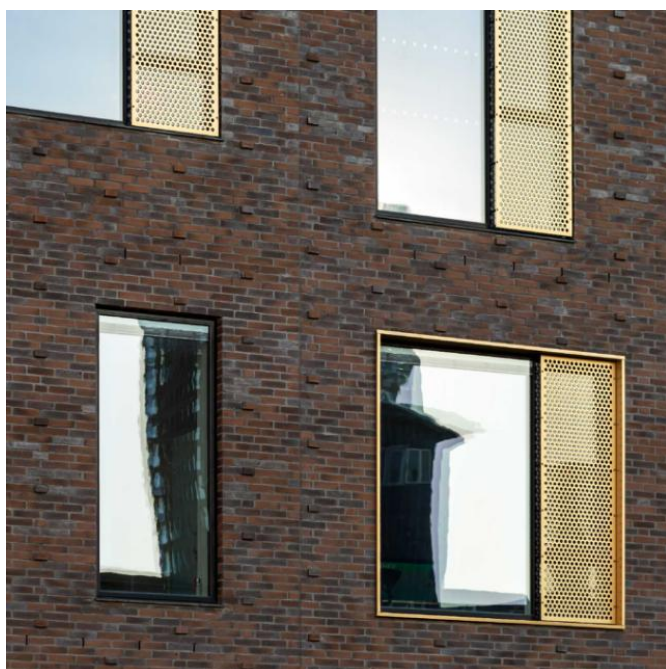


# Wood/aluminium triple glazed windows



## Owner of the EPD:

Cetonia A/S  
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Tel.: 88 514 240  
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## EPD Program Operator:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner [www.eco-platform.org](http://www.eco-platform.org)

## Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

**Life cycle analysis (LCA):** A1-A3, C1-C4 and D modules in accordance with EN 15804 (Cradle-to-Gate with options)

**The year of preparing the EPD:** 2023

**Product standard:** EN 14351-1+A2

**Service Life:** 50 years

**PCR:** ITB-PCR A

**Functional unit:** 1 m<sup>2</sup> wood/aluminium window with dimensions of 1230 x 1480 mm

**Reasons for performing LCA:** B2B

**Representativeness:** European

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### MANUFACTURER

Cetonia A/S is a Danish company specialized in the production of wood and aluminum windows and doors for buildings. Its portfolio encompasses wide range of windows, doors for both private and professional costumers in Denmark. Cetonia A/S produces windows and doors which can be built together in many different ways for the costumers individual specifications. The products are manufactured at the production plant in Denmark and then transported to the costumer.



*Fig. 1. Cetonia A/S manufacturing plant located in Bjerringbro, Denmark.*

### PRODUCTS DESCRIPTION AND APPLICATION

Wood/aluminium windows are a standard and representative windows covered by this declaration. EPD covers triple glazed window with dimensions of 1230 x 1480 mm and it comes from a Porthos+ group system. The specifications of Porthos+ wood/aluminium windows produced by Cetonia A/S are presented in Table 1.

*Table 1. The specification of Porthos+ wood/aluminium windows with dimensions of 1230 x 1480 mm and triple glazing produced by Cetonia A/S*

Type	Design	gw	F <sub>f</sub>	Min.toi (°C)	E <sub>ref</sub> (kWh/m <sup>2</sup> )	U <sub>w</sub> (W/m <sup>2</sup> K)
Tilt and turn window		0.4028	0.76	14.4	10.4	0.76
Fixed window		0.4611	0.87	14.3	29.1	0.68

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Wood/aluminium triple glazed windows with dimensions of 1230 x 1480 mm have weight about 67.7 kg, including 12.7 kg. wood, 5.1 kg. aluminium, 4.5 kg. composite PVC, 43.8 kg. glass and 1.6 kg. paints (Table 2).

*Table 2. Composition and percentage of input materials of triple glazed wood-aluminium window with dimensions of 1230 x 1480 mm produced by Cetonia A/S.*

<b>Input material</b>	<b>Content (mass basis)</b>	<b>Unit</b>	<b>Percentage</b>
Wood	12.72	kg	18.8
Aluminium	5.05	kg	7.5
PVC	4.54	kg	6.7
Glass	43.81	kg	64.7
Paints	1.60	kg	2.4
<b>Total</b>	<b>67.72</b>		<b>100.0</b>

### LIFE CYCLE ASSESSMENT (LCA) – general rules applied

#### Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the wood/aluminum windows is a line process conducted in the manufacturing plant located in Bjerringbro (Denmark). All impacts from raw materials extraction and processing are allocated in A1 module of EPD. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Energy supply was inventoried for whole production process. Packaging materials were taken into consideration.

#### System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804 + A2 and ITB PCR A. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804 + A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

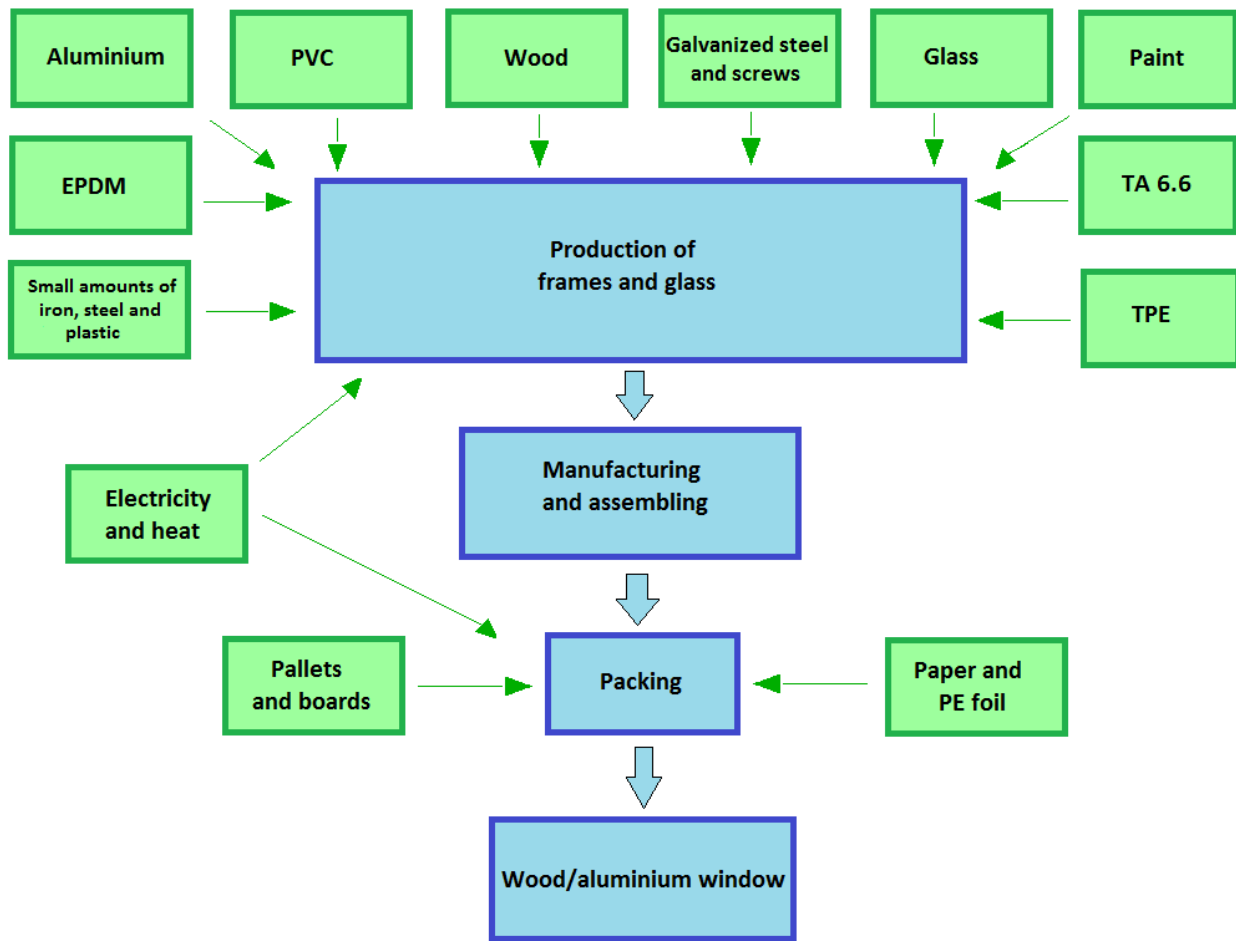


Fig. 2. A scheme of wood/aluminum windows production by Cetonia A/S

### Modules A1 and A2: Raw materials supply and transport

Raw materials such as wood, aluminium, rigid PVC grey, glass and paints are produced in European plants of leading chemical manufacturers whereas other ancillary items come mainly from local Danish suppliers. Data on transport of the different products to the manufacturing plants is collected and modelled for factory by assessor. Means of transport include average (10 – 16 t) and big (>16 t) trucks are applied. Based on data provided by the manufacturer, all input of transport resources was inventoried in details.

### Module A3: Production

A scheme of wood/aluminum windows production process is presented in Fig. 2.

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### Modules C1-C4 and D: End-of-life (EoL)

It is assumed that at the end-of-life, 100% of wood/aluminium windows are demounted using electric tools (module C1) and it is transported to waste processing plant distant by 60 km, on 16-32 t lorry (Euro 5) (module C2). Materials recovered from dismantled products are recycled, incinerated (module C3) and landfilled (module C4) according to the realistic treatment practice (mass allocation) of industrial waste what is presented in Table 3. 95% of the resulting aluminium undergo recycling after sorting and cutting while the remaining 5% is forwarded to landfill as mixed construction and demolition wastes. In turn, 90% of wood is incinerated while the 10% remaining waste materials are forwarded to landfill in the form of mixed construction and demolition wastes. A potential credit resulting from the recycling of aluminium, plastic and glass are presented in module D. Utilization of packaging material which constitute less than 1 % of the total system flows was not taken into consideration.

Table 3. End-of-life scenario for wood/aluminium windows manufactured by Cetonia A/S

Material	Waste processing	Landfilling
wood	90 %	10 %
aluminium	95 %	5 %
plastic	60 %	40 %
glass	98 %	2 %

### Data quality

The data selected for LCA analysis originates from ITB-LCI questionnaires completed by Cetonia A/S using the inventory data, ITB and Ecoinvent database v. 3.9. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good. Data for Danish electricity was supported by Ecoinvent database v. 3.9. Specific EPDs were used for wood, hydro aluminium extrusion ingot and glass inputs. Environmental characteristics that were not included in these EPDs sent by the manufacturer were taken from the Ecoinvent.

### Data collection period

The data for manufacture of the declared products refers to period between 01.07.2021 – 30.06.2022 (1 year). The life cycle assessments were prepared for Europe as reference area.

### Assumptions and estimates

Impacts were inventoried and calculated for triple glazed wood/aluminium windows with dimensions of 1230 x 1480 mm which are a standard and representative for the Porthos+ group system.

### Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

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### Databases

The data for the processes comes from Ecoinvent v. 3.9 and ITB-Database. Specific data quality analysis was a part of external audit.

### LIFE CYCLE ASSESSMENT (LCA) – Results

#### Declared unit

The declaration refers to declared unit (DU) – 1 m<sup>2</sup> wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing, manufactured by Cetonia A/S.

Table 4. System boundaries for the environmental characteristic of wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

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Table 5. LCA results of wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing – environmental impacts

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	4.12E+01	1.03E+00	2.26E+00	4.45E+01	1.41E-02	3.72E-01	1.05E+01	1.59E-01	-3.40E+01
Greenhouse gas potential - fossil	eq. kg CO2	5.42E+01	1.03E+00	2.11E+00	5.74E+01	1.32E-02	3.71E-01	1.20E+00	9.34E-02	-7.86E+01
Greenhouse gas potential - biogenic	eq. kg CO2	-1.47E+01	4.01E-03	1.44E-01	-1.46E+01	9.10E-04	1.27E-03	9.27E+00	6.60E-02	1.86E-01
Global warming potential - land use and land use change	eq. kg CO2	1.68E+00	4.63E-04	6.56E-03	1.69E+00	4.19E-05	1.46E-04	3.17E-04	1.81E-05	-8.39E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	4.55E-06	2.33E-07	4.86E-08	4.83E-06	2.84E-10	8.59E-08	7.82E-08	3.69E-09	-3.70E-06
Soil and water acidification potential	eq. mol H+	4.53E-01	4.12E-03	8.19E-03	4.65E-01	5.17E-05	1.51E-03	3.87E-03	1.58E-04	-2.64E-01
Eutrophication potential - freshwater	eq. kg P	1.39E-02	7.78E-05	1.65E-03	1.57E-02	1.05E-05	2.49E-05	1.14E-04	3.29E-06	-8.66E-03
Eutrophication potential - seawater	eq. kg N	1.32E-01	1.21E-03	2.11E-03	1.35E-01	1.25E-05	4.55E-04	1.65E-03	6.61E-04	-8.53E-02
Eutrophication potential - terrestrial	eq. mol N	1.39E+00	1.32E-02	2.24E-02	1.42E+00	1.42E-04	4.96E-03	1.67E-02	5.98E-04	-1.05E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.08E-01	4.06E-03	5.32E-03	2.18E-01	3.36E-05	1.52E-03	4.51E-03	2.18E-04	-2.60E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	4.45E-04	4.48E-06	1.37E-05	4.64E-04	8.71E-08	1.32E-06	5.13E-06	5.56E-08	-5.23E-04
Abiotic depletion potential - fossil fuels	MJ	6.57E+02	1.51E+01	3.54E+01	7.08E+02	2.23E-01	5.51E+00	6.64E+00	4.45E-01	-3.62E+02
Water deprivation potential	eq. m <sup>3</sup>	2.66E+01	7.67E-02	1.53E+00	2.82E+01	9.51E-03	2.55E-02	5.68E-01	2.55E-03	-2.35E+01

Table 6. LCA results of wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing – additional impacts indicators

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

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Table 7. LCA results of wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing - the resource use

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.61E+02	2.49E-01	3.40E+01	2.95E+02	2.17E-01	7.90E-02	-8.75E+01	-9.77E+00	-8.78E+01
Consumption of renewable primary energy resources used as raw materials	MJ	1.17E+02	0.00E+00	0.00E+00	1.17E+02	0.00E+00	0.00E+00	8.80E+01	9.78E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.77E+02	2.49E-01	3.40E+01	4.12E+02	2.17E-01	7.90E-02	6.02E-01	8.12E-03	-3.51E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	6.03E+02	1.51E+01	3.49E+01	6.53E+02	2.23E-01	5.51E+00	-1.25E+02	1.81E-01	-2.76E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	5.96E+01	0.00E+00	0.00E+00	5.96E+01	0.00E+00	0.00E+00	1.27E+02	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	6.62E+02	1.51E+01	3.55E+01	7.13E+02	2.23E-01	5.51E+00	6.64E+00	4.26E-01	-1.01E+03
Consumption of secondary materials	kg	2.74E-01	5.92E-03	1.10E-02	2.91E-01	6.89E-05	1.85E-03	1.18E-02	1.60E-04	1.75E+00
Consumption of renewable secondary fuels	MJ	1.12E-01	6.76E-05	5.00E-05	1.12E-01	3.16E-07	2.03E-05	1.70E-04	5.83E-06	-8.34E-03
Consumption of non-renewable secondary fuels	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
Net consumption of freshwater resources	m <sup>3</sup>	1.03E+00	2.07E-03	6.78E-02	1.10E+00	4.11E-04	6.93E-04	1.63E-03	4.65E-04	-5.16E-01

Table 8. LCA results of wood/aluminium window with dimensions of 1230 x 1480 mm and triple glazing – waste categories

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	1.48E+00	1.90E-02	1.42E-01	1.65E+00	9.02E-04	6.18E-03	4.93E-02	6.77E-04	-1.31E+00
Non-hazardous waste neutralised	kg	3.84E+01	3.42E-01	7.83E+00	4.66E+01	4.99E-02	1.10E-01	6.00E-01	1.01E+00	-3.86E+01
Radioactive waste	kg	1.19E-03	1.04E-04	1.82E-04	1.48E-03	1.16E-06	3.79E-05	3.90E-05	1.67E-06	-1.48E-03
Components for re-use	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
Materials for recycling	kg	2.62E-02	5.08E-05	4.71E-03	3.09E-02	2.84E-05	1.71E-05	5.29E+00	2.05E-06	1.82E-01
Materials for energy recovery	kg	1.15E-04	4.06E-07	3.12E-03	3.23E-03	4.27E-09	1.38E-07	1.03E-06	1.45E-08	-3.66E-06
Energy exported	MJ	4.21E+00	1.80E-02	2.41E-03	4.23E+00	4.27E-09	6.11E-03	3.33E+00	6.61E-04	-4.99E-01



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### Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 + A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Halina Prejzner, PhD Eng LCA. LCI audit and input data verification: Mateusz Kozicki, PhD Verification of LCA: Michał Piasecki, PhD. DSc. Eng

Note: The declaration owner has the sole ownership, liability and responsibility for the declaration. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804 + A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

### Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification
- EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- EN 14351-1+A2 Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets



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Thermal Physics, Acoustics and Environment Department

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# CERTIFICATE No 450/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Wood/aluminium triple glazed windows

Manufacturer:

**Cetonia A/S**

Hedemølle Industrivej 1, 8850 Bjerringbro

confirms the correctness of the data included in the development of  
Type III Environmental Declaration and accordance with the requirements of the standard

**EN 15804+A2**

**Sustainability of construction works.**

**Environmental product declarations.**

**Core rules for the product category of construction products.**

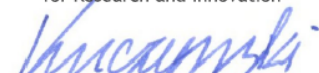
This certificate, issued on 10<sup>th</sup> May 2023 is valid for 5 years  
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics  
and Environment Department

  
Agnieszka Winkler-Skalna, PhD



Deputy Director  
for Research and Innovation

  
Krzysztof Kuczyński, PhD

Warsaw, May 2023