ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for

Bet 60/C50 CONCRETE

by Readymix Industries (Israel) Ltd.

Programme:
The International EPD® System
www.environdec.com

Programme Operator:
EPD International AB

S-P Code:
S-P-08924
Publication Date:
2023-06-18
Validity Date:
2028-06-17

Geographical Scope:
Israel

EPD® THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www environdec.com.

PROGRAMME INFORMATION

ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR):

PCR 2019:14 Construction products (EN 15804:A2) (1.2.5) and PCR 2019:14-c-PCR-003, c-PCR-003 Concrete and concrete elements (EN 16757) (2023-01-02)

PCR review was conducted by: The Technical Committee of the International EPD® System.

Review Chair: Claudia A. Peña, University of Concepción, Chile

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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Life Cycle Assessment (LCA)

LCA accountability: Yıldıray Yılmaz, Metsims Sustainability Consulting

Third-party Verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

✓ EPD verification by individual 3rd party verifier

Third party verifier: Prof. Ing. Vladimír Kočí, Ph.D., LCA Studio Šárecká 5,16000 Prague 6- Czech Republic

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No ✓

Readymix Industries (Israel) Ltd. has the sole ownership, liability, and responsibility for this EPD.

HOW TO READ THIS EPD?

An Environmental Product Declaration (EPD) is an ISO Type III Environmental Declaration based on ISO 14025 standard. An EPD transparently reports the environmental performance of products or services from a lifecycle perspective. The preparation of an EPD includes different stages, from acquiring raw materials to the end of life of the final product/service. EPDs are based on international standards and consider the entire value chain. Additionally, EPD is a third-party verified document. This EPD includes several sections described below.

1. General and Program Information

The first part of an EPD has information about the name of the manufacturer and product/service and other general information such as the validity and expiration dates of the document, the name of the program operator, geographical scope, etc. The second page states the standards followed and gives information about the program operator, third-party verifier, etc. The followed Product Category Rule (PCR) is indicated on the second page.

2. Company and Product/Service Information

Information about the company and the investigated product is given in this section. It summarizes the characteristics of the product provided by the manufacturer. It also includes information about the product such as product composition and packaging.

3. LCA Information

LCA information is one of the most important parts of the EPD as it describes the functional/declared unit, time representativeness of the study, database(s) and LCA software, along with system boundaries. The table presented in this part has columns for each stage in the life cycle. The considered stages are marked 'X' whereas the ones that are not considered are labeled as 'ND' (Not Relevant). Not all EPDs consider the full life cycle assessment for a product's entire life stages. The 'System Boundary' page is also the place where one can find detailed information about the stages and the assumptions made.

4. LCA Results

The results of the Life Cycle Assessment analysis are presented in table format. The first column in each table indicates the name of the impact category and their measurement units are presented in the second column. These tables show an amount at each life cycle stage to see the impact of different indicators on different stages. Each impact can be understood as what is released through the production of the declared unit of the material—in this case, 1 m^3 of Bet60/C50 ready-mix concrete. The benefits of reuse/recycling of the declared product is reflected in this section.

The first impact in the table is global warming potential (GWP), which shows how much CO_2 is released at each stage. Other impacts include eutrophication potential, acidification potential, ozone layer depletion, land use related impacts, etc. The second table provides results for resource use and the third table is about the waste produced during the production. The fourth and final table shows the results for the GWP-GHG indicator, which is almost equivalent to the GWP-Total indicator mentioned previously. The only difference is that this indicator excludes the biogenic carbon content by following a certain methodology.

ABOUT THE COMPANY

The Readymix Group is Israel's leading producer and supplier of raw materials for the Construction Industry. Over the decades, the Group has built its reputation on providing building solutions based on products and services representing consistent high quality, excellence, and reliability. Readymix Industries (Israel) is a story of development, success, and contribution to the country's industry. In the early '60s, the British company RMC began to expand worldwide and established Readymix Industries (Israel) Ltd. in 1962. The hands that had cast the first concrete cube in the company's plant in December 1962, are the same hands that have brought the company this far. In 2005, RMC was acquired by Cemex.

Cemex is a leading vertically integrated heavy building materials company focused on four core businesses— Cement, Ready-Mix Concrete, Aggregates, and Urbanization Solutions. The Group is active in several fields and specializes in ready-mixed concrete, aggregates, infrastructure products, landscape products, chemical admixtures for concrete and white cement.

The Readymix Group's Concrete Division is the leading producer of ready-mixed concrete and mortar in Israel. With a national network of plants from Kiryat Shmona in the north to Eilat in the south, the Group can ensure transfer and efficient supply to its customers. Readymix has supplied concrete for many of Israel's most prominent construction projects, including power stations, bridges, airports and many other important projects, such as Ben Gurion 2000 Airport, the Ayalon Highway, the Ashkelon and Herzliya marinas, the CrossIsrael Highway, the Haifa national soccer stadium and a desalination plant.

ABOUT THE PRODUCT

Concrete is a composite material consist of cement, coarse and fine aggregates, water, and minor aadditives. When water is mixed with cement and aggregates, the mixture forms a fluid slurry which can be poured easily. The reaction between cement and water occurres and within several hours it hardens and form a hard matrix binds. The final product is transported to the construction sites via concrete mixers.

The declared product is C50 ready-mix concrete which complies with the requirements. The density of the concrete is 2.34 tons per m^3. The cement used in the product is CEM II 52.5 N / A-M SLV. Product compoasition breakdown is given in the following table:

The use and end-of-life performances of the related product are valid for Israel.

PRODUCT COMPOSITION

- Cement || 16- 19 %
- Coarse Aggregates || 30- 33 %
- Fine Aggregates || 35- 38 %
- Water || 6- 9 %
- Fly Ash || 3- 5 %
- Additives || <1 %

Since fresh concrete is transferred to the construction sites via mixer trucks, there is no packaging use.

LCA INFORMATION

Functional Unit / Declared Unit	1 m³ of Bet60/C50 Ready-mix Concrete
Time Representativeness	2022
Database(s) and LCA Software Used	Ecoinvent 3.9.1 and SimaPro 9.5
System Boundaries	Cradle to grave and module D (A + B + C + D)

The inventory for the LCA study is based on the 2022 production figures for Readymix Industries (Israel) Ltd. that covers the production of Bet60/C50 ready-mix concrete at their 56 plants located in Israel. This EPD's system boundary is cradle to grave and module D (A + B + C + D). Through modules A1-A5, supplier-specific data was used for the modelling.

For the B1 module, the calcination effect is included. Some portion of the CO_2 emitted during the cement production is taken back during the use phase (B1) of the concrete, known as the CO_2 uptake. The reason is the reaction of the calcium hydroxide in the cement paste with the CO_2 in the atmosphere. The amount of CO_2 uptake is determined using calculations based on Table BB.1 in EN 16757. Similarly, the effect of calcination during the waste processing stage is also considered. The concrete does not require any maintenance (B2), repair (B3), replacement (B4), refurbishment (B5), operational energy use (B6), or operational water use (B7) during its service Life. Additionally, the effect of calcination during the end-of-life phase of the concrete is also included considering the simplified method. Reference service life is considered as 50 years.

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport	Waste Processing	Disposal	Future reuse, recycling or energy recovery potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL
Specific Data Used	>90%	>90%	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation - Products	0%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	<10%					-	-	-	-	-	-	-	-	-	-	-	-

(X = Included in LCA, ND= Not declared, NR= Not relevant)

Allocations

Raw materials transportation were weighted according to 2022 transportation figures. In addition, hazardous and nonhazardous waste amounts were also allocated from the 2022 total waste generation.

Cut-Off Criteria

1% cut-off applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. Regional energy datasets were used for all energy calculations.

Plants included in the EPD

This EPD includes the production of the C40 ready-mix concrete at the 56 plants of the Readymix Industries (Israel) Ltd. located in Israel. The location of the plants are indicated on the side.

Variation - Sites

The percentage of raw meterials used in the product and the energy requirements do not change from one plant to another. Thus, the variation of sites in terms of GWP-GHG is less than 10 %.

Geographical Scope

The geographical scope of this EPD is Israel.

LOCATION OF THE PLANTS

- Ashdod B
- Alon Tavor
- Arad
- Ashdod
- Ashkelon
- Beer Sheva
- Beit Shean
- Carmiel
- Dimona
- Eilat
- Eyal
- Givat Shaul
- Golani
- Hadera
- Haifa
- Hatzor
- Holon
- Gan Yavne
- Har Tuv
- Kadarim
- Kallanswa
- Kiryat Bialik
- Kiryat Gat
- Kiryat Shmona
- Maghar
- Mavou Carmel
- Mitzpe Ramon
- Modiin
- Nachshonim
- Nahal Shlomo Eilat
- Natania
- Natania- Mortar
- Nazareth
- Nazereth Kadmani
- Negev
- Netivot
- Ofakim
- Petah Tikva
- Premix
- Ramla
- Rehovot
- Rishon Le'zion
- Rosh Ha'ayin
- Sapir
- Shcoret Eilat
- Shfaram
- Teberia
- Tefen
- Tira
- Tlalim
- Yarka
- Yavne
- Yehiam
- Zemach
- Zfat
- Zichron Ya'akov

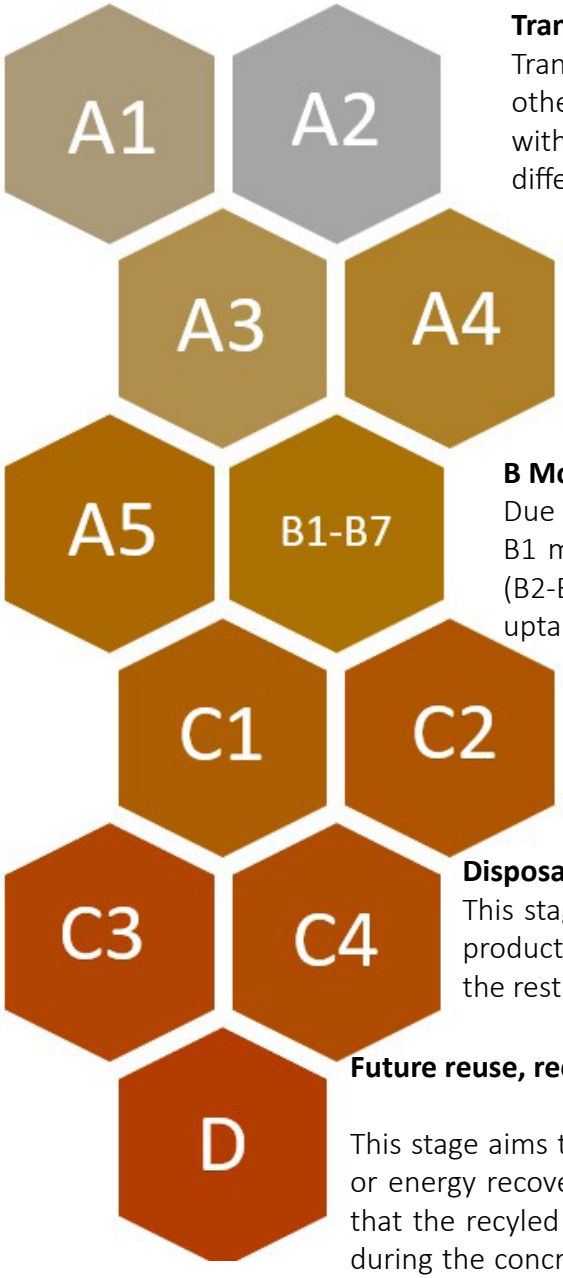
Raw Material Supply
Production starts with acquiring the raw materials. Raw material stage includes raw material extraction and/ or preparation and pre-treatment processes before production. The main materials used in the products are cement, gravel, sand, water, fly ash, and minor additives.

Manufacturing
Concrete production starts with gathering all of the needed materials to produce a particular type of concrete. Then, the cement is mixed with water and other aggerates. The mixing operation uses rotation to properly blend all the components uniformly.

Construction Installation
The diesel consumption and the efficiency of the concrete mixer truck and the concrete pump at construction site is included. The water consumption is assumed to be 669 lt/m3 concrete during this stage.

Demolition / Deconstruction
This stage includes the demolition / deconstruction of the discarded concrete. It is assumed that 129 kW construction excavator is used during the demolition of the concrete.

Waste Processing
Waste processing refers to the processing steps for the discarded concrete for its final end-of-life phase. Possible carbonation during the product is stored and before it is been recycled is also included.



Transport of Raw Materials
Transport is relevant for delivery of raw materials and other materials to the plant, and the transport of materials within the plant. Transport distances of the raw materials to different plant provided by the company for each route.

Transport to Site
Transport routes for the final product to sites are provided by the company. Based on the given information, the product shipment distances of the routes are calculated.

B Modules
Due to the calcination of concrete during the use phase, the B1 module is included, whereas the rest of the B modules (B2-B7) is not applicable for the related product. For CO_2 uptake calculation, EN16757 standard is followed.

Transport
This stage is related with the transportation of concrete waste to a waste processing area. The transport distance of the waste material is taken 40 km.

Disposal
This stage considers the impacts of the disposal of the related product. The recyling rate of construction waste is 55.4 % and the rest is landfilled.

Future reuse, recycling or energy recovery potential

This stage aims to analyze the benefits coming from the reuse, recyling or energy recovery potential of the investigated product. It is assumed that the recyled concrete is used as a substitute for the gravel content during the concrete production. The substitution rate is taken as 1 % of the recycled concrete.

LCA RESULTS	Environmental Impacts for 1 m³ Bet60/C50 Ready-Mix Concrete									
Impact Category	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
GWP- Fossil	kg CO_2 eq	396	13.5	2.63	-7.62	0	6.91	17.6	1.77	6.02	-0.131
GWP- Biogenic	kg CO_2 eq	3.94	0.005	0.002	0	0	0.002	0.006	-0.014	0.003	-356E-6
GWP- Luluc	kg CO_2 eq	0.129	0.007	0.001	0	0	0.001	0.009	397E-6	0.004	-132E-6
GWP- Total	kg CO_2 eq	400	13.5	2.63	-7.62	0	6.91	17.6	1.76	6.02	-0.132
ODP	kg CFC-11 eq	14.1E-6	202E-9	190E-9	0	0	110E-9	278E-9	103E-9	174E-9	-1.23E-9
AP	mol H+ eq	1.26	0.048	0.021	0	0	0.064	0.044	0.039	0.045	-0.001
EP- Freshwater	kg P eq	0.046	0.001	355E-6	0	0	212E-6	0.001	0.001	0.001	-44.6E-6
EP- Marine	kg N eq	0.328	0.016	0.009	0	0	0.030	0.011	0.006	0.017	-192E-6
EP- Terrestrial	mol N eq	3.73	0.166	0.093	0	0	0.323	0.109	0.060	0.187	-0.002
POCP	kg NMVOC	0.965	0.064	0.028	0	0	0.096	0.058	0.021	0.065	-0.001
ADPE	kg Sb eq	0.002	43.1E-6	4.40E-6	0	0	2.41E-6	57.3E-6	5.57E-6	8.35E-6	-686E-9
ADPF	MJ	2080	190	33.5	0	0	90.5	248	86.7	150	-1.62
WDP	m^3 depriv.	115	0.840	27.4	0	0	0.195	1.11	0.329	6.623	-0.189
PM	disease inc.	11.4E-6	1.07E-6	522E-9	0	0	1.79E-6	1.31E-6	59.7E-9	993E-9	-11.8E-9
IR	kBq U-235 eq	7.72	0.162	0.084	0	0	0.043	0.214	0.009	0.095	-0.013
HTTP- C	CTUh	99.7E-9	6.10E-9	2.51E-9	0	0	2.1E-9	8.00E-9	1.03E-9	2.56E-9	-110E-12
HTTP- NC	CTUh	2.83E-6	136E-9	31.5E-9	0	0	14.7E-9	179E-9	37.3E-9	32.1E-9	-1.40E-9
SQP	Pt	1226	113	3.65	0	0	6.10	150	6.63	297.7	-1.46
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change- biogenic, GWP-luluc: Climate change- land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion- elements, ADPF: Abiotic depletion- fossil resources, WDP: Water scarcity, PM: Respiratory inorganics- particulate matter, IR: Ionising radiation, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.										
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site, A5: Construction Installation, B1: Use, C1: Deconstruction / Demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.										
Disclaimer 1	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.										
Disclaimer 2	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.										

Resource use

Impact Category	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
PERE	MJ	106	2.41	1.08	0	0	0.51	3.20	0.442	1.27	-0.145
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	106	2.41	1.08	0	0	0.51	3.20	0.442	1.27	-0.145
PENRE	MJ	2080	190	33.5	0	0	90.5	248	86.7	150	-1.62
PENRM	MJ	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	2080	190	33.5	0	0	90.5	248	86.7	150	-1.62
SM	kg	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	4.59	0.032	1.48	0	0	0.008	0.043	0.023	0.159	-0.015
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.										

Waste&Output Flows

Impact Category	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
HWD	kg	0	0	0	0	0	0	0	0	0	0
NHWD	kg	35.1	0	0	0	0	0	0	0	0	0
RWD	kg	0	0	0	0	0	0	0	0	0	0
CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EE (Electrical)	MJ	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.										
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site, A5: Construction Installation, C1: Deconstruction / Demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.										

Climate impact according to PCR 2019:14

Indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
*GHG-GWP	kg CO_2 eq	396	13.5	2.64	-7.62	0	6.92	17.7	1.78	6.04	-0.132

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology

* The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013

REFERENCES

GPI/ General Programme Instructions of the International EPD® System. Version 4.0.

EN ISO 9001/ Quality Management Systems- Requirements

EN ISO 14001/ Environmental Management Systems- Requirements

EN ISO 50001/ Energy Management Systems- Requirements

ISO 14020:2000/ Environmental Labels and Declarations — General principles

EN 15804:2012+A2:2019/ 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 (ISO14040:2006) 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, 2019:14 Version 1.11 DATE 2019-12-20

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.ecoinvent.org

SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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