Environmental Product Declaration

In accordance with ISO14025 and EN15804 for Laminated PVC Profiles for Windows and Doors

CPC Code	363 Semi-manufactures of Plastics
ECO EPD Reg. No	**00000106**
Declaration Number	S-P-00604
EPD Valid from	05.01.2015
EPD Expire on	04.01.2020
Market Coverage	Worldwide

The environmental impacts of this product have been assessed over its whole life cycle. Environmental Product Declaration has been verified by an independent third party.

EPD®

THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD EN 15804 VERIFIED

FIRATPEN Gedizpen WINHOUSE FIRAT

PROGRAMME RELATED INFORMATION

EPD Programme Holder	The International EPD System www.environdec.com Valhallavägen 81, 114 27 Stockholm, Sweden
Product Category Rules (PCR)	2012:01 Version 1.2, 2013-03-15), Construction Products and CPC 54 Construction Services EN 15804:2012 + A1:2013 Sustainability of Construction Works
Generic PCR Review Conducted by	Technical Committee of the International EPD® System
Independent Verification	☐ Internal ☑ External ☐ EPD® Process Certification
Approved and Verified by	Mr Vladimír Kočí www.lcastudio.cz
EPD Prepared by	Metsims Sustainability Consulting www.metsims.com
Calculation Procedure	SimaPro 8.0.3 Software (Metsims Sustainability Consulting)
System Boundaries	☐ Cradle to Gate ☑ Cradle to Gate with option ☐ Cradle to Grave
Disclaimer	All values provided in this Environmental Product Declaration are a direct result from the use of characterisation factors and calculation rules as defined in the SimaPro software. The environmental indicators used for these calculations are based on CML Baseline V4.2 April 2013. For more information about this Environmental Product Declaration or its contents, contact process owner, Mr Erdem Ergin on e.ergin@firat.com.
Demonstration of Verification	**PCR Review was conducted by:** **Technical Commitee of EPD International AB.** **Valhallavägen 81, 114 27 Stockholm, Sweden** **www.environdec.com info@environdec.com** **Independent Verification and data, according to ISO 14025;2006** Internal ☐ External ☑ **Third Party Verifier:** **Mr Vladimír Kočí**, PhD, Šárecká 5, 16000 Prague 6, Czech Republic **CEN Standard EN 15804:2012 + A1:2013 Sustainability of Construction Works serves as core PCR and Construction Products and CPC 54 Construction Services (2012:01 Version 1.2, 2013-03-15) serves as specific PCR.** **Independent Verification and data, according to EN ISO 14025;2010** Internal ☐ External ☑ **Third Party Verifier:** **Mr Vladimír Kočí**, PhD, Šárecká 5, 16000 Prague 6, Czech Republic

COMPANY PROFILE

Fırat Plastik A.Ş., Fırat was established to carry out production in the field of plastic building materials in the year of 1972. Fırat, which always sets out with the principles of quality production and product diversity, has succeeded in becoming both the leading establishment and the export leader of the sector as a result of significant enterprises that have taken years. Fırat is operating in two production plants in Turkey; Büyükçekmece/İstanbul and Sincan/Ankara plants.

Fırat has a product diversity over 5000 produced as integrated systems in order to enable customers to obtain maximum benefit and satisfaction from those products: PVC Door and Window Profiles, PVC Rain Gutters, PVC Drinking Water Pipes and Drain Pipes and Fittings , PVC Deep Well Pipes, PVC Hose Pipe Groups, Rubber and PE-based Hose Pipes, PPRC Plumbing Pipes and Fittings, PP Composite Pipes and Fittings, HDPE Pipes and Fittings, LDPE Pipes and Fittings, EF Fittings, PE Fittings, PE 80 Natural Gas Pipes, Drainage Pipes, Double-Walled Cable Protection Pipes, EPDM Packing Production, Metal Injection Production (hinges and window connection elements), PEX Mobile System and Floor Heating Pipes, Pex Al Pex Pipes and PPSU Fittings, Weeping Irrigation Pipes etc.

Fırat is the only company in the global plastic sector which produces all of the elements of PVC Window and Door Systems, except for glass and screws, providing its customers %100 compatible products.

With the “Bosphorus Crossing Project” which takes place within the scope of Melen Project, Fırat has beaten a world record by producing PE 100 pipes having 1200 mm diameter, 110 mm wall thickness and are 16 bar pressure resistant, and by carrying drinking water from the Asian side of İstanbul to the European side with 300,000m3/day capacity. Fırat is also the first company to produce 500 meter long seamless PE 100 pipes to be used in the sea water distillation plant in Libya.

In order to meet the ever-increasing need for pipes with large diameter and high working pressure, Fırat has developed FCS pipe system that offers a working pressure up to 10 bars.

QUALITY and CONTROL

Fırat is capable of conducting raw material analysis; tests such as welding, heavy rain and wind resistance, blow and milled blow resistance, compression, shear and break-off strength, ring rigidity (strength of FKS and Triplex pipes against soil load).

Fırat products are offered to the market with "Fırat Quality Assurance Confirmation". Fırat is the only company of the sector which holds international quality certificates such as RAL, GOST, SKZ, BDS, SABS, EMI, DVGW, and TSE as well as all of the system certificates which are ISO 14001, OHSAS 18001 and ISO 9001. As an environmentally friendly manufacturer, Fırat holds ISO 14000 Environment Management System Certificate.

The quality control process carried out in Fırat laboratories consists of three phases as input, process and output-final quality control. Products passed all these three tests and met the required quality conditions are offered for the customer use.

Input Quality Control

Quality Control tests complying with the quality-production standards are applied to raw materials and auxiliary materials coming from the suppliers. After samples taken in the scope of "Sampling for Approval" standards, the tests of Physical Compliance, Chemical Compliance, Density, MFI, Humidity, Bulk Density, Viscosity Number, Distribution of Grain Thickness, K Number and Homogeneity are performed in the Quality Control laboratories. It is compulsory that raw materials pass these tests and obtain "Suitable for Production" approval.

Process Quality Control

In the production process carried out with raw materials and auxiliary materials bearing "Suitable for Production" approval, samples are taken from the production lines during or soon after production, and the Process Quality Control tests that are determined by national (TSE) and international (SKZ, EN, DIN etc.) standard institutions are performed and recorded regularly.

Main Process Quality Control tests are as follows:

- Test for Impact Resistance at Cold
- Test for Dent Impact Resistance
- Elongation Test
- Density Test
- Vicat Test
- Wind Load Resistance Test
- Leak Test
- Air Permeability Test
- Corner Welding Test

At the stage of Process Quality Control, product measurements are controlled simultaneously with the production process and recorded. It is compulsory that the products pass through all the tests conducted in compliance with the control frequency and numbers set by the standards and obtain "Quality Approval".

Output - Final Quality Control

The end products are then checked for Packaging Compliance, Pack Compliance, Description and Label Compliance through automatic packaging and wrapping processes and get "Suitable for Shipping" approval. Also, apart from the quality control tests conducted in FIRAT laboratories, all products are regularly sampled from the production lines twice a year, and subjected to quality control tests by the representatives of international test and certification institutions such as TSE, SKZ, IFT etc.

FUDEL LABORATORY

In order to fill the gap in the sector regarding determination of performance characteristics of window-door systems built with these profiles and providing the results in an independent, unbiased and reliable way, FIRAT PLASTİK KAUÇUK SAN. ve TİC. A.Ş. established Turkey's "first and only" TÜRKAK accredited "Window Laboratory," Fırat Conformity Evaluation Laboratory (FUDEL) in Büyükçekmece/İstanbul, with 100% Turkish capital and offered it for servicing the sector.

FUDEL, service scope consists of following tests;

Tests	Standards
Resistance to wind load	TS 4644 EN 12211
Air permeability	TS EN 1026
Water insulation	TS EN 1027
Load bearing capacity of safety systems	TS EN 14609
Calculation of heat transmission	TS EN ISO 10077-1

FUDEL provides services to associations and institutions carrying out market inspection and supervision and the window and accessory manufacturers operating in the sector.

The aim of FUDEL is to provide service to the entire sector in the fields of 'importance of window, engineering calculations of window, personnel training on window'. FUDEL is also planning to organize training days for public institutions, construction companies and private associations and institutions to describe the importance of window in Turkey, to prevent erroneous applications and to offer higher quality products to the final customers.

STATEMENT

The LCA for this EPD is conducted according to the guidelines of ISO 14040-44, the requirements given in the Product Category Rules (PCR) document for Construction Products and CPC 54 Construction Services (PCR 2012:01 Version 1.2, 2013-03-15), EN EN 15804:2012 + A1:2013 Sustainability of Construction Works: Environmental Product Declarations and the general program guidelines by The International EPD System in accordance with ISO 14025 standards.

The inventory for the LCA study is based on the 2013 - 2014 production figures for 'Laminated PVC Doors and Window Profiles and detailed profiles' from Fırat's main production plant is located in Büyükçekmece, Turkey. This LCA was modelled with SimaPro LCA package using the latest version of the Ecoinvent database and impact factors.

EPD of construction products may not be comparable if they do not comply with EN 15804.

This EPD covers the Cradle to Gate stage and disposal option.

The EPD certificate, its background data and the results will be used for business-to-business communications and is expected to be a reliable document for green building designers, architectures, manufacturers of construction products and the other stakeholders in the construction sector to understand the potential environmental impacts caused by Laminated PVC Profiles for Windows and Doors.

PRODUCT SPECIFICATIONS

The following Laminated PVC windows and doors profiles are covered under this Environmental Product Declaration. PVC windows and door profiles includes four different series: **S60, S70, S75, S80.** These series are placed on the market under three different brands owned by Fırat, namely **Fıratpen, Gedizpen and Winhouse.**

The raw material compositions of Laminated PVC Windows and Doors Profiles are shown below. Laminated PVC Profiles along with the auxiliary profiles are mainly made of Polyvinyl Chloride (PVC) known as the most valuable raw material within the chemical industry. These products may also contain other raw materials such as acrylic impact modifiers, stabilizers and calcium carbonate. For lamination, primer, adhesive amd lamine are also used. The compositions of these products are shown below.

Main Body of Profile		Lamination Process	
Composition	**Amount, %**	**Composition**	**Amount, %**
PVC	80	Rending Agent	0.1-1
Processing Aid Additives	10	Rending Agent	0.1-1
Plasticizer	5	Lamina Foil	1-10

Raw materials used in the production of Laminated PVC Profiles for Windows and Doors

S60 Series Technical Specifications

	Profile Withs (mm)	Number of Chambers (ad)	Air Diffusion Ability (m^3/h cm)	Sound Isolation (db)	Profile Heat Isolation Coefficient (W/m 20 K)
Gedizpen	60	4	4	34	1.45
Winhouse	60	4	4	37	1.45


Grey


Antracite


Golden Oak


Mahagony

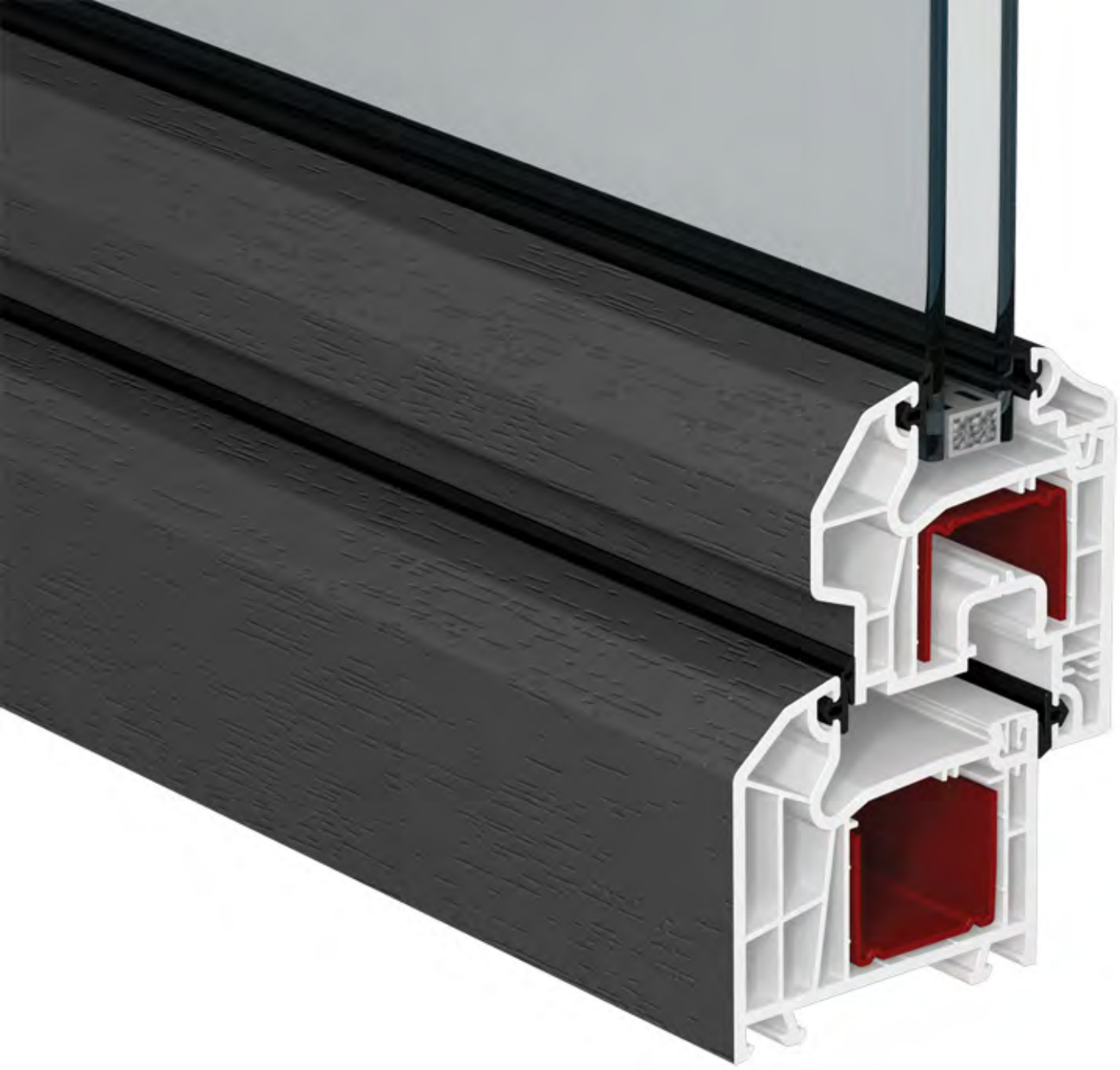

Oak


Walnut

S70 Series Technical Specifications

	Profile Withs (mm)	Number of Chambers (ad)	Air Diffusion Ability (m^3/h cm)	Sound Isolation (db)	Profile Heat Isolation Coefficient (W/m 20 K)
Fıratpen	70	5	4	34	1.45
Gedizpen	70	5	4	34	1.45
Winhouse	70	5	4	37	1.45

Grey Antracite Cedar Mahagony Oak Walnut



S75 Series Technical Specifications

	Profile Withs (mm)	Number of Chambers (ad)	Air Diffusion Ability (m^3/h cm)	Sound Isolation (db)	Profile Heat Isolation Coefficient (W/m 20 K)
Fıratpen	75	6	4	34	1.40
Gedizpen	75	6	4	34	1.40
Winhouse	75	6	4	37	1.40


Grey

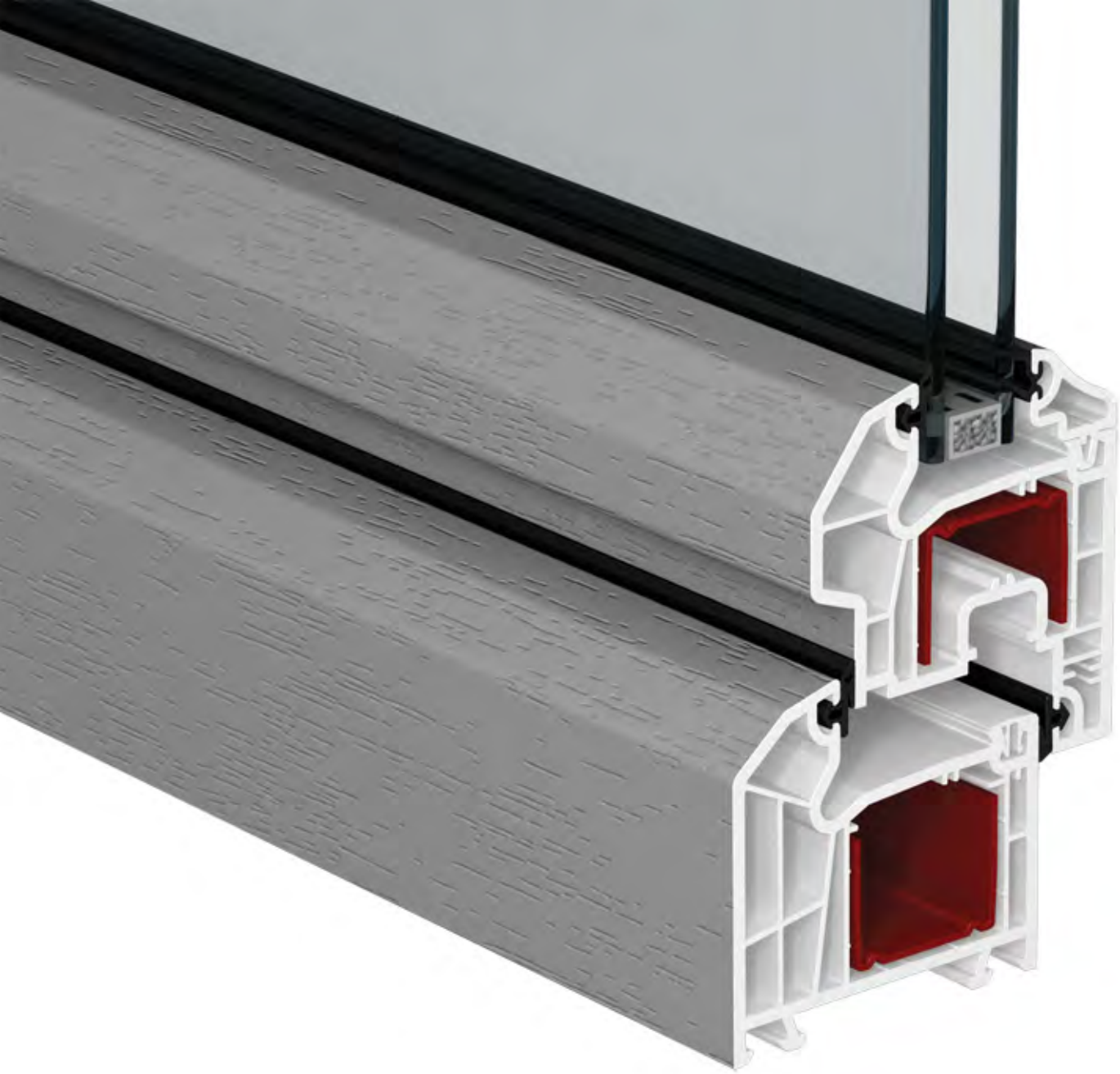

Cedar


Golden Oak


Mahagony


Oak


Walnut



S80 Series Technical Specifications

	Profile Withs (mm)	Number of Chambers (ad)	Air Diffusion Ability (m^3/h cm)	Sound Isolation (db)	Profile Heat Isolation Coefficient (W/m 20 K)
Fıratpen	80	6	4	34	1.40
Gedizpen	80	6	4	34	1.40
Winhouse	80	6	4	37	1.40


Cedar


Antracite


Golden Oak


Mahagony


Oak


Walnut

PRODUCTION PROCESS and SYTEM BOUNDARY

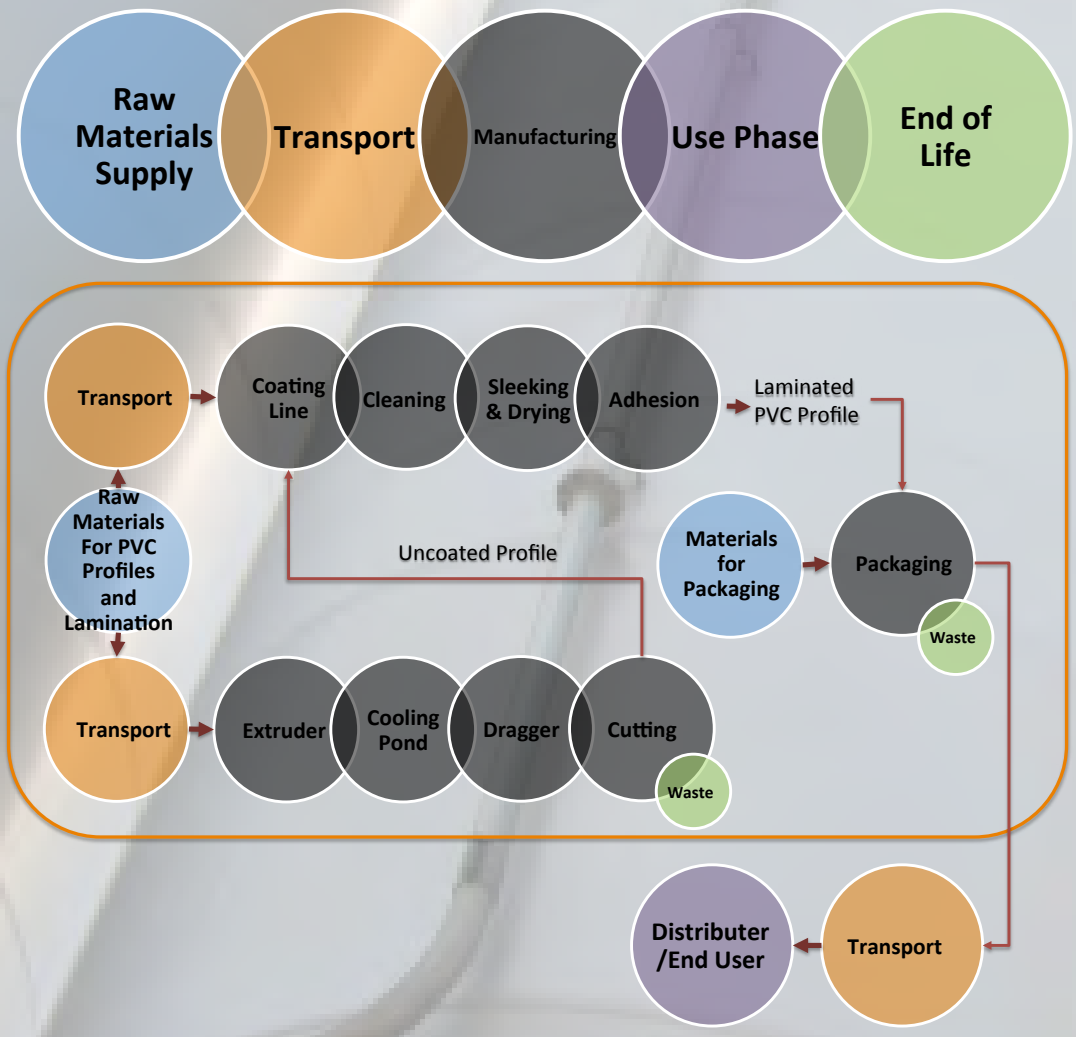
The system boundary covers the production of raw materials, all relevant transport down to factory gate and manufacturing by Fırat Plastik (cradle to gate). The review framework comprises the following details:

- Raw materials acquisition and transport,
- Further processing of raw materials for main bodies of PVC Profiles,
- Production operations includes extruder, cooling ponds, dragger, cutting for delivery,
- Energy and water consumption, waste management; and
- Packaging of the product final for delivery.

The system boundary of the LCA study conducted on the Laminated PVC Profile products is shown above including packaging of the final product for delivery.

Environment and health during manufacturing
Of all the constituents of PVC formulations, only the stabilisers have to be classified and marked as follows in accordance with /GHS/:
H302: Harmful if swallowed

Environment and health during use
No health and environmental impacts during use is observed.



System Boundary of the LCA study conducted on Laminated PVC Profiles

LIFE CYCLE ASSESSMENT RESULTS

Description of the system boundary (X = Included in LCA, MND = Module Not Declared)

PRODUCT STAGE			CONSTRUCTION PROCESS		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse- Recycling - Recovery Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	MND

Upstream Processes (A1: Raw Material Supply)
In this report, for each product group production starts with raw materials, mainly locally sourced but some transported from other parts of the world. 'Raw material supply' includes pre-treatment before production such as masterbatch preparation (A1, see Section 6).

Core Processes (A2:Transportation and A3: Manufacturing)
Transport is only relevant for delivery of raw materials to the plant. (A2, see Section 6).
Production stages start with extrusion of PVC and continue with cooling, dragging and cutting for Laminated PVC Profiles and the process goes on as coating, cleaning, sleeking, drying and adhesion for Laminated PVC Profiles. Only electric energy is consumed during the manufacturing of PVC Profiles, no natural gas is consumed for the production. (A3, see Section 6).

Downstream Processes (C4: Disposal)
According to the recycling rates of Turkey 11% of PVC Products are collected for sending to the recycling process and the rest of is sent to the landfill for their final fate and this is modelled as such in the LCA. There is no open loop recycling. Packaging is assumed to end up at packaging recycling streams (C4).

Benefits and loads beyond the product system boundary in information Module D
No possible benefits of recycling and re-use were taken into account in the LCA work here. Inert waste was stored on site then disposed of in landfills according to current legislation. However, Fırat is looking for an outlet to get this material recycled back for other uses.

LCA CALCULATION RULES

Functional Unit/ Declared Unit	The declared unit is the production of 1 kg of Laminated PVC Windows and Doors Profiles (both includes detailed and auxiliary profiles). Average weight of 1 m Laminated PVC Profile is about 0.9 kg). Standard manufacturing size is 6 m, which is about 5.4 kg.
Goal and Scope	This EPD evaluates the environmental impacts of 1 tonne laminated PVC products from cradle to gate with disposal.
System Boundaries	The system boundary covers A1 – A3 product stages referred as 'Raw material supply', 'Transport' and 'Manufacturing' and C4 as Disposal.
Estimates and Assumptions	There are no additional product scenarios developed for this EPD. However, very small amount of packaging waste for the PVC profiles are modelled based on the 44% collection rate enforced by law in Turkey.
Cut - Off Rules	Raw materials that are also a minor constituent of the Laminated PVC Profiles amounting less than 1% of total raw materials are excluded in this study.
Background Data	Ecoinvent database were used as generic background data source.
Data Quality	Raw materials, electricity, water use and waste data were taken for the relevant products based on prodution time scale from July 2013 to July 2014. Localized data based on Ecoinvent (EcoinventTR) database developed by Metsims were used where relevant.
Period Under Review	This data is representative of 2013 - 2014 production figures for Laminated PVC Doors and Window Profiles.
Allocations	There are no co-products in the production of Laminated PVC Profiles. Hence, there is no need for co-product allocation. Transport is allocated according to tonnages for almost all raw materials. Water consumption is allocated according to the production figures of Laminated PVC Profiles.
Comparability	A comparison or an evaluation of EPD data is only possible where EN 15804 has been followed, and the same building context and product-specific characteristics of performance are taken into account and the same stages have been included in the system boundary. According to EN 15804, EPD of construction products may not be comparable if they do not comply with this standard.

All the waste resulting from the main production and related processes of Fırat Plastik is managed in accordance with valid legal requirements.

ENVIRONMENTAL PERFORMANCE

Indicators for the Life Cycle Analysis as per EN15804

The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1-A3) and disposal (C4). The system boundaries in tabular form for all modules is shown in the table above. Life Cycle Inventory Analysis indicators describing the use of resources are shown below.

Parameter	Unit	Raw Material	Transport	Manufacturing	Disposal
Energy			A1 - A3		C4
Use of Renwable Primary Energy Excluding Resources	MJ		0		0
Use of Renewable Primary Energy Resources Used as Raw Materials	MJ		0		0
Total Use of Renewable Primary Energy Resources	MJ		0		0
Use of non-renewable Primary Energy Excluding Resources	MJ		73		1
Use of non-renewable Primary Energy Resources Used as Raw Materials	MJ		0		0
Total Use of non-renewable Primary Energy Resources	MJ		73		1
			A1 - A3		C4
Use of Secondary Material	kg		0		0
Use of Renewable Secondary Fuels	MJ		0		0
Use of non-renewable Secondary Fuels	MJ		0		0
Water			A1 - A3		C4
Use of Net Fresh Water	m3		0.043		0

Results of the LCA - Resource use for 1 kg of Laminated PVC Profile Products

Table below depicts the contributions in the production of 1 kg Laminated PVC Profile, to the following impact categories, calculated using CML-IA baseline (v4.2) method: ozone depletion potential (ODP), formation potential of tropospheric ozone photochemical oxidants, acidification potential, eutrophication potential and abiotic depletion potential for fossil resources.

Parameter	Unit	Raw Material	Transport	Manufacturing	Disposal
			A1 - A3		C4
Global Warming Potential	[kg CO2 eq.]		5.04		0.914
Ozone Deplation Potential	[kg CFC11 eq.]		3.36E-07		2.53E-09
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene eq.]		1.53E-03		2.45E-04
Acidification Potential	[kg SO2 eq.]		2.80E-02		3.09E-04
Eutrophication Potential	[kg PO43- eq.]		3.78E-03		4.97E-03
Abiotic deplation potential for non-fossil resources	[kg Sb eq.]		2.00E-06		3.82E-08
Abiotic deplation for fossil resources	[MJ eq.]		7.26E+01		6.68E-01

LCA Environmental Impacts for 1 kg of Laminated PVC Profile Products

Table below shows the impacts for Laminated PVC Profile products according to the following categories: Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Components for re-use (CRU), Materials for recycling (MFR), Materials for energy recovery (MER), Exported energy per energy carrier (EE).

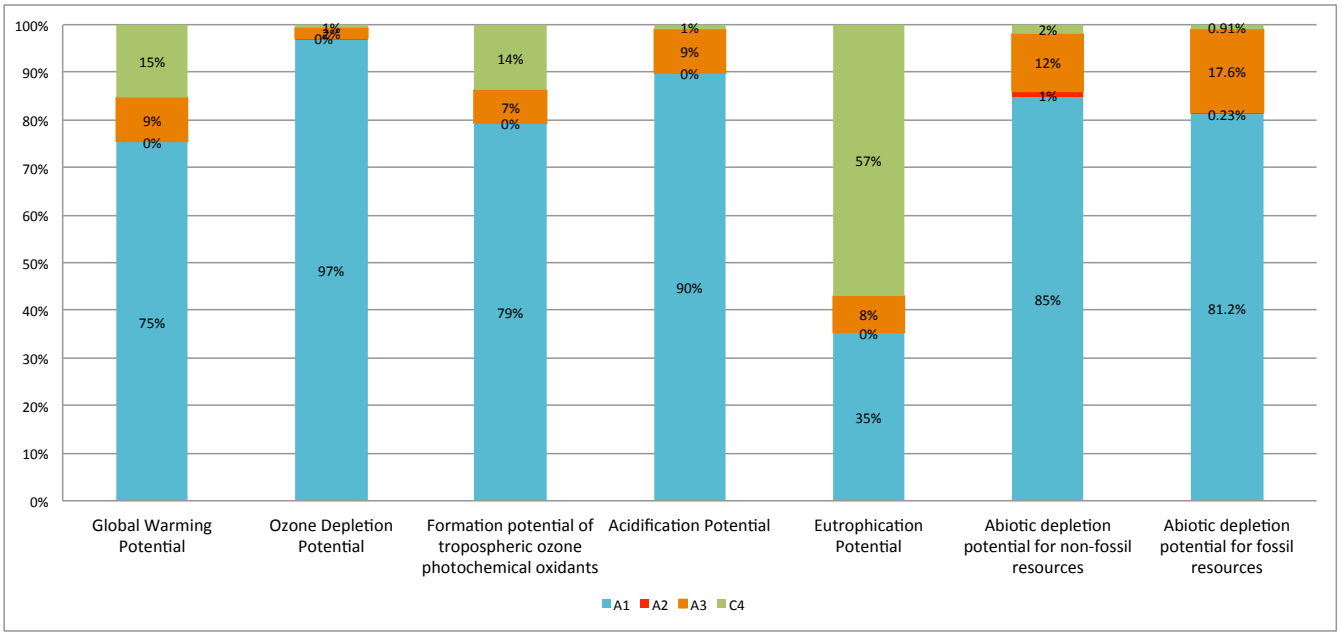
Parameter	Unit	Raw Material	Transport	Manufacturing	Disposal
			A1 - A3		C4
HWD	[kg]		2.35E-04		0
NHWD	[kg]		1.06E-03		1
RWD	[kg]		0		0
CRU	[kg]		0		0
MFR	[kg]		0		0
MER	[kg]		0		0
EE [Typ]	[MJ]		0		0

Output flows and waste categories for 1 kg of Laminated PVC Profile Products

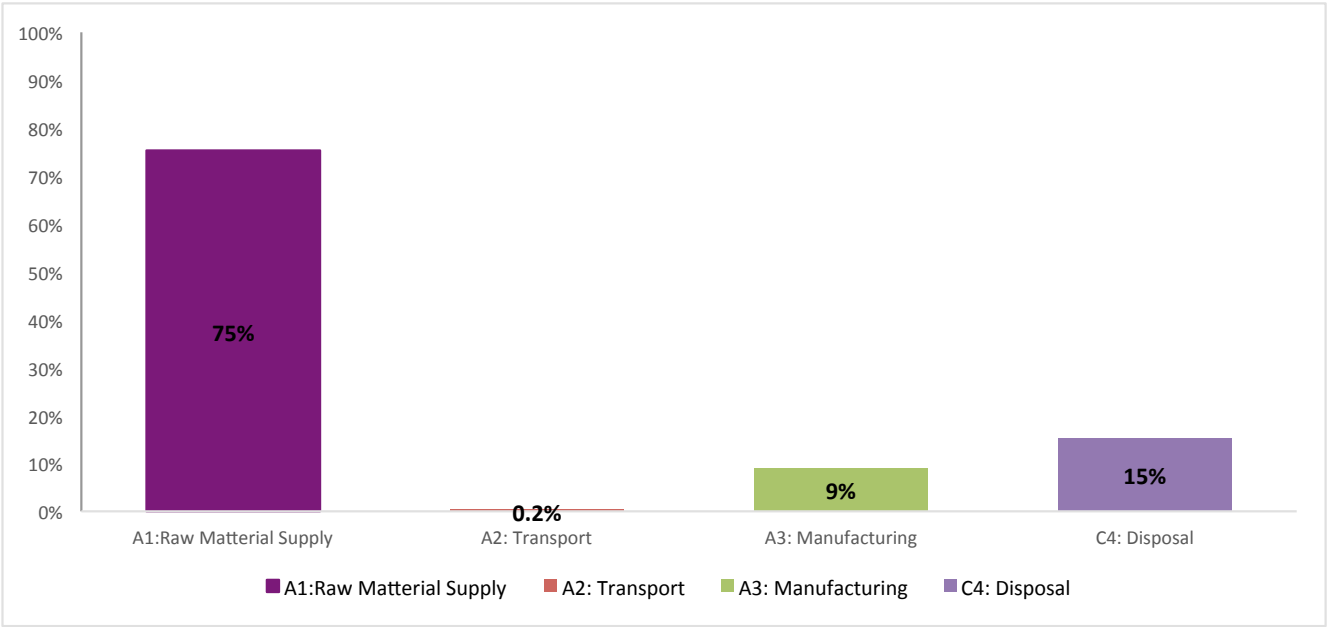
ENVIRONMENTAL IMPACTS

The GWP of raw materials supply is 75%, while manufacturing has about 9% of the total carbon emissions followed by end of life with 15% of the impact. The carbon impact of 1 kg Laminated PVC Profile is 5.95 kg CO_2 eq.

Raw materials supply has about 97% of ODP impacts, followed by manufacturing (2%) and end of life (1%). The ODP impact of of 1 kg Laminated PVC Profile is 3.39E-07 kg CFC11 eq.



Relative impacts of LCA stages by each EPD indicator of Laminated PVC Profile



Global Warming Potential (IPCC GWP100a) kg CO_2 eq. of Laminated PVC Profile Products

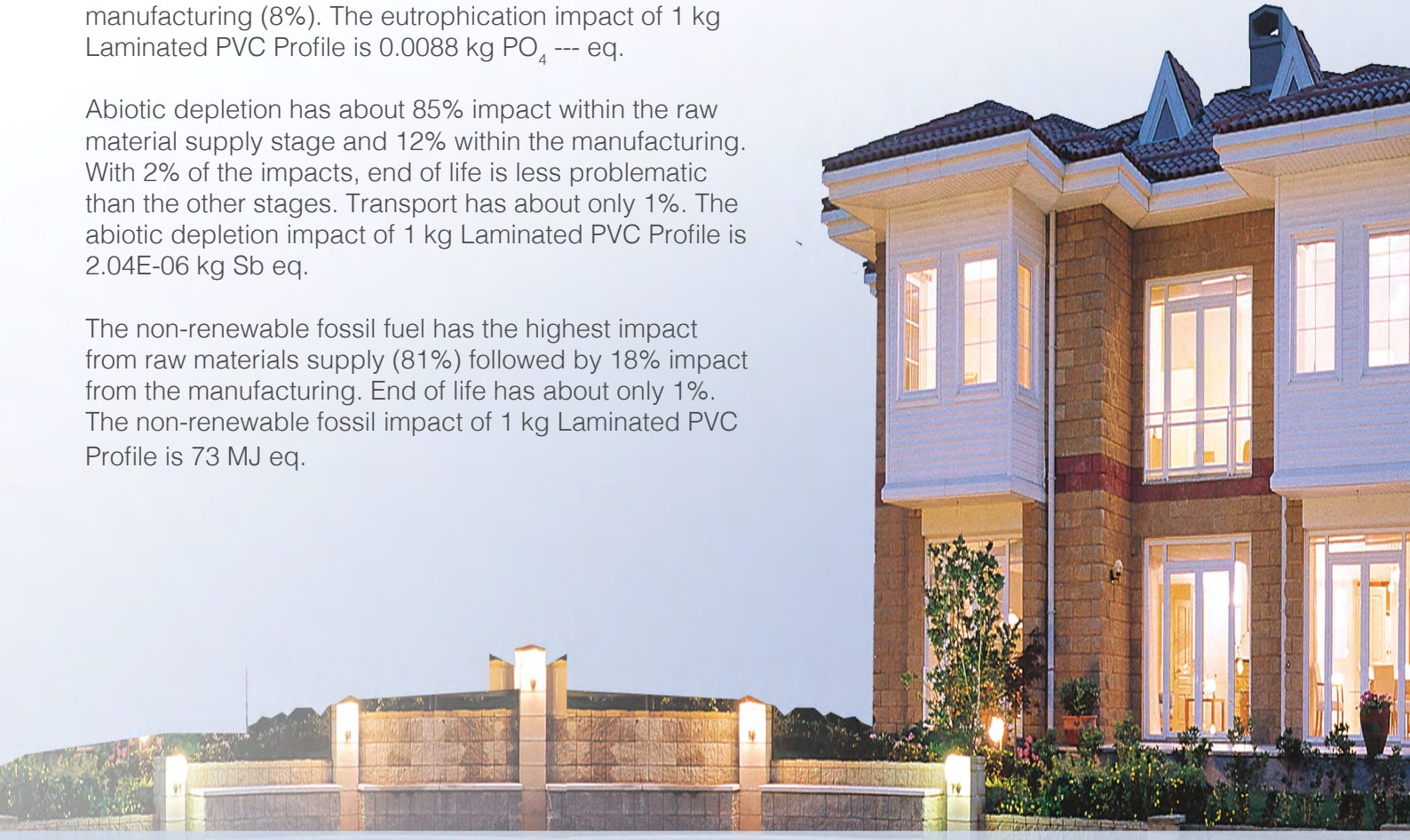
w materials supply has about 79% of the photochemical oxidation impacts, followed by the end of life and manufacturing, with about 14% and 7%, respectively. The photochemical oxidation impact of of 1 kg Laminated PVC Profile is 0.0018 kg C_2H_4 eq.

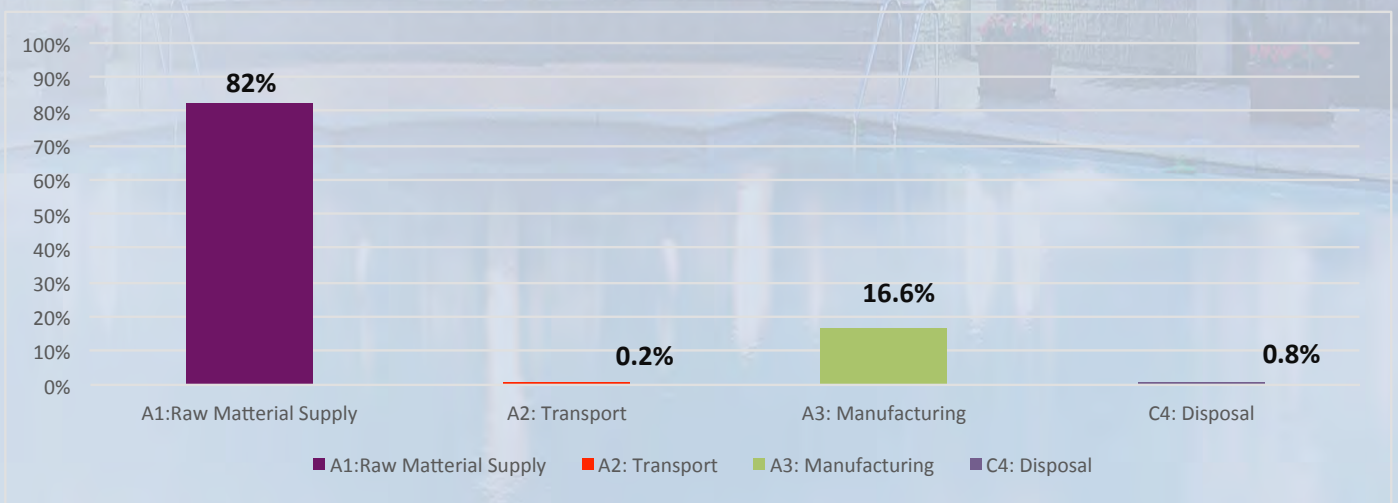
Acidification impact of raw material supply is about 90%, while that of manufacturing is around 9%, followed by 1% from end of life. The acidification impact of of 1 kg Laminated PVC Profile is 0.0283 kg SO_2 eq. by this cost.

Eutrophication is dominated by the end of life (57%) followed by the raw materials supply (35%) and manufacturing (8%). The eutrophication impact of 1 kg Laminated PVC Profile is 0.0088 kg PO_4 --- eq.

Abiotic depletion has about 85% impact within the raw material supply stage and 12% within the manufacturing. With 2% of the impacts, end of life is less problematic than the other stages. Transport has about only 1%. The abiotic depletion impact of 1 kg Laminated PVC Profile is 2.04E-06 kg Sb eq.

The non-renewable fossil fuel has the highest impact from raw materials supply (81%) followed by 18% impact from the manufacturing. End of life has about only 1%. The non-renewable fossil impact of 1 kg Laminated PVC Profile is 73 MJ eq.





Total Energy Contributions to each life cycle stage for Laminated PVC Profile Products

REFERENCES

/ISO 9001/ DIN EN ISO 9001:2008, Quality Management System-Requirements.

/TS EN 997/ Standard for WC pans and WC suites with integral trap.

/TS EN 13407/ Standard for Wall-hung urinals - Functional requirements and test methods.

/TS EN 14528/ Standard for Bidets — Functional requirements and test methods.

/TS EN 14688/ Standard for Sanitary appliances - Wash basins - Functional requirements and test methods.

/EN 15804/ EN 15804:2012 + A1: 2013, Sustainability of construction works-Environmental Product Declarations - Core rules for the product category of construction products.

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

/ISO 14040-44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006).

/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 1.2, 2013-03-15.

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025.www.environdec.com

/Ecoinvent/ Ecoinvent Centre, www.eco-invent.org

VERIFICATION & REGISTRATION CONTACTS

Environmental declarations published within the same product category, though originating from different programs, may not be comparable.

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PCR Review Conducted by:Technical Committee of EPD International AB.

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