



Environmental Product Declaration

Accoya® decking and cladding



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This is an Environmental Product Declaration for Accoya® decking and Accoya® cladding of Accsys Technologies PLC, registered in the International EPD System (www.environdec.com).

The declaration has been developed based on the results of a Life Cycle Assessment (LCA) in compliance with ISO 14044 and the Product Category Rules (PCR) for Builders' joinery and carpentry of wood, PCR 2011:23 version 1.0, 2011-12-19, CPC Class 31600, and has been verified according to ISO 14025. This includes verification by an independent and certified party.

Information and data given in this EPD can be used as upstream data by a customer who will perform a new EPD within the system boundaries given in a related PCR. EPDs within the same product category but from different programmes may not be comparable.

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The product

Accoya® Wood is a modified wood made by the process of acetylation. It has a class 1 durability according to EN 350-1 (= highest durability class, at least as good as the best performing European and tropical hardwoods) and exceptional dimensional stability. These properties make it well suited for external applications such as windows and doors, cladding, decking, outdoor furniture and when stress graded for structural applications such as bridges. By significantly enhancing the durability and dimensional stability of fast-growing and abundantly available certified wood, Accoya® Wood provides compelling environmental advantages over slow-growing hardwoods (which are often unsustainably sourced), woods treated with toxic chemicals, and non-renewable carbon-intensive materials such as plastics, metals and concrete. The durability translates to an expected service life of 60 years for external cladding and decking more than 20 cm above the ground.

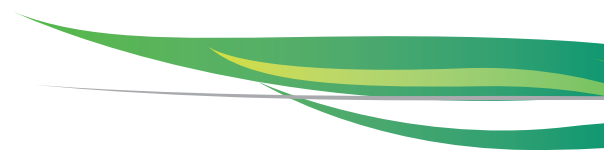
For more information on the product, the production process, and examples of international projects, see www.accoya.com.

The company

Accsys Technologies PLC is a UK incorporated environmental science and technology company focused on sustainability via the development and commercialization of a range of transformational technologies based upon the acetylation of solid wood and wood elements. Accsys' first commercial scale Accoya® Wood production facility is located in the Netherlands.

The production facility and its products have been granted various certificates:

- ▶ FSC Chain of Custody Certificate
- ▶ FSC COC Multisite Certificate
- ▶ FSC Controlled Wood Certificate
- ▶ PEFC Chain of Custody
- ▶ Cradle to Cradle (C2C) Gold Certificate
- ▶ RAL Certificate
- ▶ 3 Part Spec for NA Architects
- ▶ Certificate of Thermal Performance by IFT
- ▶ KOMO product Certificate



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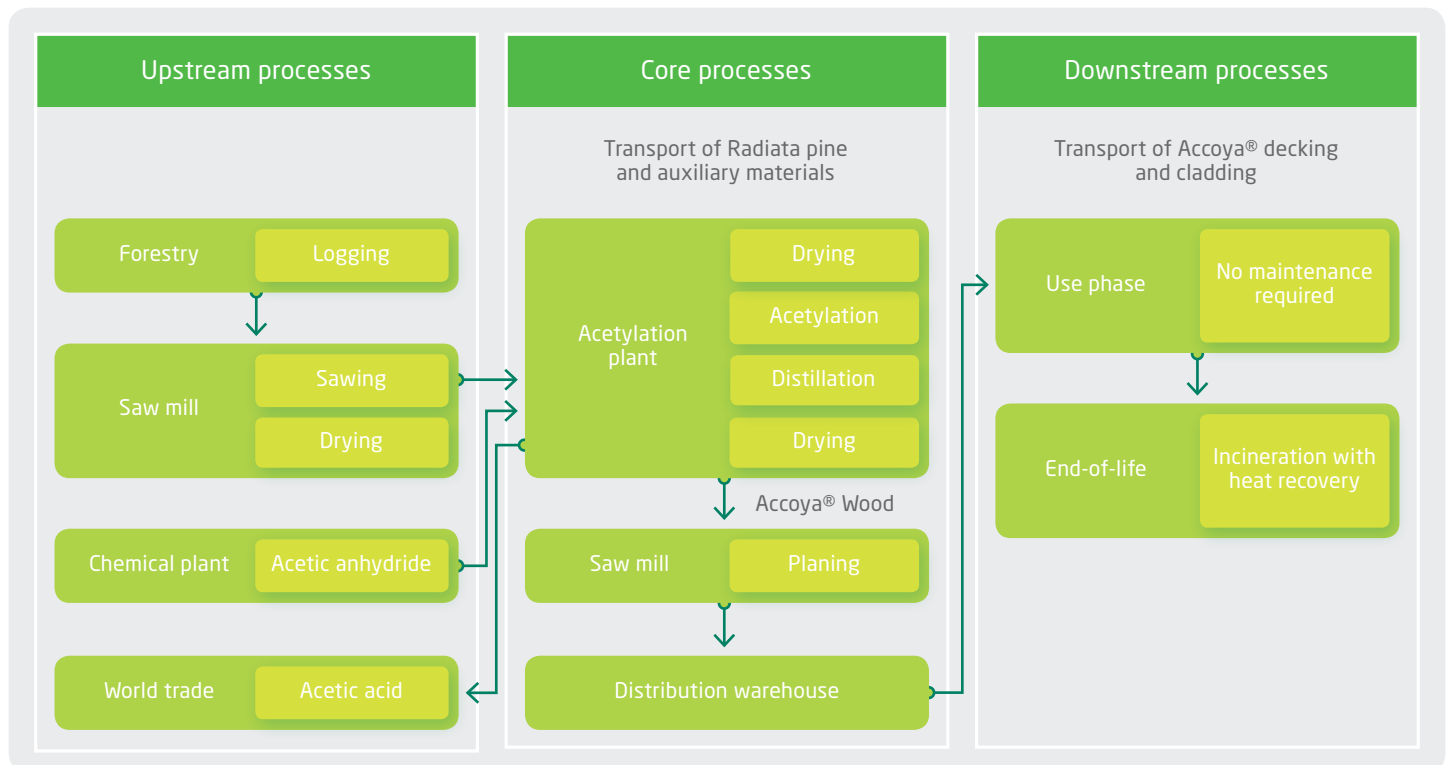
The system, system boundaries and the functional unit

The system is depicted below, and comprises the three life cycles phases as described in the Product Category Rules (PCR):

- ▶ **The upstream processes:** forestry activities, logging, sawing and drying of the timber, production of acetic anhydride (required for the modification process) and auxiliary materials.
- ▶ **The core processes:** transportation of all materials to the core process, processing (modification) of the wood, planing and profiling of the decking planks, transport to the warehouse in Sweden, Denmark or Norway; the product is not packaged.
- ▶ **The downstream processes:** the end-of-life, i.e. combustion with energy recovery; note that the decking is not painted, and requires no maintenance.

The core process is acetylation of wood. The wood (in this case Radiata Pine, but certain local species can also be used) reacts with acetic anhydride. The result is wood which is more dimensionally stable and extremely durable. The by-product is acetic acid, which is purified by distillation, and delivered back to the world market of chemicals (resulting in a credit of "avoided production of acetic acid" in the upstream processes). For more information on the acetylation process, see www.accoya.com/acetylated-wood.

The functional unit is 1 m³ of Accoya® Decking or Accoya® Cladding, as specified in the PCR for uncoated products.



For the LCA calculations Simapro 7.3.2 has been used, applying Ecoinvent v2.2 LCIs for transport and the upstream and downstream processes (when Ecoinvent LCIs were not available, IDEMAT2010 LCIs have been applied for materials). As required in the PCR the 1% cut-off rule has been applied. Data on the core processes are measured and certified by Det Norske Veritas in 2011.



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Use of resources

The table below presents the use of raw materials for the production of Accoya® Wood from cradle-to-grave (= upstream + core processes + end-of-life). Thus it also includes all source materials for the main input (acetic anhydride, nitrogen, electricity, natural gas) and output (acetic acid) resources from the acetylation process. It is the result of the Simapro calculations, where materials less than 1 gram have been left out.

Note that the negative weights are resulting from the credits for combustion in an electrical power plant of wood waste from the mills and the end-of-life phase.

materials resources (per m ³ Accoya Decking or Cladding , total life cycle)	unit	decking	cladding
Aluminium, 24% in bauxite, 11% in crude ore, in ground	g	-2.48	-2.42
Barite, 15% in crude ore, in ground	g	42.06	41.10
Basalt, in ground	g	5.13	5.01
Calcite, in ground	kg	-2.30	-2.25
Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	g	10.71	10.46
Clay, bentonite, in ground	g	-11.93	-11.65
Clay, unspecified, in ground	g	762.68	745.35
Coal, brown, in ground	kg	-84.93	-83.00
Coal, hard, unspecified, in ground	kg	-46.21	-45.16
Copper, 1.18% in sulfide, Cu 0.39% and Mo 8.2E-3% in crude ore, in ground	g	-1.49	-1.46
Copper, 2.19% in sulfide, Cu 1.83% and Mo 8.2E-3% in crude ore, in ground	g	-1.80	-1.76
Fluorspar, 92%, in ground	g	-1.04	-1.02
Gas, natural, in ground	m ³	107.62	105.18
Gravel, in ground	kg	162.82	159.12
Iron, 46% in ore, 25% in crude ore, in ground	g	60.71	6.56
Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	g	-1.92	-1.88
Magnesite, 60% in crude ore, in ground	g	1.44	1.41
Nickel, 1.98% in silicates, 1.04% in crude ore, in ground	g	25.78	25.19
Oil	kg	690.07	67.50
Oil, crude, in ground	kg	50.08	49.06
Phosphorus, 18% in apatite, 12% in crude ore, in ground	g	1.75	1.71
Sodium chloride, in ground	g	-12.89	-12.57
Sylvite, 25 % in sylvinitite, in ground	g	6.27	6.13
TiO ₂ , 54% in ilmenite, 2.6% in crude ore, in ground	g	-3.16	-3.09
Uranium, in ground	g	-3.29	-3.22
Water, cooling, surface, from river for Accoya production	m ³	46.51	45.45
Water, cooling, unspecified natural origin/m ³	m ³	-5.57	-5.44
Water, river	m ³	-1.37	-1.34
Water, turbine use, unspecified natural origin	m ³	-1,654.73	-1,617.07
Wood, soft, standing	m ³	1.21	1.18
Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	g	8.53	8.34

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Cumulative Energy Demand

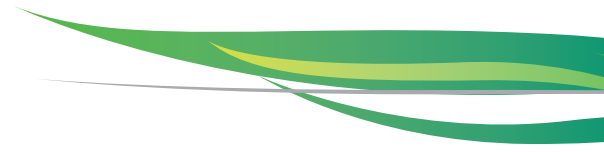
The two tables below show the use of energy (Cumulative Energy Demand) for Accoya® Wood for the upstream, core, and downstream processes. The negative figures are caused by the credits for the combustion with energy recovery (i.e. electricity production) of wood at the end-of-life phase.

Decking

Cumulative Energy demand (per m ³)	unit	upstream	core	downstream	total
Non renewable, fossil	MJ	5,217	3,719	-4,262	4,674
Non-renewable, nuclear	MJ	560	484	-2,886	-1,843
Non-renewable, biomass	MJ	0	0	0	0
total non-renewable	MJ	5,777	4,203	-7,148	2,832
Renewable, biomass	MJ	11,153	16	-96	11,072
Renewable, wind, solar, geothermal	MJ	10	9	-54	-35
Renewable, water	MJ	72	55	-326	-199
total renewable	MJ	11,234	80	-476	10,838
Total	MJ	17,011	4,283	-7,625	13,669

Cladding

Cumulative Energy demand (per m ³)	unit	upstream	core	downstream	total
Non renewable, fossil	MJ	5,099	3,737	-4,262	4,573
Non-renewable, nuclear	MJ	547	539	-2,886	-1,801
Non-renewable, biomass	MJ	0	0	0	0
total non-renewable	MJ	5,646	4,276	-7,148	2,773
Renewable, biomass	MJ	10,899	18	-96	10,820
Renewable, wind, solar, geothermal	MJ	10	10	-54	-35
Renewable, water	MJ	70	61	-326	-194
total renewable	MJ	10,979	89	-476	10,591
Total	MJ	16,625	4,364	-7,625	13,364



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Emissions

The emissions of the upstream, core and downstream processes are given in the table below. The negative figures downstream are caused by the credit of combustion with electricity recovery.

Decking

Emissions (per m ³)	upstream	core	downstream	total
greenhouse gases (kg CO ₂ equi.)	165.24	247.61	-352.29	60.56
ozone-depleting gases (kg CFC 11 equi.)	0.00	0.00	0.00	0.00
acidifying gases (kg SO ₂ equi.)	0.84	2.99	-1.58	2.24
eutrophication substances (kg PO ₄ equi.)	0.04	1.06	-0.12	0.97
ozone-creating gases (kg Ethene equi.)	0.04	0.01	-0.01	0.04

Cladding

Emissions (per m ³)	upstream	core	downstream	total
greenhouse gases (kg CO ₂ equi.)	161.48	250.38	-352.29	59.57
ozone-depleting gases (kg CFC 11 equi.)	0.00	0.00	0.00	0.00
acidifying gases (kg SO ₂ equi.)	0.82	2.96	-1.58	2.20
eutrophication substances (kg PO ₄ equi.)	0.03	1.03	-0.12	0.95
ozone-creating gases (kg Ethene equi.)	0.04	0.01	-0.01	0.04

Maintenance, hazardous waste and durability

There are no hazardous materials used in the core process, so there is no hazardous waste. Uncoated Accoya® Decking and Cladding are maintenance free and meet durability Class 1 (EN 350-1). The expected lifespan is at least 60 years when more than 20 cm above the ground.



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Verification and Certification

EPD Programme: The International EPD[®] System

Note: EPDs from different programs may not be comparable

For more information: www.environdec.com

PCR: Product Category Rules for Builders' joinery and carpentry of wood, PCR 2011:23 version 1.0, 2011-12-19, CPC Class 31600. **PCR prepared by:** CORMO and LCA-lab SRL (Italy). **PCR moderator:** Francesca Falconi, LCA-lab SRL

This EPD has been prepared by: Dr. Joost Vogtländer (Delft University of Technology). LCA study on Accoya[®] Wood was carried out in 2010 by Dr. Joost Vogtländer (Delft University of Technology), with a formal LCA review team: Dr. Richard Murphy (chair, Imperial College London); Harry van Ewijk (University of Amsterdam); Erik Alsema (W/E consultants Utrecht)

Independent verification of the declaration and data, according to ISO 14025:

- Internal
 External

EPD third party verifier:

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