) pipes.

The raw materials used to manufacture plastic pipes are supplied in pellets (provided in bulk transporter, octabins or bags), both as natural resin or finished compound. Resin is pneumatically conveyed from the bulk transporters to silos at the plant site. The resin is then transferred from the silos to the pipe extruder by a vacuum transfer system.

The pipe extrusion line consists of the extruder, die, cooling systems, puller, printer, saw and take-off equipment. The function of the extruder is to heat, melt, mix, and convey the material to the die, where it is shaped into a pipe. The extruder is used to heat the raw material and then force the resulting melted polymer through the pipe extrusion die. The pipe extrusion die supports and distributes the homogeneous polymer melt around a solid mandrel, which forms it into an annular shape for solid wall pipe.

The dimensions and tolerances of the pipe are determined and set during the sizing and cooling operation. The sizing operation holds the pipe in its proper dimensions during the cooling of the molten material. During

vacuum sizing, the molten material is drawn through a sizing tube or rings while its surface is cooled enough to maintain proper dimensions and a circular form. The outside surface of the pipe is held against the sizing sleeve by vacuum. After the pipe exits the vacuum sizing tank, it is moved through a second vacuum tank or a series of spray or immersion cooling tanks.

The puller must provide the necessary force to pull the pipe through the entire cooling operation. Pipes are marked at specific intervals through ink jet or hot marking with tape machines.

Finished pipes can be coiled (depending to their sizes and physical/mechanical characteristics) or cut in customised straight lengths for handling and shipping convenience. Coiled pipes and straight lengths are then arranged with the proper packaging, ready for the storage, handling and transport phases.

Technical data

Niron&Polysystem pipes are designed to fully exploit the characteristics of the materials used to make them and offer high performance standards that allow them to be used both for plumbing and heating systems.

The table below, an excerpt from Standard EN ISO 15874, demonstrates the fields of use and the corresponding operating pressures and temperatures guaranteed for this system.

PP-R

APPLICATION CLASSES									P_D					
	1	2	4	5	1	2	4	5			10	8	6	4
P_D	S				SDR				S	SDR	ALLOWABLE CLASSES			
4	5	5	5	3,2	11	11	11	7,4	2,5	6	1&4	2	5	5
6	5	3,2	5	3,2	11	7,4	11	7,4	3,2	7,4	2)	1&4	2	5
8	3,2	2,5	3,2	-	7,4	6	7,4	1)	5	11	2)	2)	1&4	1&2&4
10	2,5	-	2,5	-	6	1)	6	1)						

PP-RCT

APPLICATION CLASSES									P_D					
	1	2	4	5	1	2	4	5			10	8	6	4
P_D	S				SDR				S	SDR	ALLOWABLE CLASSES			
4	8	8	8	5	17	17	17	11	3,2	7,4	1&2&4	5	5	5
6	5	5	5	4	11	11	11	9	4	9	2)	1,2,4	5	5
8	4	4	4	3,2	9	9	9	7,4	5	11	2)	2)	1&2&4	5
10	3,2	3,2	3,2	1)	7,4	7,4	7,4	1)	8	17	2)	2)	2)	1&2&4

1) Series/SDR not available in the NIRON piping range.
2) Application class not covered by this Series/SDR.
Example: A PP-RCT, SDR7,4, Series 3,2 pipe can be used in application classes 1,2 and 4 with a design pressure of 10 bar and in class 5 with a design pressure of 8 bar.

Service Conditions - Application classes as per EN ISO 15874 and ISO 10508

PROPERTIES	TEST METHOD	VALUES AT +23°C	UNIT OF MEASURE
Volumic mass	ISO 1183	**0,898**	g/cm^3
Yield strength	ISO 527	**23**	N/mm^2
Elongation at break	ISO 527	**> 50**	%
Modulus of elasticity	ISO 527	**850**	N/mm^2
Melt flow index MFI 190/5	ISO 1133	**0,5**	g/10 min
Heat conductivity (λ)	DIN 52612	**0,24**	W/mk
Linear thermal expansion coefficient	VDE 0304	**1,5 x 10^{-4}**	K^{-1}
Melting point	DIN 53736b2	**150 - 154**	°C
Impact strength (Charpy)			
+23°C	ISO 179/1 e A	**no break**	KJ/m^2
-30°C	ISO 179/1 e A	**50**	KJ/m^2
Volumic strength	IEC 93	**>10^{15}**	Ω cm
Dielectric strength	IEC 243/1	**75**	KV/mm
Dielectric loss factor	DIN 53483	**< 5 x 10^{-4}**	
Fire resistance	DIN 4102	**B2**	

Technical properties Niron and Polysystem

Pipes are classified as Class 1, 2 or 5 in compliance with EN ISO 15874 Table 1 in combination with the dedicated Design Pressure given by the pipe SDR.

Base materials/ancillary materials in the functional/declared unit

Material		Piping system
Polypropylene granulate	Base	99 %
Pigments for Polypropylene	Ancillary	1 %
TOTAL		100%

The product does not contain any substances included in the “Candidate List Of Substances of Very High Concern for Authorization” (SVHC) in compliance with REACH regulation.

Description of functional/declared unit

In this EPD an average pipe is considered. The pipe diameters range considered in the data collection includes a size range from DN 16 to DN 400. It has been considered a declared unit of 1 kg of NIRON, NIRON BETA AND POLYSYSTEM pipes.

The declared unit’s packaging includes 0,0007 kg of wooden crates and 0,0171 kg of protective polyethylene sleeve.

The product does not contain substances included in the "Candidate list of substances of very high concern (SVHC) for authorization" in a percentage greater than 0.1% in weight/weight.

Reference service life (RSL)

NIRON AND POLYSYSTEM pipes are regarded as having 50 years RSL independent of their material, according to EN 16904.

Products Distribution

In NUPI, pipes and fittings are supplied to customers with appropriate protection sleeve and packaging. For Polypropylene pipes the packaging consists in plastic bags and wood crate.

Installation

According to PCR EN 16904 installation of the product was considered to be negligible, as it is done manually in the building. Environmental impacts from waste packaging materials (A5) and release of biogenic carbon dioxide from wood pallets was considered. The impacts of material production, its processing and its disposal as installation waste are also included. Packaging treatment scenarios are based on Eurostat data for Europe.

No emissions are generated during installation and plastic pipes installations do not cause health or environmental hazards. 3% of scraps have been included in.

End of Life

After the demolition and deconstruction phase, the EU Eol as per MFA JRC 2025 (2024 data) scenario for Polypropylene materials has been chosen (45.5 % incineration, 39.3% landfill and 15.2% recycling).

For transport from the installation site to the treatment site (C2), the considered distances (as per EN 16904) were:

- incineration = 150 km
- recycling = 500 km
- landfilling = 50 km

LCA results – Environmental impacts per declared unit

The tables below show the environmental impacts results of 1 kg of NIRON, NIRON BETA AND POLYSYSTEM monolayer pipes.

Additional environmental impact indicators have been calculated and included in the project report but are not declared according to /EN 15804+A2:2019/ chapter 7.2.3.2.

CORE ENVIRONMENTAL IMPACT INDICATORS												
	A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP - total [kg CO_2 eq.]	2,22E+00	2,22E-01	2,97E-01	2,74E+00	1,13E-01	2,48E-02	0,00E+00	0,00E+00	1,57E-02	1,50E+00	1,16E-02	-9,86E-01
GWP- fossil [kg CO_2 eq.]	2,21E+00	2,19E-01	2,95E-01	2,72E+00	1,13E-01	2,33E-02	0,00E+00	0,00E+00	1,57E-02	1,50E+00	1,15E-02	-9,82E-01
GWP - biogenic [kg CO_2 eq.]	7,87E-03	5,57E-04	2,35E-03	1,08E-02	1,03E-04	1,42E-03	0,00E+00	0,00E+00	1,44E-05	2,62E-04	3,54E-05	-3,88E-03
GWP - LULUC [kg CO_2 eq.]	2,60E-04	3,05E-03	1,62E-05	3,33E-03	1,12E-05	8,17E-07	0,00E+00	0,00E+00	2,03E-06	1,06E-05	4,25E-05	-9,34E-05
ODP [kg CFC-11 eq.]	5,46E-12	2,97E-14	2,16E-13	5,71E-12	1,24E-14	1,98E-14	0,00E+00	0,00E+00	1,96E-15	5,42E-13	3,81E-14	-6,35E-12
AP [mol of H+ eq.]	4,37E-03	1,13E-03	1,08E-04	5,61E-03	1,23E-03	5,26E-06	0,00E+00	0,00E+00	2,12E-05	2,01E-04	6,91E-05	-1,27E-03
EP - freshwater [kg P eq.]	2,43E-06	7,85E-07	9,78E-08	3,31E-06	3,00E-08	7,52E-08	0,00E+00	0,00E+00	4,15E-09	1,74E-07	6,63E-06	-1,41E-06
EP - marine [kg N eq.]	1,39E-03	4,11E-04	4,11E-05	1,84E-03	5,01E-04	1,34E-06	0,00E+00	0,00E+00	8,39E-06	4,53E-05	1,49E-05	-3,98E-04
EP - terrestrial [mol of N eq.]	1,50E-02	4,59E-03	4,55E-04	2,00E-02	5,50E-03	1,95E-05	0,00E+00	0,00E+00	9,41E-05	8,39E-04	1,63E-04	-4,29E-03
POCP [kg NMVOC eq.]	5,86E-03	1,13E-03	1,44E-04	7,13E-03	1,23E-03	3,96E-06	0,00E+00	0,00E+00	2,30E-05	1,31E-04	4,76E-05	-1,39E-03
ADPe [kg Sb eq.]*	4,24E-06	1,66E-08	3,97E-08	4,30E-06	2,86E-09	4,05E-10	0,00E+00	0,00E+00	4,22E-10	9,52E-09	7,68E-10	-7,78E-08
ADPf [MJ]*	7,91E+01	2,85E+00	1,28E+00	8,32E+01	1,45E+00	2,84E-02	0,00E+00	0,00E+00	2,09E-01	7,20E-01	1,95E-01	-2,22E+01
WDP [m^3 world equiv.]*	3,68E-01	2,88E-03	8,91E-02	4,60E-01	2,59E-04	2,32E-03	0,00E+00	0,00E+00	3,95E-05	1,41E-01	1,49E-03	-1,21E-01

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.

*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 according to EN 15804+A2:2019 chapter 7.2.3.2.

LCA results – Resource use per declared unit

RESOURCE USE												
	A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE [MJ]	4,56E+00	2,08E-01	1,11E-01	4,88E+00	9,64E-03	1,67E-02	0,00E+00	0,00E+00	1,53E-03	3,35E-01	2,95E-02	-4,25E+00
PERM [MJ]	0,00E+00	0,00E+00	1,17E-02	1,17E-02	0,00E+00	-3,52E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT [MJ]	4,56E+00	2,08E-01	1,22E-01	4,89E+00	9,64E-03	1,32E-02	0,00E+00	0,00E+00	1,53E-03	3,35E-01	2,95E-02	-4,25E+00
PENRE [MJ]	3,31E+01	2,85E+00	4,98E-01	3,64E+01	1,45E+00	3,19E-01	0,00E+00	0,00E+00	2,09E-01	2,16E+01	1,95E-01	-2,22E+01
PENRM [MJ]	4,60E+01	0,00E+00	7,87E-01	4,68E+01	0,00E+00	-2,91E-01	0,00E+00	0,00E+00	0,00E+00	-2,09E+01	0,00E+00	0,00E+00
PENRT [MJ]	7,91E+01	2,85E+00	1,28E+00	8,32E+01	1,45E+00	2,84E-02	0,00E+00	0,00E+00	2,09E-01	7,20E-01	1,95E-01	-2,22E+01
SM [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	0,00E+00	0,00E+00	0,00E+00	1,36E-01
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	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	0,00E+00	0,00E+00	0,00E+00
FW [m³]	9,63E-03	2,32E-04	2,21E-03	1,21E-02	1,08E-05	5,86E-05	0,00E+00	0,00E+00	1,67E-06	3,41E-03	4,46E-05	-4,25E-03

Caption: 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; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = 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 secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

LCA results – Output flows and waste categories per declared unit

WASTE CATEGORIES AND OUTPUT FLOWS												
	A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
HWD [kg]	1,78E-08	1,06E-10	1,46E-08	3,25E-08	5,06E-11	8,33E-10	0,00E+00	0,00E+00	7,61E-12	1,87E-08	4,82E-11	-8,71E-09
NHWD [kg]	1,79E-02	4,34E-04	3,97E-03	2,23E-02	1,48E-04	4,45E-03	0,00E+00	0,00E+00	2,18E-05	1,21E-02	3,91E-01	-8,18E-03
RWD [kg]	6,06E-04	4,88E-06	1,21E-05	6,23E-04	2,12E-06	2,83E-06	0,00E+00	0,00E+00	3,33E-07	8,10E-05	2,75E-06	-9,26E-04
EEE [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	0,00E+00	0,00E+00	0,00E+00
EET [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,79E-03	0,00E+00	0,00E+00	0,00E+00	1,52E-01	0,00E+00	0,00E+00
CRU [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	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,29E-02	0,00E+00	0,00E+00	0,00E+00	3,03E+00	0,00E+00	0,00E+00
MFR [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,60E-02	0,00E+00	0,00E+00	0,00E+00	5,39E+00	0,00E+00	0,00E+00

.Caption: 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; EEE = Exported electrical energy; EET = Exported thermal energy

LCA results – Biogenic carbon content of product and packaging per declared unit

Biogenic carbon content of product and packaging	
Biogenic carbon content in product [kg]	0,00E+00
Biogenic carbon content in packaging [kg]	2,60E-04

Assumptions and approximations

Where possible, a conservative approach has been adopted, overestimating burdens to prove irrelevance. In other cases, proxy data were selected based on scientific experience, in order to improve the accuracy of the model. Where it was not possible to know the precise composition of materials in the supply chain (due to commercial or industrial confidential suppliers' reasons or due to missing datasets), these have been approximated with LCIs of similar materials, estimated by the combination of available dataset or reconstructed with literature data.

1. Where potential benefits from energy recovery in A5 and C modules are considered, for rest of world countries (other than Europe) these are calculated based on the European grid mix.
2. Wastes deriving from extraordinary maintenance activities have not been considered.
3. Some components produced by third party companies come to NUPI with their own packaging. This packaging is not accounted for in this study.
4. In case of CCHP system in place as electricity is produced only for internal use, no electricity is sent to national grid.
5. Internal transports between production sites have not been considered
6. A European scenario has been considered for end of life scenarios.

Cut off criteria

EN 15804+A2:2019 requires that where there are data gaps or insufficient input data for a unit process the cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of this unit process. It can be concluded that the total sum of neglected material flows does not exceed 5% of mass, energy or environmental relevance. On the other hand, impacts generated from the machinery and facilities itself are neglected. This is in accordance with ISO14040/44 (2006).

In this study, the only aspects that have been omitted are the polyamide strips for packaging as they are <1% of their respective unit processes.

Data quality

The data quality can be considered as good. The LCA model has been checked and most relevant flows were considered. Technological, geographical and temporal representativeness is good.

Examination period

Primary data collected in the context of this study refer to 2024.

Allocation of background data

In general, the allocation principles used in standard Sphera LCA for Expert (previously GaBi Professional) datasets are explained within Sphera LCA for Expert (GaBi)-Documentation (MANAGED LCA CONTENT (GABI DATABASES)).

- **Module A1** includes the manufacture of primary materials which are required for the pipes manufacturing. The datasets for the primary basic materials already include their upstream process. The energy demand is also considered.
- **Module A2** includes the transports of the basic materials to the pipes producer. Fuel use is also included in the transport sub-plans. Truck-trailer, Euro 6 A-C, 20 - 28t gross weight / 12.4t payload capacity , Container ship, 5,000 to 200,000 dwt payload capacity, deep sea and Rail transport cargo - average, average train, gross tonne weight 1,000t / 726t payload capacity are used as standard processes in the model.

- **Module A3** includes the production of pipes, auxiliaries and packaging materials. In this module are also considered emissions to air, production of wastes and their treatment (such activities refer to NUPI Industrie Italiane S.p.A. direct activities. Primary data have been used for (such as plastic extrusion for pipes production and emissions/wastes).
- **Module A4** takes into account the transport to the final customer/distributor or construction site. The distribution scenario is taken from an internal survey and shown below:

Means of transport	GaBi transport dataset	Weighted Average distance [km]
Truck	Truck, Euro 5, > 32 t/ 24.7% utilization factor 33,5 t truck max load	408,10
Ship	Average ship, 5000-200000 dwt payload capacity/ deep sea	1868,97

- **Module C1** (Deconstruction / demolition)- As generic scenario for the demolition of piping system, it is considered that it is mainly demolished together with the construction of the building. During the demolition of a building a significant amount of energy is used. This energy is mainly used to break inert waste streams, such as concrete and brick, and only a very little, insignificant part could be allocated to the piping system. Therefore, the impact of the deconstruction/demolition stage allocated to the piping system can be considered as zero.
- **Module C2, C3** (sorting, recycling and incineration with energy recovery) and C4 (landfilling) consider the end of life scenarios of the product, considering all components. The percentages to the given scenarios have been taken from MFA JRC 2025 (2024 data) as shown below:

  - 45.5 % incineration, 39.3% landfill, 15,2% recycling typical for products made of PP.

  For transport from the installation site to the treatment site, reference can be made to the document /TEPPFA EOL SCENARIO/ where it is stated that:
  • incineration = 150 km
  • recycling = 500 km
  • landfilling = 50 km

Module D consists of loads and benefits beyond the system boundaries.

Other additional environmental information

Emissions to indoor air:

No direct emissions at the building site. Nupi Industrie Italiane S.p.A confirms that the NIRON AND POLYSYSTEM pipes do not contain any substances mentioned on the REACH-list.

Emissions to soil and water:

No direct emissions at the building site. Nupi Industrie Italiane S.p.A confirms that NIRON AND POLYSYSTEM pipes do not contain any substances mentioned on the REACH-list.

Annex I - Products specific weight table

Items Code	Description	Pipe Weight (kg/m)
03TNIRR11011	PIPE NIRON PPR blue ø110 (SDR11 - S5)	2,96
03TNIRR1106	PIPE NIRON PPR blue ø110 (SDR 6 - S 2,5)	4,92
03TNIRR11074	PIPE NIRON PPR blue ø110 (SDR 7,4 -S 3,2)	4,25
03TNIRR12511	PIPE NIRON PPR blue ø125 (SDR11 - S5)	3,84
03TNIRR1256	PIPE NIRON PPR blue ø125 (SDR 6 - S 2,5)	6,30
03TNIRR12574	PIPE NIRON PPR blue ø125 (SDR 7,4 -S 3,2)	5,41
03TNIRR16011	PIPE NIRON PPR blue ø160 (SDR11 - S5)	6,22
03TNIRR16074	PIPE NIRON PPR blue ø160 (SDR 7,4 -S 3,2)	8,79
03TNIRR166	PIPE NIRON PPR blue ø16 (SDR 6 - S 2,5)	0,11
03TNIRR20011	PIPE NIRON PPR blue ø200 (SDR11 - S5)	9,76
03TNIRR20074	PIPE NIRON PPR blue ø200 (SDR 7,4 -S 3,2)	13,70
03TNIRR206	PIPE NIRON PPR blue ø20 (SDR 6 - S 2,5)	0,17
03TNIRR2074	PIPE NIRON PPR blue ø20 (SDR 7,4 -S 3,2)	0,15
03TNIRR25011	PIPE NIRON PPR blue ø250 (SDR11 - S5)	15,00
03TNIRR256	PIPE NIRON PPR blue ø25 (SDR 6 - S 2,5)	0,26
03TNIRR2574	PIPE NIRON PPR blue ø25 (SDR 7,4 -S 3,2)	0,23
03TNIRR31511	PIPE NIRON PPR blue ø315 (SDR11 - S5)	25,17
03TNIRR3211	PIPE NIRON PPR blue ø32 (SDR11 - S5)	0,26
03TNIRR326	PIPE NIRON PPR blue ø32 (SDR 6 - S 2,5)	0,43
03TNIRR3274	PIPE NIRON PPR blue ø32 (SDR 7,4 -S 3,2)	0,37
03TNIRR35511	PIPE NIRON PPR blue ø355 (SDR11 - S5)	30,00
03TNIRR40011	PIPE NIRON PPR blue ø400 (SDR11 - S5)	38,00
03TNIRR4011	PIPE NIRON PPR blue ø40 (SDR11 - S5)	0,40
03TNIRR406	PIPE NIRON PPR blue ø40 (SDR 6 - S 2,5)	0,66
03TNIRR4074	PIPE NIRON PPR blue ø40 (SDR 7,4 -S 3,2)	0,57
03TNIRR5011	PIPE NIRON PPR blue ø50 (SDR11 - S5)	0,63
03TNIRR506	PIPE NIRON PPR blue ø50 (SDR 6 - S 2,5)	1,03
03TNIRR5074	PIPE NIRON PPR blue ø50 (SDR 7,4 -S 3,2)	0,88
03TNIRR6311	PIPE NIRON PPR blue ø63 (SDR11 - S5)	0,99
03TNIRR636	PIPE NIRON PPR blue ø63 (SDR 6 - S 2,5)	1,62
03TNIRR6374	PIPE NIRON PPR blue ø63 (SDR 7,4 -S 3,2)	1,39
03TNIRR7511	PIPE NIRON PPR blue ø75 (SDR11 - S5)	1,37
03TNIRR756	PIPE NIRON PPR blue ø75 (SDR 6 - S 2,5)	2,29

Items Code	Description	Pipe Weight (kg/m)
03TNIRR7574	PIPE NIRON PPR blue ø75 (SDR 7,4 -S 3,2)	1,99
03TNIRR9011	PIPE NIRON PPR blue ø90 (SDR11 - S5)	1,99
03TNIRR906	PIPE NIRON PPR blue ø90 (SDR 6 - S 2,5)	3,30
03TNIRR9074	PIPE NIRON PPR blue ø90 (SDR 7,4 -S 3,2)	2,83
03TNIRRCT1109	PIPE NIRON PP-RCT blue ø110 (SDR9 - S4)	3,54
03TNIRRCT1259	PIPE NIRON PP-RCT blue ø125 (SDR9 - S4)	4,58
03TNIRRCT1609	PIPE NIRON PP-RCT blue ø160 (SDR9 - S4)	7,46
03TNIRRCT2009	PIPE NIRON PP-RCT blue ø200 (SDR9 - S4)	11,57
03TNIRRCT2074	PIPE NIRON PP-RCT blue ø20 (SDR 7,4 -S 3,2)	0,15
03TNIRRCT2509	PIPE NIRON PP-RCT blue ø250 (SDR9 - S4)	17,96
03TNIRRCT2574	PIPE NIRON PP-RCT blue ø25 (SDR 7,4 -S 3,2)	0,23
03TNIRRCT3159	PIPE NIRON PP-RCT blue ø315 (SDR9 - S4)	28,68
03TNIRRCT329	PIPE NIRON PP-RCT blue ø32 (SDR9 - S4)	0,31
03TNIRRCT3559	PIPE NIRON PP-RCT blue ø355 (SDR9 - S4)	35,35
03TNIRRCT409	PIPE NIRON PP-RCT blue ø40 (SDR9 - S4)	0,48
03TNIRRCT509	PIPE NIRON PP-RCT blue ø50 (SDR9 - S4)	0,74
03TNIRRCT639	PIPE NIRON PP-RCT blue ø63 (SDR9 - S4)	1,17
03TNIRRCT759	PIPE NIRON PP-RCT blue ø75 (SDR9 - S4)	1,65
03TNIRRCT909	PIPE NIRON PP-RCT blue ø90 (SDR9 - S4)	2,38
03TNIRRV11011	PIPE NIRON PPR PURPLE ø110 (SDR11 - S5)	2,96
03TNIRRV12511	PIPE NIRON PPR PURPLE ø125 (SDR11 - S5)	3,84
03TNIRRV2074	PIPE NIRON PPR PURPLE ø20 (SDR 7,4 -S 3,2)	0,15
03TNIRRV2574	PIPE NIRON PPR PURPLE ø25 (SDR 7,4 -S 3,2)	0,23
03TNIRRV3211	PIPE NIRON PPR PURPLE ø32 (SDR11 - S5)	0,26
03TNIRRV4011	PIPE NIRON PPR PURPLE ø40 (SDR11 - S5)	0,40
03TNIRRV5011	PIPE NIRON PPR PURPLE ø50 (SDR11 - S5)	0,63
03TNIRRV6311	PIPE NIRON PPR PURPLE ø63 (SDR11 - S5)	0,99
03TNIRRV7511	PIPE NIRON PPR PURPLE ø75 (SDR11 - S5)	1,37
03TNIRRV9011	PIPE NIRON PPR PURPLE ø90 (SDR11 - S5)	1,99
27TNIRR2511R120	PIPE PP-RCT monolayer ø25 (SDR 11 - S 5)	0,16
27TNIRR2511R61	PIPE PP-RCT monolayer ø25 (SDR 11 - S 5)	0,16
27TNIRR3211R61	PIPE PP-RCT monolayer ø32 (SDR 11 - S 5)	0,26
27TNIRR11011	PIPE NIRON PPR blue ø110 (SDR11 - S5)	2,96
27TNIRR1106	PIPE NIRON PPR blue ø110 (SDR 6 - S 2,5)	4,92
27TNIRR11074	PIPE NIRON PPR blue ø110 (SDR 7,4 -S 3,2)	4,25
27TNIRR12511	PIPE NIRON PPR blue ø125 (SDR11 - S5)	3,84
27TNIRR1256	PIPE NIRON PPR blue ø125 (SDR 6 - S 2,5)	6,30
27TNIRR12574	PIPE NIRON PPR blue ø125 (SDR 7,4 -S 3,2)	5,41

Items Code	Description	Pipe Weight (kg/m)
27TNIRR16011	PIPE NIRON PPR blue ø160 (SDR11 - S5)	6,22
27TNIRR16074	PIPE NIRON PPR blue ø160 (SDR 7,4 -S 3,2)	8,79
27TNIRR166	PIPE NIRON PPR blue ø16 (SDR 6 - S 2,5)	0,11
27TNIRR20011	PIPE NIRON PPR blue ø200 (SDR11 - S5)	9,76
27TNIRR20074	PIPE NIRON PPR blue ø200 (SDR 7,4 -S 3,2)	13,70
27TNIRR206	PIPE NIRON PPR blue ø20 (SDR 6 - S 2,5)	0,17
27TNIRR2074	PIPE NIRON PPR blue ø20 (SDR 7,4 -S 3,2)	0,15
27TNIRR25011	PIPE NIRON PPR blue ø250 (SDR11 - S5)	15,00
27TNIRR256	PIPE NIRON PPR blue ø25 (SDR 6 - S 2,5)	0,26
27TNIRR2574	PIPE NIRON PPR blue ø25 (SDR 7,4 -S 3,2)	0,23
27TNIRR31511	PIPE NIRON PPR blue ø315 (SDR11 - S5)	25,17
27TNIRR3211	PIPE NIRON PPR blue ø32 (SDR11 - S5)	0,26
27TNIRR326	PIPE NIRON PPR blue ø32 (SDR 6 - S 2,5)	0,43
27TNIRR3274	PIPE NIRON PPR blue ø32 (SDR 7,4 -S 3,2)	0,37
27TNIRR35511	PIPE NIRON PPR blue ø355 (SDR11 - S5)	30,00
27TNIRR40011	PIPE NIRON PPR blue ø400 (SDR11 - S5)	38,00
27TNIRR4011	PIPE NIRON PPR blue ø40 (SDR11 - S5)	0,40
27TNIRR406	PIPE NIRON PPR blue ø40 (SDR 6 - S 2,5)	0,66
27TNIRR4074	PIPE NIRON PPR blue ø40 (SDR 7,4 -S 3,2)	0,57
27TNIRR5011	PIPE NIRON PPR blue ø50 (SDR11 - S5)	0,63
27TNIRR506	PIPE NIRON PPR blue ø50 (SDR 6 - S 2,5)	1,03
27TNIRR5074	PIPE NIRON PPR blue ø50 (SDR 7,4 -S 3,2)	0,88
27TNIRR6311	PIPE NIRON PPR blue ø63 (SDR11 - S5)	0,99
27TNIRR636	PIPE NIRON PPR blue ø63 (SDR 6 - S 2,5)	1,62
27TNIRR6374	PIPE NIRON PPR blue ø63 (SDR 7,4 -S 3,2)	1,39
27TNIRR7511	PIPE NIRON PPR blue ø75 (SDR11 - S5)	1,37
27TNIRR756	PIPE NIRON PPR blue ø75 (SDR 6 - S 2,5)	2,29
27TNIRR7574	PIPE NIRON PPR blue ø75 (SDR 7,4 -S 3,2)	1,99
27TNIRR9011	PIPE NIRON PPR blue ø90 (SDR11 - S5)	1,99
27TNIRR906	PIPE NIRON PPR blue ø90 (SDR 6 - S 2,5)	3,30
27TNIRR9074	PIPE NIRON PPR blue ø90 (SDR 7,4 -S 3,2)	2,83
16V6002	PIPE POLYSYSTEM green PP-R ø20 x 3,4	0,17
16V6003	PIPE POLYSYSTEM green PP-R ø25 x 4,2	0,26
16V6004	PIPE POLYSYSTEM green PP-R ø32 x 5,4	0,43
16V6005	PIPE POLYSYSTEM green PP-R ø40 x 6,7	0,66
16V6006	PIPE POLYSYSTEM green PP-R ø50 x 8,3	1,03
16V6007	PIPE POLYSYSTEM green PP-R ø63 x 10,5	1,62
16V6008	PIPE POLYSYSTEM green PP-R ø75 x 12,5	2,29

Items Code	Description	Pipe Weight (kg/m)
16V6009	PIPE POLYSYSTEM green PP-R ø90 x 15	3,30
16V6010	PIPE POLYSYSTEM green PP-R ø110 x 18,3	4,92
16V6011	PIPE POLYSYSTEM green PP-R ø125 x 20,8	6,37
16VCT60026	PIPE POLYSYSTEM green PP-R ø20 SDR6	0,17
16VCT60036	PIPE POLYSYSTEM green PP-R ø25 SDR6	0,26
16VCT60046	PIPE POLYSYSTEM green PP-R ø32 SDR6	0,43
16VCT60056	PIPE POLYSYSTEM green PP-R ø40 SDR6	0,66
16VCT60066	PIPE POLYSYSTEM green PP-R ø50 SDR6	1,03
16VCT60076	PIPE POLYSYSTEM green PP-R ø63 SDR6	1,62
16VCT60086	PIPE POLYSYSTEM green PP-R ø75 SDR6	2,29
16VCT60096	PIPE POLYSYSTEM green PP-R Ø90sdr6	3,30
16VCT60106	PIPE POLYSYSTEM green PP-R ø110 SDR6	4,92
16VCT60116	PIPE POLYSYSTEM green PP-R ø125 SDR6	6,37
16VCT600274	PIPE POLYSYSTEM green PP-R ø20 SDR 7,4	0,16
16VCT600374	PIPE POLYSYSTEM green PP-R ø25 SDR 7,4	0,25
16VCT600474	PIPE POLYSYSTEM green PP-R ø32 SDR 7,4	0,40
16VCT600574	PIPE POLYSYSTEM green PP-R ø40 SDR 7,4	0,62
16VCT600674	PIPE POLYSYSTEM green PP-R ø50 SDR 7,4	0,95
16VCT600774	PIPE POLYSYSTEM green PP-R ø63 SDR 7,4	1,48
16VCT600874	PIPE POLYSYSTEM green PP-R ø75 SDR 7,4	2,10
16VCT600974	PIPE POLYSYSTEM green PP-R ø90 SDR 7,4	3,01
16VCT601074	PIPE POLYSYSTEM green PP-R ø110 SDR 7,4	4,52
16VCT601174	PIPE POLYSYSTEM green PP-R ø125 SDR 7,4	5,78
16VCT601274	PIPE POLYSYSTEM green PP-R ø160 SDR 7,4	9,36
16VCT601374	PIPE POLYSYSTEM green PP-R ø200 SDR 7,4	15,57

References

ISO 14040: Environmental management - Life cycle assessment - Principles and framework.

ISO 14044: Environmental Management – Life Cycle Assessment – Requirements and Guidelines.

ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

EN 15804+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products.

MANAGED LCA CONTENT (GABI DATABASES) - Life cycle assessment database, by Sphera Solutions GmbH, Leinfelden-Echterdingen, 2024.2 https://sphera.com/life-cycle-assessment-lca-database/

SPHERA LCA FOR EXPERT (GABI) - Life cycle assessment software (version 10), by Sphera Solutions GmbH, Leinfelden-Echterdingen, 2024 https://sphera.com/life-cycle-assessment-lca-software/

UNI EN 16904:2025 – Plastics piping systems inside the building structure - Environmental product.

declarations - Product category rules complementary to EN 15804.

PCR-ICMQ-001-15_Rev-3.2; 03/11/2025 – PCR for construction products.

REGULATIONS OF THE EPDItaly PROGRAMME V.6.

EN 15941 - Sustainability of construction works - Data quality for environmental assessment of products and construction work - Selection and use of data.

CEN/TR 16970:2016 - Sustainability of construction works - Guidance for the implementation of EN 15804.

EPD background report NUPI LCA tool v.8.1 30-01-2025.

EUROSTAT 2021 - Packaging waste by waste management operations.