Asphalt mixture produced in Iceland using Hólabrú aggregate

Malbikstöðin ehf.

Environmental Product Declaration - EPD

Programme The International EPD® System

Programme operator EPD International AB

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in accordance with ISO 14025 and EN 15804+A1

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PROGRAMME-RELATED INFORMATION

CEN standard EN 15804 serves as the core PCR
Product group classification: UN CPC 1533 & 3794
PCR 2018:04 Asphalt mixtures, version 1.03; 2019-09-06
PCR review was conducted by The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña. Contact via info@environdec.com
Independent third-party verification of the declaration and data in accordance with ISO14025:2006 ☒External ☐Internal covering ☐ EPD process certification ☒ EPD verification
Procedure for follow-up during EPD validity involves third party verifier ☐ Yes ☒ No
The EPD owner has the sole ownership, liability and responsibility of the EPD.
EPDs within the same product category but from different programmes may not be comparable. EPD of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see ISO 14025.

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COMPANY INFORMATION

Malbikstöðin ehf., located in Iceland, produces asphalt for road construction with an emphasis on quality, service, and environmental considerations. Malbikstöðin is a leader in environmentally friendly production of asphalt in Iceland. New equipment enables the company to produce asphalt with up to 60% recycled asphalt. The company's environmental policy aims to further reduce carbon emissions in the production of asphalt by replacing diesel oil for methane in the production of asphalts in the coming years. The methane will be obtained from landfill gas which would otherwise be flared-off. Malbikstöðin also run their own laboratory which greatly contributes to ensuring the quality of the production and the development of products. Malbikstöðin strives to create a professional and inspiring work environment as well as maintaining a culture based on respect, ambition, and team spirit.

PRODUCT DESCRIPTION

Hólabrú 11 is a dense surface course asphalt specifically designed for its high durability and resistance to rutting. It is a combination of hard-wearing durable aggregates combined with bitumen to give enhanced stability under stress with good load bearing capacity made to the highest standards. As a surface course, Hólabrú 11 is designed to provide a safe and smooth road, meet the needs of road users and resist the elements. Hólabrú 11 is a 100% recyclable material and uses local aggregates. It is suitable for public roads with traffic levels up to 8000 vehicles per day, housing estate roads, factory and car parking areas, runways, and house fronts. 71.32% of the mass of produced material at Malbikstöðin is Hólabrú 11-based asphalt.

APPLICATION

The asphalt is intended for use on roads, runways and other infrastructure for land transport (1).

CONTENT DECLARATION

The main components in asphalt mixes are bitumen and aggregates. Other materials such as fillers and additives can be added, and their content depends on the asphalt type. Reclaimed Asphalt Pavement (RAP) is also commonly incorporated to replace virgin bitumen and virgin aggregate. The mix recipe for Hólabrú 11 can be found in Table 1.

Table 1. Product composition

Hólabrú 11
Aggregates from Hólabrú quarry
Fillers
Bitumen
Additives

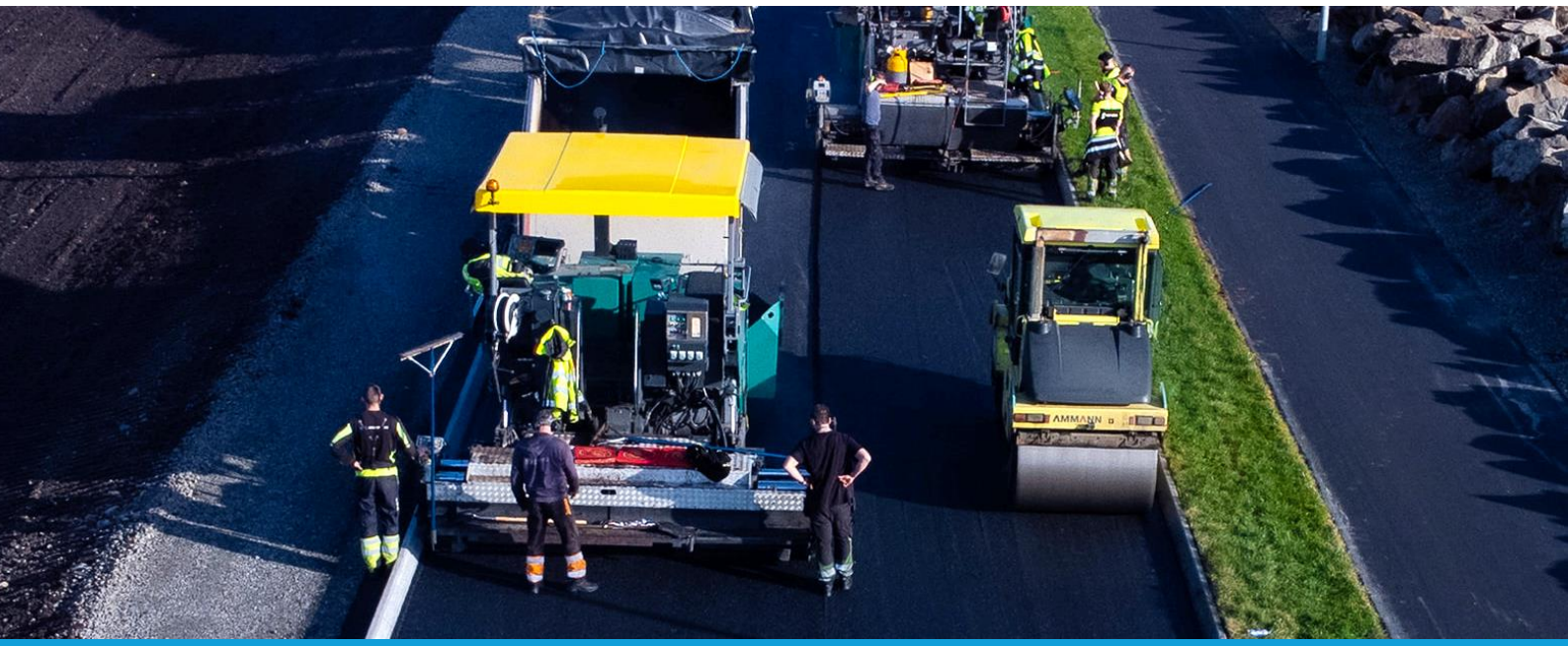

Table 2 displays a declaration of performance for the Hólabrú 11 asphalt produced by Malbikstöðin in accordance with ÍST EN 13108-1:2016. No packaging is used for the final product. The product does not contain any REACH SVHC substances in amounts greater than 0.1% (1 000 ppm).

Table 2. Declaration of performance for Hólabrú 11

Declared usability in accordance with ÍST EN 13108-1			
Name	**Weight ratio that penetrates sieve**	**Standard**	**Important qualities**
Grading	SL 11		
Size of aggregates Dmax	11.2 mm	ÍST EN 12697-2	2,3
Penetrates sieve %			
16 mm	100		
11.2 mm	90-100		
8 mm	64-84		
5.6 mm	52-71		
2 mm	28-48		
0.063 mm	6-10		
Other qualities			
Binder content	$B_{min5.5}$	ÍST EN 12697-39	1,2,3,4
Air voids	$V_{min1.5}$ – $V_{max3.5}$	ÍST EN 12697-8	1,2,3,4
Voids filled with binder	VFB_{min75} – VFB_{max97}	ÍST EN 12697-8	3
Temperature of mixture °C Penetration grade 160/220	130-165	ÍST EN 12697-13	1,2,3,4
Temperature of mixture °C Penetration grade 70/100	140-180	ÍST EN 12697-13	1,2,3,4

LCA INFORMATION

GOAL OF STUDY

This study aims to generate an environmental profile for the manufacturing of 1 000 kg of Hólabrú 11 asphalt produced by Malbikstöðin in Iceland. Type III EPD is to be generated and made public via the International EPD system®.

EPD TYPE

Product specific.

DECLARED UNIT

The declared unit of the LCA is the manufacturing of **1 000 kg (1 metric tonne)** of Hólabrú 11 asphalt. The average is based on the mass of the product produced and the reference year for this LCA is 2021.

GOAL AND SCOPE

This LCA evaluates the environmental impacts of the production of 1000 kg of Hólabrú 11 asphalt from cradle-to-gate. No modules or processes are excluded which are stated as mandatory in the standards and PCR 2018:04.

BACKGROUND DATA

Specific data from manufacturer is used in combination with the Ecoinvent v.3.8. databank and LCA databanks provided by OpenLCA. The Ecoinvent database is one of the most widely used LCA databases worldwide and it contains international industrial life cycle inventory data on energy supply, resource extraction, material supply, chemicals, metals, agriculture,

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waste management services, and transport services (2,3)

PRODUCT SUSTAINABILITY SOFTWARE

OpenLCA 1.11.0.

DATA QUALITY

Energy mix and other processes are valid for the production site in Esjumelar, Iceland. Malbikstöðin provided data for one-year of operation for the year 2021. Modelling of the life cycle of Hólabrú 11 asphalt was performed using OpenLCA software developed by GreenDelta. All relevant background life cycle inventory (LCI) datasets were gathered from Ecoinvent v.3.8. and other open databanks. The data quality for the entire study can be judged as good (measured directly at a specific process site or scaled from measurements).

TIME REPRESENTIVENESS

All primary data used in this study are for the year 2021 and are thought to represent the manufacturing process for at least the next five years.

GEOGRAPHICAL SCOPE

Europe.

ALLOCATIONS

Energy and emissions were subdivided between the different products of Malbikstöðin based on mass because Malbikstöðin only had energy and emissions data for the whole plant. Diesel use needed to heat and dry the aggregates was distributed evenly between aggregate sizes as there is not a vast difference in the wetness of the aggregates for different products.

COMPARABILITY

EPDs within the same product category but from different programmes may not be comparable. EPD of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see ISO 14025.

CUT-OFF RULES

All raw materials and consumable item inputs, associated internal transports and external transports, as well as process energy use, are included in the LCA study. It is considered that the total potential neglected input flows are much less than 0.1% of total energy, area, area-time activities and mass.

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SYSTEM BOUNDARY

Product environmental performance was assessed using Life Cycle Assessment (LCA), from the extraction of raw materials to the gate of the asphalt plant. The declared unit is one metric tonne of manufactured asphalt mixture. The reference flow in the LCA is defined at the gate of the asphalt mixing plant. The study was conducted in compliance with the ISO 14040 standard, EN 15804+A1 and the product category rules set forth in PCR 2018:04 Asphalt mixtures, approved by the International EPD® System technical committee. The scope of this study is "Cradle to gate" covering stages A1 – A3 in the PCR and standards (Table 3).

Table 3. Diagram illustrating life cycle stages studied for this EPD. (MND: module not declared).

Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw materials	Transport	Manufacturing	Transport	Construction installation	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
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

PRODUCTION PROCESS

The main steps of the production of Hólabrú 11 by Malbikstöðin is illustrated in . The aggregates used for the asphalt are mined in Hólabrú quarry in Hvalfjörður, Iceland. All raw materials are transported to Malbikstöðin site via trucks mostly and in some cases by ship. The different materials for the asphalt are unloaded at Malbikstöðin's factory at Esjumelar. The aggregates are stored in specially marked slots and then they are internally transported by a diesel-powered wheel loader to funnels according to their grain size. From there the aggregates are transported via a conveyor belt to the rotary drum dryer where they get dried and heated. After drying they are sieved so that filler and other unwanted material falls out. The filler is not reused in any way and is considered waste from the production. After sieving the RAP is mixed with the aggregates and the bitumen as well by mixing and heating for about 45 seconds. Once the asphalt has been mixed the mixture is transported to a holding tank which keeps the asphalt under optimal temperature until it is weighed onto asphalt trucks.

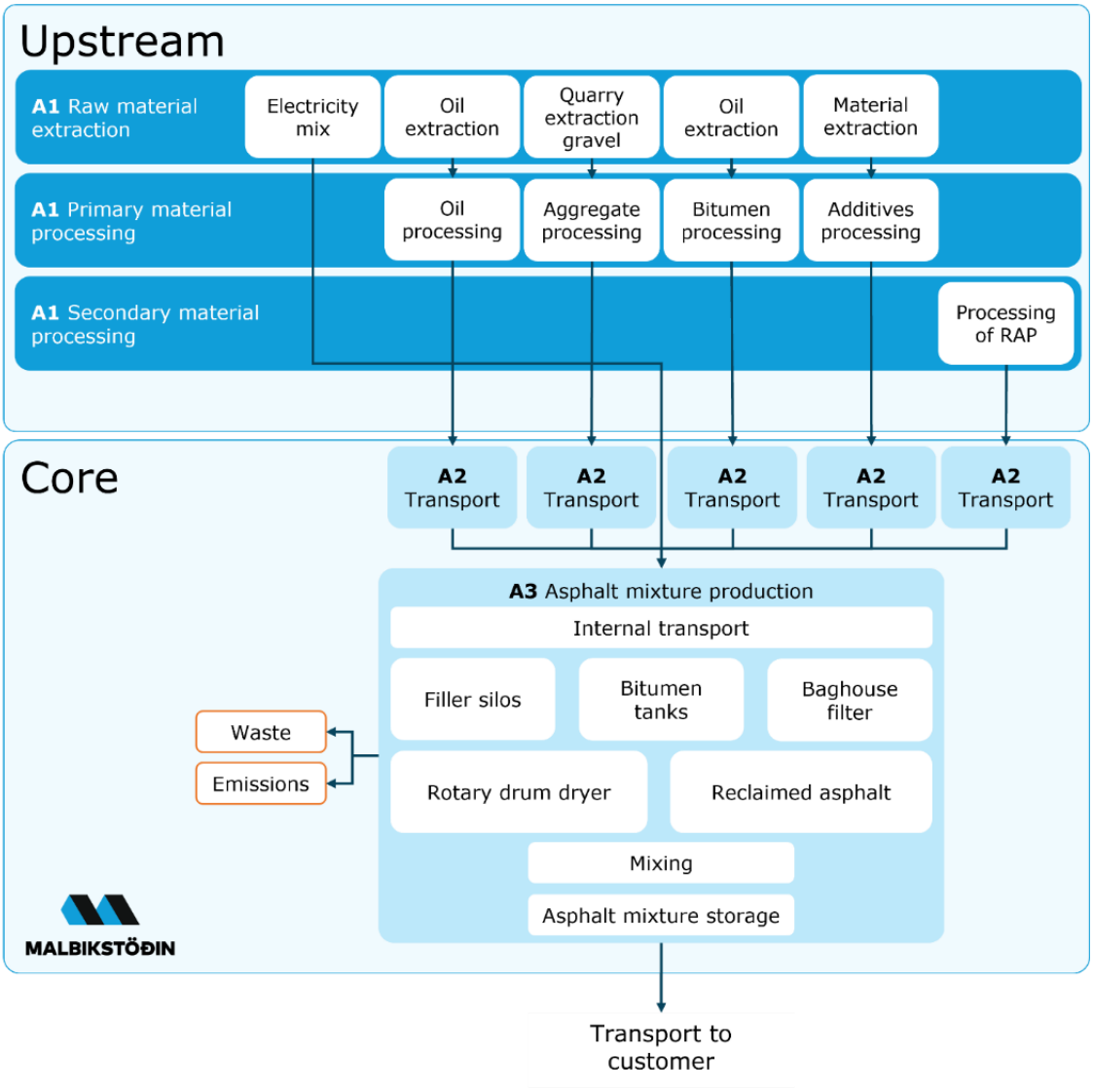

Figure 1. System diagram for the LCA assessment of Hólabrú 11. Downstream processes are outside the system boundary.

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LCA: RESULTS

The environmental impacts are declared according to PCR 2018:04, parameters and units. The environmental impact results refer to 1000 kg of produced Hólabrú 11 asphalt by Malbikstöðin in Iceland. The Life Cycle Impact Assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Table 4 and Table 5 show the LCIA results for the production of 1000 kg of Hólabrú 11 asphalt by Malbikstöðin. The production of 1 000 kg of Hólabrú 11 asphalt by Malbikstöðin from cradle-to-gate generates 60.9 kg CO_2 eq.. Potential depletion of fossil resources and global warming potential are the most critical impacts of the life cycle for Hólabrú 11. About half of the total global warming potential for Hólabrú 11 stems from the production line of Malbikstöðin.

Malbikstöðin plans to use compressed biomethane gas (commonly referred to as “metangas” or “metan eldsneyti” in Icelandic) produced at a nearby landfill as an energy source and to substitute aggregates from mines with RAP in ever greater proportions. The results indicate that the planned changes in Malbikstöðin’s production target the most significant environmental impacts and processes in the life cycle of the Hólabrú 11 asphalt.

Table 4. Potential environmental impact generated by the production of 1 000 kg of asphalt by Malbikstöðin.

Parameter		Unit	A1	A2	A3	TOTAL
Global warming potential (GWP)	Fossil	kg CO_2 eq.	22.0	1.60	36.3	**59.9**
	Biogenic	kg CO_2 eq.	3.98E-02	5.82E-03	6.40E-02	**0.110**
	Land use / land transformation	kg CO_2 eq.	0.157	3.31E-02	0.682	**0.872**
	TOTAL	kg CO_2 eq.	22.3	1.64	37.0	**60.9**
Acidification potential (AP)		kg SO_2 eq.	2.31E-04	8.17E-03	0.130	**0.138**
Eutrophication potential (EP)		kg PO_4^{3-} eq.	0.0790	0.00154	0.0113	**0.0918**
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	4.31E-04	0.0102	0.0510	**0.0616**
Abiotic depletion potential – Elements		kg Sb eq.	1.70E-03	5.12E-07	9.43E-06	**1.71E-03**
Abiotic depletion potential – Fossil resources		MJ, net calorific value	525	22.2	449	**996**
Ozone layer depletion		kg CFC-11 eq.	3.83E-08	3.73E-7	7.61E-6	**8.02E-6**

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Table 5. Parameters describing resource use, primary energy for the production of 1 000 kg of Hólabrú 11 asphalt by Malbikstöðin.

Parameter		Unit	A1	A2	A3	Total
Parameters describing resource use, primary energy						
Primary energy resources - renewables	Used as energy	MJ, net calorific value	21.2	8.95E-01	190	**212**
	Used as raw materials	MJ, net calorific value	0	0	0	**0**
	Total	MJ, net calorific value	21.2	8.95E-01	190	**212**
Primary energy resources – non-renewables	Used as energy	MJ, net calorific value	525	22.2	449	**996**
	Used as raw materials	MJ, net calorific value	8.10E-02	1.44E-02	2.71E-01	**3.67E-01**
	Total	MJ, net calorific value	525	22.2	449	**996**
Parameters describing resource use, secondary materials and fuels, use of water						
Secondary material		kg	0	0	197	**197**
Renewable secondary fuels		MJ, net calorific value	0	0	0	**0**
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	**0**
Net use of fresh water		m^3	5.62E-02	1.17E-03	2.79E-02	**8.52E-02**
Other environmental information describing waste categories						
Hazardous waste disposed		kg	0	0	0	**0**
Non-hazardous waste disposed		kg	0	0	0	**0**
Radioactive waste disposed		kg	0	0	0	**0**
Other environmental information describing outflows						
Components for reuse		kg	0	0	0	**0**
Materials for recycling		kg	0	0	0	**0**
Materials for energy recovery		kg	0	0	0	**0**
Exported energy, electricity		MJ	0	0	0	**0**
Exported energy, thermal		MJ	0	0	0	**0**

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