







## LCA: Calculation rules

### Declared unit:

1 pcs NorDan NTech Villa Topswing reversible - TG 105/80 (With Aluminium Cladding)

### Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis. The PCR specific background data follow the allocation rules in the Ecoinvent v3.7.1 Cut-off database version. The allocation of water, energy and waste flows within the production facilities for windows and doors follows unit-based allocation adjusted with a point system to different product groups or products. This score system is regulated by a factor which increases with the resource intensity of each product. The unit-based allocation is adjusted by the weight of the product, excluding the weight of glass.

### Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

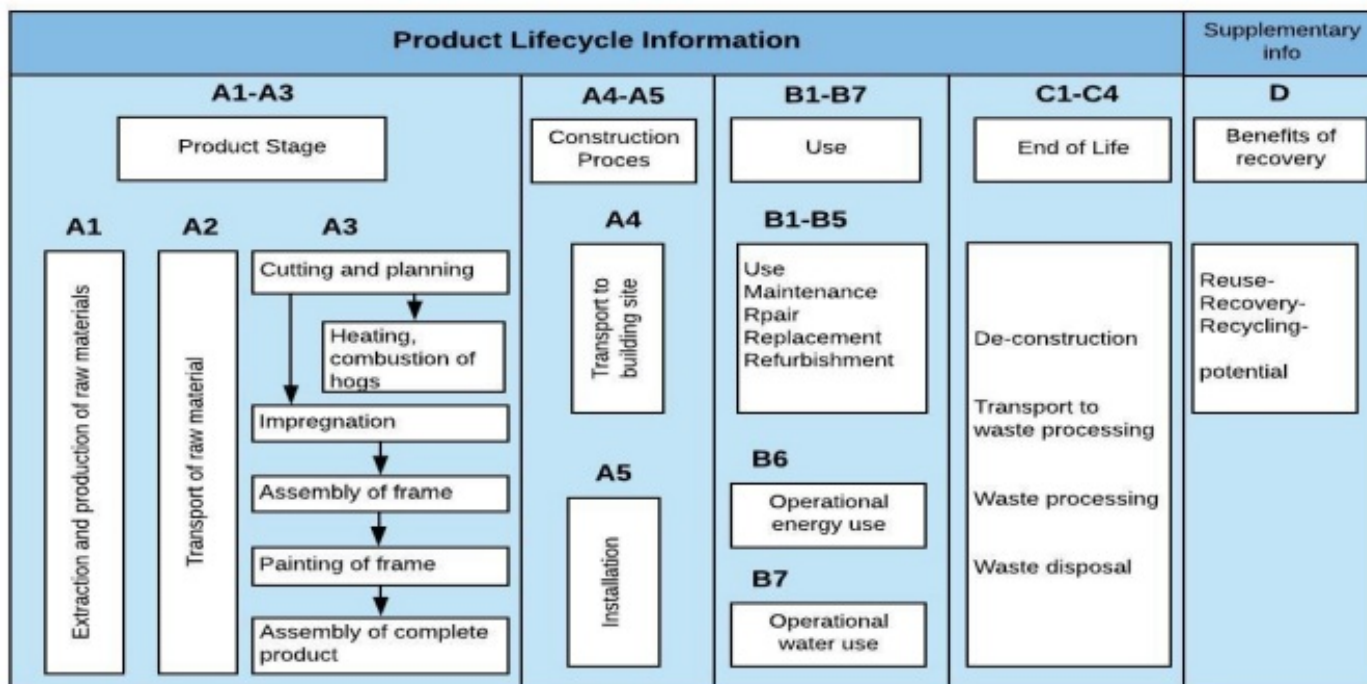
Material quantities of the specified product in reference size have been calculated by NorDan's business system. The production data was collected in 2021 and is an average for 2020.

Materials	Source	Data quality	Year
Packaging - Plastic	ecoinvent 3.6	Database	2019
Packaging - Steel	ecoinvent 3.6	Database	2019
Argon gas - IGU	ecoinvent 3.7.1	Database	2020
Glass	ecoinvent 3.7.1	Database	2020
Insulation	ecoinvent 3.7.1	Database	2020
Absorbent - IGU	ecoinvent 3.7.1	Specific	2020
Adhesive and sealant	ecoinvent 3.7.1	Specific	2020
Aluminium	ecoinvent 3.7.1	Specific	2020
Coating materials	ecoinvent 3.7.1	Specific	2020
Gasket	ecoinvent 3.7.1	Specific	2020
Metal	ecoinvent 3.7.1	Specific	2020
Plastic	ecoinvent 3.7.1	Specific	2020
Sealant - IGU	ecoinvent 3.7.1	Specific	2020
Spacer - IGU	ecoinvent 3.7.1	Specific	2020
Wood	ecoinvent 3.7.1	Specific	2020
Packaging - Wood	Modified ecoinvent 3.6	Database	2019

### System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	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	MND	X	MND	X	MND	MND	MND	X	X	X	X	X

### System boundary:



### Additional technical information:

For the products with different sizes from the declared unit, the environmental impacts must be converted by using a conversion factor. The Norwegian EPD Foundation has published instructions on how to interpret EPDs for windows on its website ([www.epdnorge.no](http://www.epdnorge.no)) where different calculation methods have been stated. (Document: Bruksanvisninger i hvordan tolke EPD'er - Vinduer).






















## LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact												
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D	
 GWP-total	kg CO <sub>2</sub> -eq	1,22E+02	9,12E+00	5,46E+00	6,31E+01	0	0	4,86E-01	4,11E+01	5,27E-01	-6,68E+00	
 GWP-fossil	kg CO <sub>2</sub> -eq	1,56E+02	9,11E+00	1,58E-02	6,23E+01	0	0	4,85E-01	1,16E+01	5,26E-01	-6,54E+00	
 GWP-biogenic	kg CO <sub>2</sub> -eq	-3,34E+01	3,65E-03	5,44E+00	4,54E-01	0	0	2,08E-04	2,95E+01	3,94E-04	-1,69E-02	
 GWP-luluc	kg CO <sub>2</sub> -eq	1,43E-01	3,26E-03	2,28E-06	3,46E-01	0	0	1,72E-04	3,72E-04	1,58E-04	-1,18E-01	
 ODP	kg CFC11-eq	1,54E-05	2,13E-06	1,55E-09	7,20E-06	0	0	1,11E-07	2,19E-07	1,62E-07	-1,46E-01	
 AP	mol H <sup>+</sup> -eq	1,17E+00	7,15E-02	5,44E-05	5,29E-01	0	0	2,77E-03	1,17E-02	3,71E-03	-4,37E-02	
 EP-FreshWater	kg P -eq	8,08E-03	6,66E-05	8,46E-08	1,48E-03	0	0	3,99E-06	1,65E-05	5,25E-06	-3,99E-04	
 EP-Marine	kg N -eq	1,89E-01	1,71E-02	2,91E-05	8,91E-02	0	0	9,89E-04	5,23E-03	1,32E-03	-9,63E-03	
 EP-Terrestrial	mol N -eq	2,15E+00	1,90E-01	2,33E-04	1,04E+00	0	0	1,09E-02	5,30E-02	1,46E-02	-1,03E-01	
 POCP	kg NMVOC-eq	6,32E-01	5,70E-02	6,38E-05	2,73E-01	0	0	3,12E-03	1,36E-02	4,21E-03	-3,42E-02	
 ADP-minerals&metals <sup>1</sup>	kg Sb -eq	1,28E-03	1,52E-04	1,52E-07	7,66E-04	0	0	1,26E-05	5,76E-06	9,06E-06	-5,04E-05	
 ADP-fossil <sup>1</sup>	MJ	1,92E+03	1,42E+02	1,10E-01	7,38E+02	0	0	7,45E+00	1,57E+01	1,20E+01	-7,78E+01	
 WDP <sup>1</sup>	m <sup>3</sup>	2,39E+03	1,01E+02	2,48E-01	9,83E+01	0	0	7,06E+00	6,12E+01	2,39E+01	-1,71E+03	

GWP total Global Warming Potential total; GWP fossil Global Warming Potential fossil fuels ; GWP biogenic Global Warming Potential biogenic; GWP luluc Global Warming Potential land use change; ODP Ozone Depletion; AP Acidification; EP freshwater Eutrophication aquatic freshwater; EP marine Eutrophication aquatic marine; EP terrestrial Eutrophication terrestrial ;POCP Photochemical zone formation; ADPE Abiotic Depletion Potential minerals and metals; ADPf Abiotic Depletion Potential fossil fuels;







"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed

1. 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

### Remarks to environmental impacts

Global warming potential in A1-A3 includes sequestration of carbon in the wood. This amount is accounted as an emission in module C3. Additionally, it is included sequestration in the wood packaging. This is accounted as an emission in module A5.





Additional environmental impact indicators												
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D	
 PM	Disease incidence	1,36E-05	7,26E-07	7,51E-10	5,35E-06	0	0	4,43E-08	1,82E-07	6,78E-08	-1,35E-06	
 IRP <sup>2</sup>	kgBq U235 -eq	5,81E+00	6,21E-01	4,44E-04	2,09E+00	0	0	3,26E-02	5,77E-02	4,82E-02	-3,17E-01	
 ETP-fw <sup>1</sup>	CTUe	4,38E+03	1,01E+02	1,13E-01	2,09E+03	0	0	5,57E+00	6,03E+01	7,11E+00	-3,06E+02	
 HTP-c <sup>1</sup>	CTUh	3,35E-07	0,00E+00	8,00E-12	8,51E-08	0	0	0,00E+00	7,36E-09	2,53E-10	-1,89E-08	
 HTP-nc <sup>1</sup>	CTUh	3,49E-06	1,02E-07	3,92E-10	8,30E-07	0	0	7,38E-09	7,38E-08	6,79E-09	-1,64E-08	
 SQP <sup>1</sup>	dimensionless	8,51E+03	1,40E+02	1,13E-01	3,12E+02	0	0	6,38E+00	5,84E+00	2,61E+01	-1,93E+02	

PM Particulate Matter emissions; IRP Ionizing radiation – human health; ETP-fw Eco toxicity – freshwater; HTP-c Human toxicity – cancer effects; HTP-nc Human toxicity – non cancer effects; SQP Soil Quality (dimensionless)

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed




1. 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
2. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Resource use												
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D	
 PERE	MJ	5,14E+02	1,69E+00	2,39E-03	4,47E+01	0	0	1,07E-01	2,30E+00	2,24E-01	-1,90E+02	
 PERM	MJ	3,58E+02	0,00E+00	-4,98E+01	0,00E+00	0	0	0,00E+00	-3,08E+02	0,00E+00	0,00E+00	
 PERT	MJ	8,72E+02	1,69E+00	-2,49E+00	4,47E+01	0	0	1,07E-01	-3,05E+02	2,23E-01	-1,90E+02	
 PENRE	MJ	1,79E+03	1,42E+02	1,10E-01	6,68E+02	0	0	7,45E+00	1,57E+01	1,20E+01	-7,78E+01	
 PENRM	MJ	1,12E+02	0,00E+00	-5,52E+00	0,00E+00	0	0	0,00E+00	-1,07E+02	0,00E+00	0,00E+00	
 PENRT	MJ	1,91E+03	1,42E+02	-5,41E+00	6,68E+02	0	0	7,45E+00	-9,10E+01	1,20E+01	-7,78E+01	
 SM	kg	3,32E-01	0,00E+00	0,00E+00	1,47E-02	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 RSF	MJ	3,52E+00	5,82E-02	6,75E-05	4,30E-02	0	0	3,80E-03	4,80E-02	5,92E-03	3,61E-02	
 NRSF	MJ	3,14E+00	1,86E-01	4,80E-04	1,04E-01	0	0	1,34E-02	0,00E+00	2,56E-01	-8,40E+00	
 FW	m <sup>3</sup>	3,54E+00	1,49E-02	6,49E-05	6,93E-01	0	0	8,43E-04	1,94E-02	1,08E-02	-2,82E-01	

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 materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; FW Use of net fresh water

\*Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009






\*INA Indicator Not Assessed

End of life - Waste												
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D	
	HWD	kg	2,87E+00	7,50E-03	0,00E+00	4,79E+01	0	0	4,02E-04	0,00E+00	4,69E+01	-9,73E-04
	NHWD	kg	3,40E+01	1,05E+01	3,60E-01	8,17E+00	0	0	4,62E-01	4,10E+01	4,46E-01	-2,23E+00
	RWD	kg	6,51E-03	9,75E-04	0,00E+00	2,55E-03	0	0	5,07E-05	0,00E+00	7,39E-05	-2,77E-04

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed;

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

End of life - Output flow												
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D	
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	1,63E+00	0,00E+00	1,81E-01	2,59E-01	0	0	0,00E+00	1,63E+00	0,00E+00	0,00E+00
	MER	kg	1,78E+00	0,00E+00	6,82E-06	9,45E-05	0	0	0,00E+00	7,10E+01	0,00E+00	0,00E+00
	EEE	MJ	2,63E-01	0,00E+00	7,78E-02	4,10E+00	0	0	0,00E+00	1,90E+01	0,00E+00	0,00E+00
	EET	MJ	3,40E+00	0,00E+00	1,18E+00	6,01E+01	0	0	0,00E+00	2,87E+02	0,00E+00	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported energy Thermal

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

Biogenic Carbon Content		
Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	1,18E+01
Biogenic carbon content in accompanying packaging	kg C	1,48E+00

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>

## Additional Norwegian requirements

### Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Data source	Amount	Unit
Electricity, Poland (kWh)	ecoinvent 3.6	1060,47	g CO <sub>2</sub> -eq/kWh

### Dangerous substances

The product contains no substances on the REACH Candidate list or the Norwegian priority list at or above 100 ppm, 0,01 % by weight.

### Indoor environment

The product has not been tested for emissions to indoor environments.

## Additional Environmental Information






Environmental impact indicators EN 15804+A1 and NPCR Part A v2.0											
Indicator	Unit	A1-A3	A4	A5	B2	B4	C1	C2	C3	C4	D
GWP	kg CO <sub>2</sub> -eq	6,21E+01	9,03E+00	1,05E-01	1,07E+01	0	0	4,80E-01	3,84E+01	2,20E-02	-6,43E+00
ODP	kg CFC11 -eq	2,11E-06	1,73E-06	1,33E-08	5,14E-07	0	0	8,85E-08	4,96E-08	1,74E-09	-4,78E-07
POCP	kg C <sub>2</sub> H <sub>4</sub> -eq	1,62E-02	1,90E-03	2,19E-05	1,78E-03	0	0	6,85E-05	1,17E-04	2,47E-06	-4,90E-03
AP	kg SO <sub>2</sub> -eq	2,54E-01	5,34E-02	4,97E-04	2,65E-02	0	0	9,76E-04	5,87E-03	3,83E-05	-3,36E-02
EP	kg PO <sub>4</sub> <sup>3-</sup> -eq	3,05E-02	5,81E-03	1,49E-04	3,65E-03	0	0	1,02E-04	2,37E-03	5,23E-06	-5,64E-03
ADPM	kg Sb -eq	2,28E-04	1,52E-04	1,64E-06	7,35E-05	0	0	1,26E-05	2,31E-06	1,09E-07	-5,05E-05
ADPE	MJ	5,06E+02	1,40E+02	1,16E+00	8,47E+01	0	0	7,29E+00	4,58E+00	1,82E-01	-6,83E+01
GWPIOBC	kg CO <sub>2</sub> -eq	1,66E+02	9,12E+00	7,09E-04	5,65E+01	0	0	4,86E-01	8,96E+00	4,81E-02	-7,52E+00

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources; GWP-IOBC/GHG Global warming potential calculated according to the principle of instantaneous oxidation (except emissions and uptake of biogenic carbon)

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EPD Norway Bruksanvisninger i hvordan tolke EPD'er - Vinduer URL: <https://www.epd-norge.no> [in Norwegian]

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