Environmental Product Declaration for asphalt mixtures from Mora asphalt plant – Grönsberg

According to EN 15804:2012+A2:2019/AC:2021,
ISO 14025, ISO 14040 and ISO 14044
Programme operator: EPD International AB
EPD owner: NCC Industry Nordic AB

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See Table 1 for all declared asphalt mixtures in this EPD.

EPD Information

Declared unit:	1000 kg product
PCR:	Product Category Rules PCR 2019:14 Construction products, version 1.11 of 2021-02-05
Programme:	The International EPD® System, www.environdec.com

General product information

The asphalt mixtures declared are manufactured at Grönsberg asphalt plant in Mora, by NCC Industry, Division Asphalt in Sweden.

Asphalt plants manufacture asphalt mixtures for paving purposes. The asphalt mixtures that can be produced at the declared plant are hot mix asphalt (HMA), warm mix asphalt (WMA), soft bitumen asphalt (SA) and polymer modified asphalt (PMB).

The main components in asphalt mixtures are mineral rock aggregates and bitumen. Other materials are added, and the content varies depending on the asphalt type. These include for instance hydraulic adhesion promoter and fibre and they normally constitute less than 0.5 weight-% of the product. In addition, Reclaimed Asphalt (RA) is usually added to the asphalt mixture, replacing virgin aggregates and virgin bitumen. The content declaration of the asphalt mixtures declared is shown in the section Content declaration including packaging, Table 6.

The temperature class of the asphalt mixtures are given in Table 1.

Table 1: Temperature class of the asphalt mixtures declared.

#	Asphalt mixture	Temperature class
1	ABT 11 160/220	HMA
2	ABT 11 160/220 LTA	WMA
3	ABT 11 100/150	HMA
4	ABT 11 100/150 LTA	WMA
5	ABT 11 70/100	HMA
6	ABT 11 70/100 LTA	WMA
7	ABS 11 100/150	HMA
8	ABS 11 100/150 LTA	WMA
9	ABS 11 70/100 LTA	WMA
10	ABT 16 70/100	HMA
11	ABT 16 70/100 LTA	WMA
12	ABT 16 100/150	HMA
13	ABT 16 100/150 LTA	WMA
14	ABT 16 160/220	HMA
15	ABT 16 160/220 LTA	WMA
16	ABS 16 100/150	HMA
17	ABS 16 100/150 LTA	WMA
18	ABS 16 70/100	HMA
19	ABS 16 70/100 LTA	WMA
20	AG 16 70/100	HMA
21	AG 16 70/100 LTA	WMA
22	AG 160/220	HMA
23	AG 160/220 LTA	WMA
24	ABb 16 70/100	HMA
25	ABb 16 70/100 LTA	WMA
26	ABTS 8 160/220	HMA
27	ABTS 8 100/150	HMA
28	AG 22 100/150	HMA
29	AG 22 100/150 LTA	WMA
30	AG 22 70/100	HMA
31	AG 22 70/100 LTA	WMA
32	ABT 4 160/220	HMA
33	ABT 11 160/220 Hand	HMA
34	ABb 16 50/70	HMA
35	ABb 16 50/70 LTA	WMA
36	ABb 11 50/70	HMA
37	AG 16 100/150	HMA
38	AG 16 100/150 LTA	WMA
39	AG 22 160/220	HMA
40	AG 22 160/220 LTA	WMA
41	ABS 16 40/100-75	PMB
42	ABS 11 40/100-75	PMB

At the asphalt plant, the manufacture of a typical asphalt mixture is managed from the on-site control room where adjustments are made to individual raw materials. A schematic illustration of an asphalt plant is shown in Figure 1.

Aggregates, which are obtained either from the quarry on-site or purchased from external suppliers, are stored in stockpiles of different fractions (e.g. 0/4, 4/8 and 8/11 etc). The aggregates in an individual stockpile are hauled to a cold feed bin of the asphalt plant before transported further, together with the other aggregate fractions of a given recipe, by a conveyor belt running below the bins. The mixed aggregates enter a rotating dryer drum, where the material is dried and heated to desired temperature. The heated material continues to an elevator and is further transported up to the batch tower.

The next step comprises screening using a hot screen where the heated aggregates are separated according to grain size and put into a weigh hopper.

The material is mixed with bitumen, filler, fibres and other additives, such as adhesive agents (amines or cement), in the mixing chamber. When a homogeneous asphalt mixture is obtained it is transferred with a skip hoist to an insulated storage silo before being retrieved by a truck.

A schematic illustration of the production process of asphalt in general is presented in Figure 2.

The dashed lines illustrate the six different methods of adding RA to an asphalt mixture. Mora asphalt plant uses the methods “elevator” and “direct to mixer”.

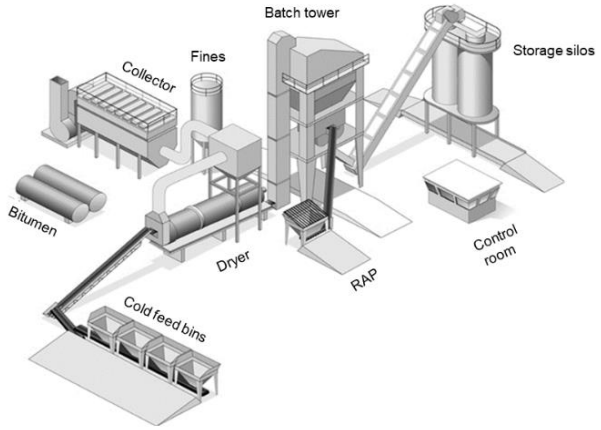

Figure 1: Schematic illustration of an asphalt plant

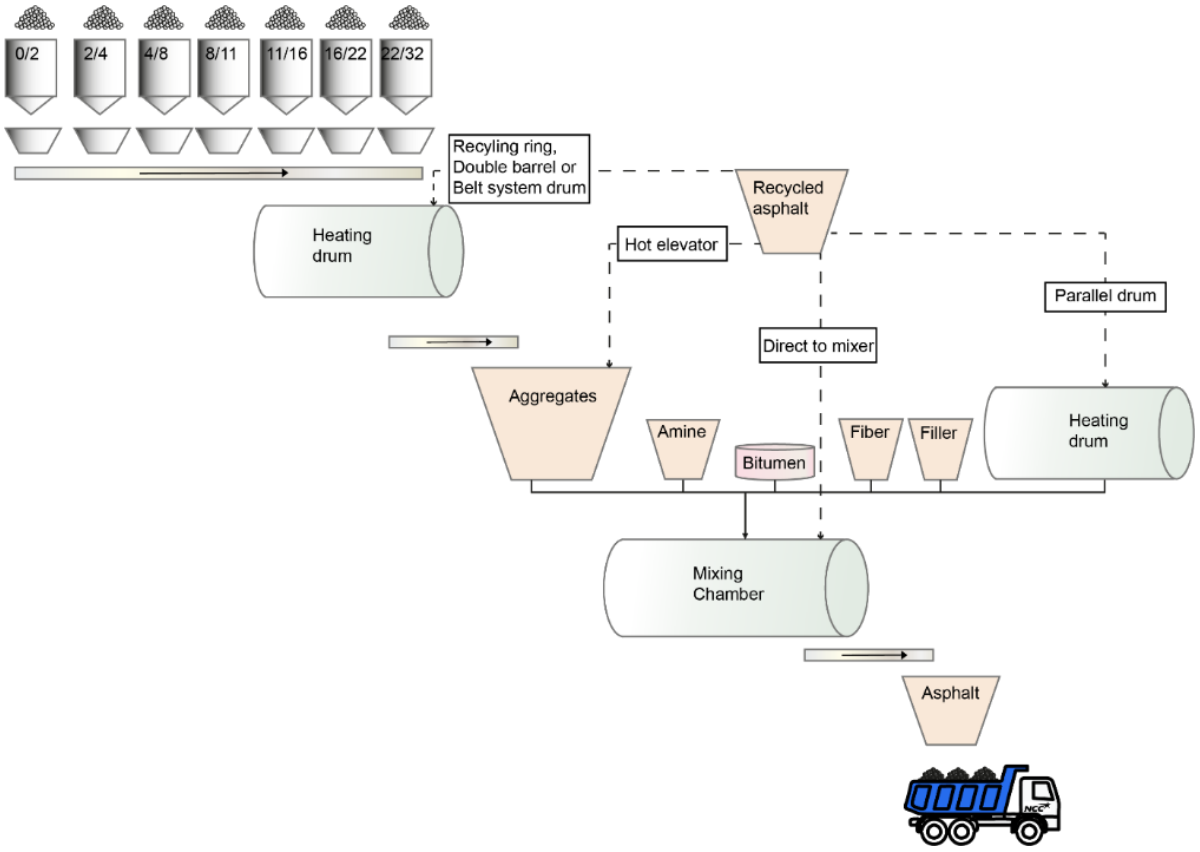

Figure 2: Illustration of the general production process of asphalt.

It is important to treat emissions (i.e. polyaromatic hydrocarbons, PAHs) generated in the dryer drum. Such emissions largely depend on production temperature, fuel type, amount and type of technique used for adding RA. Depending on technique used, PAHs created at the drying drum or at the top of the batch tower are transported for filtering at the collector.

Warm Mix Asphalt is a production method used by NCC for manufacturing of any type of asphalt but at a lower temperature compared to conventionally produced asphalt mixtures. To obtain the temperature reduction a foaming technique is used. Water is injected into the bitumen, which expands and forms a foam of bitumen in a foaming chamber. The bitumen is mechanically foamed inside the chamber where the binder increases roughly 20 times in volume before it is mixed with the heated aggregates and the reclaimed asphalt. The procedure reduces the binder viscosity and the compatibility of the asphalt mixture thus allowing it to be laid at typically 30°C lower temperature than conventionally produced asphalt. All other raw

materials are added following the same principle as described for conventional asphalt production.

The products declared are classified as the United Nations Central Product Classification (UN CPC) code 15330. The products declared follow the technical standards SS-EN 13108-1, SS-EN 13108-3, SS-EN 13108-5 and SS-EN 13108-7.

The geographical location of Mora asphalt plant is shown in Figure 3.

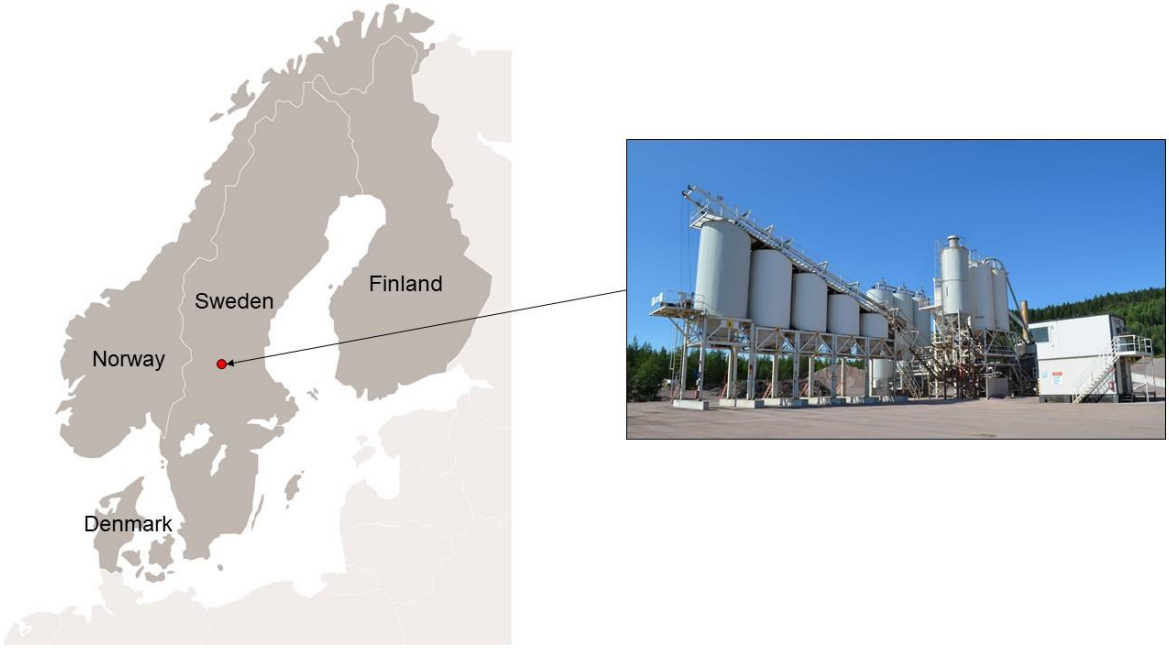

Figure 3: Map and picture showing the geographical location of the declared plant.

Declared unit

The declared unit is 1 tonne (1000 kg) of asphalt mixture.

System boundary

The system boundaries cover aspects such as temporal and geographical. The setting of system boundaries follows two principles according to EN 15804: (1) The “modularity principle” and (2) the “polluter pays principle”.

This is a “cradle to gate with modules C1–C4 and module D”. EPD and it is based on a LCA model described in the background report and in the related annex (see reference list). The declared modules are A1-A3, C, D, see Table 2. The product system under study is presented in Figure 4. Figure 4 is modified and originates from the PCR 2018:04 Asphalt Mixtures, version 1.03 of 2019-09-06. The figure has been slightly adjusted to be in line with EN 15804.

Table 2: Modules of the life cycle in the EPD, including geography, share of specific data (in GWP-GHG indicator) and data variation.

	Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
	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	Reuse, recovery, recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	SE/ EU	SE/ EU	SE	-	-	-	-	-	-	-	-	-	SE	SE	SE	SE	SE
Specific data	Se Table 3.			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3: Share of specific data for each asphalt mixture.

#	Asphalt mixture	Share specific data (%)
1	ABT 11 160/220	18
2	ABT 11 160/220 LTA	12
3	ABT 11 100/150	17
4	ABT 11 100/150 LTA	16
5	ABT 11 70/100	16
6	ABT 11 70/100 LTA	12
7	ABS 11 100/150	15
8	ABS 11 100/150 LTA	11
9	ABS 11 70/100 LTA	12
10	ABT 16 70/100	18
11	ABT 16 70/100 LTA	12
12	ABT 16 100/150	18
13	ABT 16 100/150 LTA	12
14	ABT 16 160/220	18
15	ABT 16 160/220 LTA	13
16	ABS 16 100/150	16
17	ABS 16 100/150 LTA	11
18	ABS 16 70/100	12
19	ABS 16 70/100 LTA	11
20	AG 16 70/100	15
21	AG 16 70/100 LTA	14
22	AG 160/220	21
23	AG 160/220 LTA	20
24	ABb 16 70/100	19
25	ABb 16 70/100 LTA	13
26	ABTS 8 160/220	15
27	ABTS 8 100/150	16
28	AG 22 100/150	21
29	AG 22 100/150 LTA	20
30	AG 22 70/100	15
31	AG 22 70/100 LTA	14
32	ABT 4 160/220	13
33	ABT 11 160/220 Hand	17
34	ABb 16 50/70	19
35	ABb 16 50/70 LTA	18
36	ABb 11 50/70	19
37	AG 16 100/150	20
38	AG 16 100/150 LTA	19
39	AG 22 160/220	16
40	AG 22 160/220 LTA	20
41	ABS 16 40/100-75	9
42	ABS 11 40/100-75	9

Data that represent the current situation of the production process at the plant are used. All input data used in the LCA model (e.g. raw materials and production data) that NCC Industry has influence over are plant-specific data for the production year 2022, except for data on waste that is based on 2020. The geographical scope, i.e. location(s) of use and end-of-life performance, is Sweden.

The environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the Life Cycle Inventory (LCI). Personnel-related impacts, such as transportation to and from work, are neither accounted for in the LCI.

Declaration of the RSL is only possible if B1-B5 are included, i.e. RSL is not assessed.

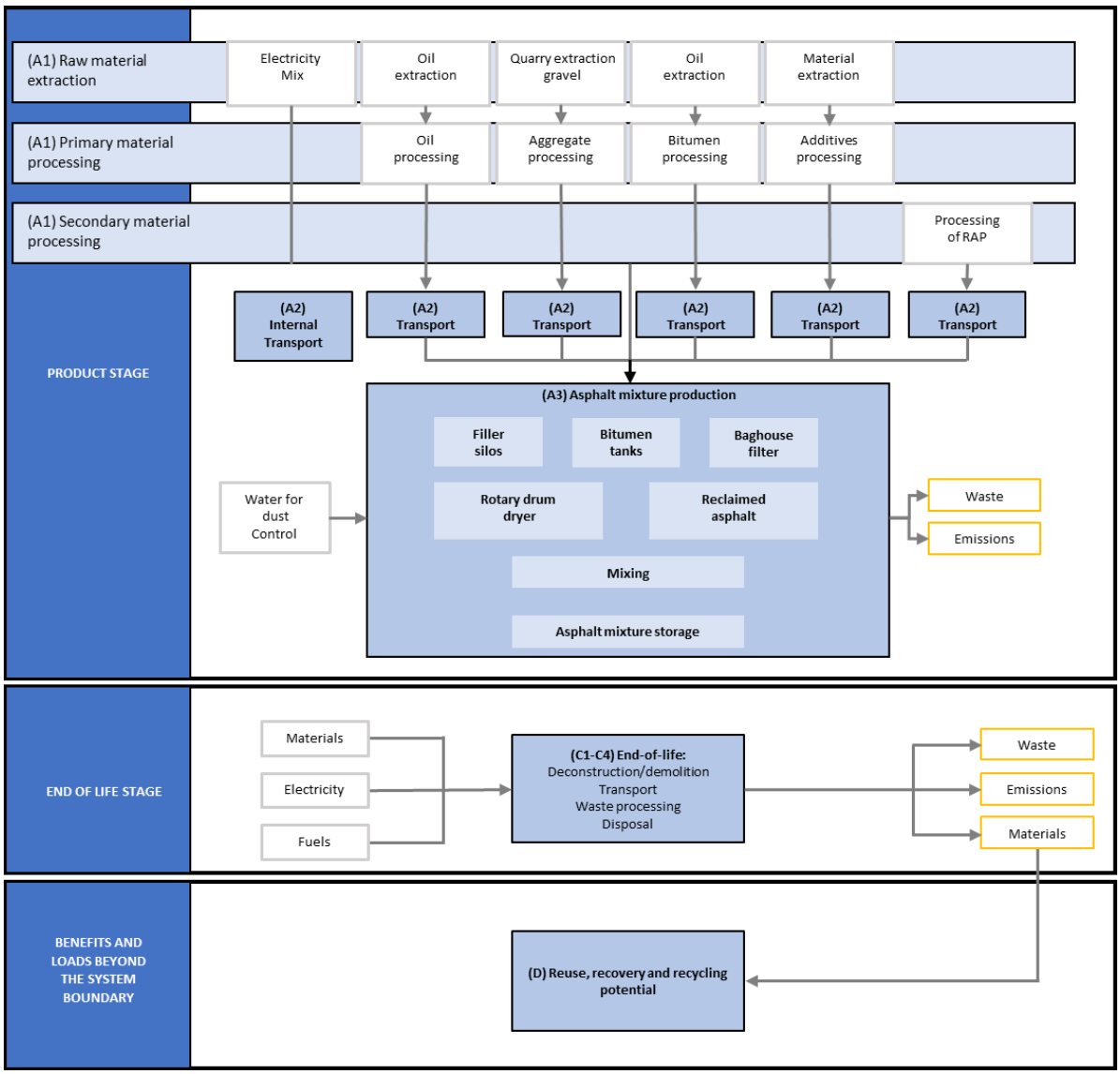

Figure 4: System boundaries for the studied product system.

Assumptions and approximations

It is possible to vary the share of RA in the asphalt mixtures. Results are presented for asphalt mixtures containing the mean share. The mean share is the actual annual average RA share in the asphalt mixtures at the plant. In addition, the result for no RA content and the maximum possible share of RA are presented for the impact category GWP-GHG. The maximum is the highest possible RA share for the given product at the plant. By doing so, the improvement potential is shown which can drive the development to demand asphalts mixtures with a higher share of RA.

The content of aggregate and bitumen in RA is assumed to 96.2% aggregates and 3.8% bitumen on average.

The RA replacing virgin aggregates is assumed to have the same fraction sizes (0/4, 4/8 etc) as the fractions of virgin aggregates in the asphalt mixtures. This is a conservative assumption since RA is normally replacing small size-fractions of aggregates which have a higher environmental impact than larger fractions.

PAHs emitted to air during production are approximately 40 mg per tonne asphalt produced. This is based on that bitumen heated to about 150°C emits PAHs less than 10 mg/kg*h heated (The German BITUMEN Forum 2016). The hot bitumen is contained in a closed system so no direct emission to air occurs at the asphalt plant, except when the asphalt is transported in contact with outside air. According to measurements and expertise judgments on-site, the time when the asphalt mixture is exposed to air is about five minutes. This time frame is a very conservative estimate. This means that the total direct PAH emissions to air during production are on average 40 mg/tonne asphalt produced.

Allocation

The asphalt manufacturing process does not produce any co-products.

During normal production in an asphalt plant, steady-state in terms of mass flow or temperatures rarely exists. Instead, there are numerous transients with varying extensions and time delays. In addition, there are ad-hoc adjustments within a specific asphalt mixture because of e.g. weather and transport distance. Therefore, the heat required for specific asphalt mixtures cannot simply be inferred from statistical production data. Instead, allocation between mixtures is based on yearly sums of produced amounts of asphalts and used energy, which is subsequently allocated to mixtures according to a thermodynamic model of asphalt heating described in Ekblad and Lundström (2013). The allocation model is described in the background documentation to this EPD.

Concerning the manufacture of various mixtures, four temperature classes are defined with respect to their annual average production temperature, as summarized in Table 4. The average temperature for each class is based on local experience and requirements in standards. Production temperatures can vary slightly between plants.

Table 4: Temperature classes and corresponding average production temperatures.

Temperature class	Annual average production temperature [°C]
Polymer modified (PMB)	175
Conventional hot mix asphalt (HMA)	155
Reduced temperature, warm mix asphalt (WMA)	130
Soft asphalt (SA)	100

Cut-offs

The cut-off criteria are 1% of the renewable and non-renewable primary energy usage and 1% of the total mass input of the manufacture process (according to the EN 15804 standard).

In the assessment, all available data from the production process are considered, i.e. all raw materials used, utilised ancillary materials, and energy consumption using the best available LCI datasets.

The following cut-offs have been made:

– The packaging for the input materials used in the production process are negligible.
– Lubricants used in the asphalt plant production are negligible.

Software and database

The LCA software “LCA for Experts” (formerly GaBi Professional) and its integrated database from Sphera have been used in the LCA modelling.

Electricity in manufacturing

If the electricity in module A3 accounts for more than 30% of the total energy in stage A1 to A3, the energy sources behind the electricity grid in module A3 shall be documented, including the LCA data of grams CO2 eq./kWh. For transparency the information is given in Table 5 even though electricity in A3 accounts for less than 30% of the total energy in A1-A3.

Table 5: Electricity in manufacturing (A3).

Energy source	LCA data (g CO_2 eq./kWh)
Hydropower	14.3

Data quality

The primary data collected by the manufacturer are based on the required materials and energy to manufacture the product. The data of the raw materials are collected per declared unit. All necessary life cycle inventories for the basic materials are available in the Sphera database or via EPDs. The only generic selected datasets (secondary data) that is older than ten years is PMB. No specific data collected is older than five years and represent a period of about one year. The representativeness, completeness, reliability and consistency are judged as good.

About NCC

NCC is one of the leading construction and property development companies in the Nordic region, with sales of 54 billion SEK and approximately 12 500 employees in 2022. With the Nordic region as its home market, NCC is active throughout the value chain – developing commercial properties and constructing housing, offices, industrial facilities and public buildings, roads, civil engineering structures and other types of infrastructure. NCC also offers input materials used in construction and accounts for paving and road services.

NCC’s vision is to renew our industry and provide superior sustainable solutions. NCC aims to be the leading society builder of sustainable environments and will proactively develop new businesses in line with this.

NCC works to reduce both our own and our customers' environmental impact and continues to further refine our offerings with additional products and solutions for sustainability. In terms of the environment, this entails that NCC, at every step of the supply chain, is to offer resource and energy-efficient products and solutions to help our customers reduce their environmental impact and to operate more sustainably.

NCC's sustainability work is based on a holistic approach with all three dimensions of sustainability – social, environmental and economical. NCC´s sustainability framework is divided into eight impact areas: Data and expertise, Natural resources and biodiversity, Materials and circularity, Climate and energy, Health and safety, People and team, Ethics and compliance and Economic performance. Our sustainability strategy includes the aim of being both a leader and a pioneer in these areas.

NCC reports on its sustainability progress each year and the report has been included in NCC's Annual Report since 2010. NCC applies Global Reporting Initiative (GRI) Standards, the voluntary guidelines of the GRI for the reporting of sustainability information. In addition to GRI, NCC also reports the Group's emission of greenhouse gases to the CDP each year. NCC is a member in BSCI (Business Social Compliance Initiative), which is the broadest business-driven platform for the improvement of social compliance in the global supply chain and has been a member of the UN Global Compact since 2010. The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with 10 defined and universally accepted principles in the areas of human rights, labour, environment and anti-corruption.

Also visit: https://www.ncc.com/sustainability

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Content declaration including packaging

The products do not contain any substances of very high concern (SVHC) according to REACH. Table 6 presents the content of all asphalt mixtures as ranges since it is at corporate secrecy and varies depending of the mixture. This refers to the actual annual mean share of RA. The mass of biogenic carbon in the products is less than 5%. The packaging material is negligible.

Table 6: Content declaration of the asphalt mixtures declared (ranges for declared products).

Product component	Weight, kg	Post-consumer material, weight-%	Renewable material weight-%
Reclaimed Asphalt (RA)	0 – 309	0 – 31	0
Aggregates 0/4	106 – 833	*	0
Aggregates 4/8	0 – 303	*	0
Aggregates 8/11	0 – 514	*	0
Aggregates 11/16	0 – 447	*	0
Aggregates 16/22	0 – 255	*	0
Bitumen, virgin	0 – 67	0	0
Polymer modified bitumen (PMB), virgin	0 – 66	0	0
Fibre	<10	0	90
Baghouse fines	25 – 103	3 – 10**	0
Hydraulic adhesion promoter	≤10	0	0
Packaging material	Weight, kg	Weight-% (versus the product)	
Negligible for all product components	Negligible	Negligible	

*Data is not available, probably 0.
**Could be either pre- or post-consumer material.

Environmental performance

The environmental performance results are presented for asphalt mixtures containing the actual annual mean share of RA.

The results of the life cycle assessment based on the declared unit for asphalt mixtures containing the actual annual mean share of RA are presented in Table 7 and 8 (core environmental indicators), Table 9 and 10 (resource use) and Table 11 and 12 (waste categories and output flows).

In addition, the result for GWP-GHG is presented for asphalt mixtures containing no RA and the potential maximum share of RA. This is presented in Table 15 and 16.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Table 7: Results of the LCA (modules A1-A3) – Core environmental indicators per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA).

Core environmental indicators			1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA	7 ABS 11 100/150
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	20	22	20	20	21	23	23
	Fossil	kg CO_2 eq.	20	22	20	20	21	23	22
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.029	0.028	0.030	0.029	0.030	0.029	0.033
	GWP-GHG	kg CO_2 eq.	19**	22**	20**	19**	21**	23**	22**
Ozone depletion		kg CFC 11 eq.	2.4E-11	3.2E-11	2.4E-11	2.3E-11	2.5E-11	3.2E-11	3.0E-11
Acidification		mol H^+ eq.	0.17	0.19	0.17	0.17	0.18	0.20	0.19
Eutrophication aquatic freshwater		kg P eq.	4.2E-04	3.8E-04	4.2E-04	3.8E-04	4.2E-04	3.8E-04	4.2E-04
Eutrophication aquatic marine		kg N eq.	0.049	0.055	0.050	0.048	0.052	0.057	0.054
Eutrophication terrestrial		mol N eq.	0.49	0.56	0.50	0.48	0.53	0.58	0.55
Photochemical ozone formation		kg NMVOC eq.	0.15	0.17	0.15	0.15	0.16	0.18	0.17
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.5E-06	2.3E-06	2.5E-06	2.3E-06	2.5E-06	2.3E-06	2.5E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	2332	2819	2427	2396	2612	2999	2690
Water use		m^3 world eq. deprived	5.3	5.6	5.4	5.1	5.6	5.8	5.9

Core environmental indicators			8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	24	23	20	23	20	23	19
	Fossil	kg CO_2 eq.	24	23	20	23	20	23	19
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.032	0.031	0.030	0.028	0.030	0.028	0.029
	GWP-GHG	kg CO_2 eq.	24**	23**	20**	22**	19**	22**	19**
Ozone depletion		kg CFC 11 eq.	3.6E-11	3.5E-11	2.4E-11	3.2E-11	2.3E-11	3.2E-11	2.3E-11
Acidification		mol H^+ eq.	0.21	0.21	0.17	0.19	0.17	0.19	0.16
Eutrophication aquatic freshwater		kg P eq.	3.8E-04	3.8E-04	4.2E-04	3.8E-04	4.2E-04	3.8E-04	4.2E-04
Eutrophication aquatic marine		kg N eq.	0.058	0.058	0.049	0.055	0.049	0.055	0.048
Eutrophication terrestrial		mol N eq.	0.59	0.59	0.49	0.57	0.49	0.57	0.48
Photochemical ozone formation		kg NMVOC eq.	0.18	0.18	0.15	0.17	0.15	0.17	0.14
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.4E-06	2.4E-06	2.5E-06	2.3E-06	2.5E-06	2.3E-06	2.4E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	3025	3055	2362	2864	2341	2864	2260
Water use		m^3 world eq. deprived	6.1	6.1	5.3	5.7	5.3	5.7	5.2

Core environmental indicators			15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	22	21	24	24	25	20	20
	Fossil	kg CO_2 eq.	22	21	24	24	25	20	20
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.028	0.034	0.032	0.032	0.033	0.026	0.025
	GWP-GHG	kg CO_2 eq.	22**	21**	24**	24**	24**	20**	20**
Ozone depletion		kg CFC 11 eq.	3.2E-11	2.9E-11	3.7E-11	3.5E-11	3.7E-11	3.3E-11	3.3E-11
Acidification		mol H^+ eq.	0.19	0.18	0.20	0.21	0.21	0.18	0.17
Eutrophication aquatic freshwater		kg P eq.	3.8E-04	4.2E-04	3.8E-04	4.2E-04	3.8E-04	4.1E-04	3.7E-04
Eutrophication aquatic marine		kg N eq.	0.054	0.051	0.058	0.059	0.059	0.052	0.051
Eutrophication terrestrial		mol N eq.	0.56	0.52	0.59	0.60	0.60	0.53	0.51
Photochemical ozone formation		kg NMVOC eq.	0.17	0.16	0.18	0.18	0.18	0.16	0.15
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.3E-06	2.5E-06	2.4E-06	2.6E-06	2.4E-06	2.5E-06	2.3E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	2775	2464	2987	2979	3077	2419	2416
Water use		m^3 world eq. deprived	5.6	5.7	6.1	6.2	6.2	5.5	5.2

Core environmental indicators			22 AG 160/220	23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	17	16	18	21	22	21	16
	Fossil	kg CO_2 eq.	17	16	18	21	22	21	16
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.026	0.025	0.027	0.026	0.030	0.030	0.025
	GWP-GHG	kg CO_2 eq.	17**	16**	18**	20**	21**	21**	16**
Ozone depletion		kg CFC 11 eq.	2.5E-11	2.4E-11	2.5E-11	3.3E-11	2.8E-11	2.5E-11	2.4E-11
Acidification		mol H^+ eq.	0.14	0.14	0.16	0.18	0.19	0.18	0.14
Eutrophication aquatic freshwater		kg P eq.	4.1E-04	3.7E-04	4.1E-04	3.7E-04	4.2E-04	4.2E-04	4.1E-04
Eutrophication aquatic marine		kg N eq.	0.043	0.041	0.046	0.052	0.053	0.053	0.042
Eutrophication terrestrial		mol N eq.	0.43	0.41	0.46	0.53	0.54	0.53	0.41
Photochemical ozone formation		kg NMVOC eq.	0.13	0.12	0.14	0.16	0.16	0.16	0.12
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.4E-06	2.2E-06	2.5E-06	2.3E-06	2.5E-06	2.5E-06	2.4E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	1773	1724	2046	2506	2672	2632	1694
Water use		m^3 world eq. deprived	4.7	4.4	5.0	5.3	5.7	5.6	4.6

Core environmental indicators			29 AG 22 100/150 LTA	30 AG 22 70/100	31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	16	20	19	24	20	18	18
	Fossil	kg CO_2 eq.	16	20	19	24	20	18	18
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.025	0.025	0.024	0.030	0.028	0.028	0.027
	GWP-GHG	kg CO_2 eq.	16**	19**	19**	24**	19**	18**	18**
Ozone depletion		kg CFC 11 eq.	2.4E-11	3.4E-11	3.3E-11	3.1E-11	2.7E-11	2.4E-11	2.3E-11
Acidification		mol H^+ eq.	0.13	0.17	0.17	0.21	0.18	0.16	0.15
Eutrophication aquatic freshwater		kg P eq.	3.7E-04	4.1E-04	3.7E-04	4.2E-04	4.1E-04	4.1E-04	3.7E-04
Eutrophication aquatic marine		kg N eq.	0.040	0.051	0.049	0.059	0.051	0.046	0.044
Eutrophication terrestrial		mol N eq.	0.40	0.51	0.50	0.60	0.52	0.46	0.45
Photochemical ozone formation		kg NMVOC eq.	0.12	0.15	0.15	0.18	0.16	0.14	0.13
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.2E-06	2.5E-06	2.3E-06	2.5E-06	2.5E-06	2.4E-06	2.3E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	1684	2285	2282	3091	2500	2070	2071
Water use		m^3 world eq. deprived	4.4	5.3	5.1	6.2	5.5	5.0	4.8

Core environmental indicators			36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA	39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Impact category		Unit	A1-A3	A1- A3	A1- A3	A1-A3	A1-A3	A1-A3	A1-A3
Climate change	Total	kg CO_2 eq.	19	17	17	19	16	36	36
	Fossil	kg CO_2 eq.	19	17	17	19	16	36	36
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.029	0.026	0.026	0.024	0.024	0.031	0.031
	GWP-GHG	kg CO_2 eq.	19**	17**	17**	18**	16**	36***	36***
Ozone depletion		kg CFC 11 eq.	2.3E-11	2.4E-11	2.4E-11	3.4E-11	2.5E-11	3.7E-11	3.6E-11
Acidification		mol H^+ eq.	0.16	0.14	0.14	0.16	0.13	0.31	0.31
Eutrophication aquatic freshwater		kg P eq.	4.1E-04	4.1E-04	3.7E-04	4.1E-04	3.7E-04	7.4E-03	7.5E-03
Eutrophication aquatic marine		kg N eq.	0.047	0.044	0.042	0.049	0.040	0.076	0.076
Eutrophication terrestrial		mol N eq.	0.47	0.43	0.42	0.49	0.40	0.76	0.76
Photochemical ozone formation		kg NMVOC eq.	0.14	0.13	0.13	0.14	0.12	0.22	0.22
Depletion of abiotic resources - minerals and metals		kg Sb eq.	2.4E-06	2.4E-06	2.2E-06	2.5E-06	2.2E-06	2.8E-06	2.7E-06
Depletion of abiotic resources - fossil fuels		MJ, net calorific value	2174	1829	1846	2105	1635	3244	3285
Water use		m^3 world eq. deprived	5.1	4.8	4.5	5.1	4.3	26	26

* This indicator is set to zero, due to inconsistencies in the dataset used delivered by Sphera. Though, net result over the life cycle is zero since carbon uptake and emission is zero during a life-cycle.
** The default value in the Swedish Transport Administration´s tool Klimatkalkyl is 49 kg per tonne asphalt mixture (6.5% bitumen) for A1-A3 (Trafikverket, Klimatkalkyl version 7.0, 2023)
*** There is no default value in Klimatkalkyl for this type of asphalt mixture (polymer modified bitumen based). It is however expected to give higher impacts than other asphalt mixtures.

Table 8: Results of the LCA (modules C and D) – Core environmental indicators per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA). S1=Scenario 1, S2=Scenario 2.

Core environmental indicators			1-42 All asphalt mixtures				1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA
Impact category		Unit	C1 (S1/S2)	C2	C3	C4	D	D	D	D	D	D
Climate change	Total	kg CO_2 eq.	2.2/0.65	3.8	0	0	-11	-14	-11	-11	-12	-14
	Fossil	kg CO_2 eq.	2.2/0.65	3.8	0	0	-11	-14	-11	-11	-12	-14
	Biogenic*	kg CO_2 eq.	0/0	0	0	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.019/5.7E-03	0.035	0	0	9.6E-03	0.013	9.6E-03	9.4E-03	0.010	0,013
	GWP-GHG	kg CO_2 eq.	2.2/0.65	3.8	0	0	-11	-13	-11	-11	-12	-14
Ozone depletion		kg CFC 11 eq.	1.9E-13/5.4E-14	4.9E-13	0	0	-2.1E-11	-2.9E-11	-2.1E-11	-2.0E-11	-2.2E-11	-2.9E-11
Acidification		mol H^+ eq.	5.6E-03/1.7E-03	0.015	0	0	-0.12	-0.15	-0.12	-0.12	-0.13	-0.15
Eutrophication aquatic freshwater		kg P eq.	7.7E-06/2.2E-06	1.4E-05	0	0	3.4E-06	4.7E-06	3.4E-06	3.3E-06	3.7E-06	4.7E-06
Eutrophication aquatic marine		kg N eq.	2.5E-03/7.5E-04	7.2E-03	0	0	-0.029	-0.036	-0.030	-0.029	-0.032	-0.038
Eutrophication terrestrial		mol N eq.	0.028/8.4E-03	0.081	0	0	-0.32	-0.40	-0.33	-0.33	-0.36	-0.42
Photochemical ozone formation		kg NMVOC eq.	7.9E-03/2.4E-03	0.014	0	0	-0.10	-0.13	-0.11	-0.10	-0.11	-0.13
Depletion of abiotic resources - minerals and metals		kg Sb eq.	1.3E-07/3.9E-08	2.5E-07	0	0	-1.3E-07	-1.9E-07	-1.3E-07	-1.3E-07	-1.4E-07	-1.9E-07
Depletion of abiotic resources - fossil fuels		MJ,net calorific value	28/8.3	51	0	0	-2229	-2715	-2323	-2296	-2507	-2893
Water use		m^3 world eq. deprived	0.098/7.0E-03	0.045	0	0	-2.5	-3.1	-2.7	-2.6	-2.9	-3.3

Core environmental indicators			7 ABS 11 100/150	8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Impact category		Unit	D	D	D	D	D	D	D	D
Climate change	Total	kg CO_2 eq.	-13	-14	-15	-11	-14	-11	-14	-11
	Fossil	kg CO_2 eq.	-13	-14	-15	-11	-14	-11	-14	-11
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.010	0.013	0.013	9.6E-03	0.014	9.4E-03	0.014	9,5E-03
	GWP-GHG	kg CO_2 eq.	-12	-14	-14	-11	-14	-11	-14	-10
Ozone depletion		kg CFC 11 eq.	-2.2E-11	-2.8E-11	-2.8E-11	-2.1E-11	-3.0E-11	-2.0E-11	-3.0E-11	-2.1E-11
Acidification		mol H^+ eq.	-0.13	-0.15	-0.16	-0.12	-0.15	-0.12	-0.15	-0.11
Eutrophication aquatic freshwater		kg P eq.	3.6E-06	4.5E-06	4.6E-06	3.4E-06	4.8E-06	3.3E-06	4.8E-06	3.4E-06
Eutrophication aquatic marine		kg N eq.	-0.033	-0.038	-0.038	-0.029	-0.037	-0.029	-0.037	-0.028
Eutrophication terrestrial		mol N eq.	-0.36	-0.42	-0.42	-0.32	-0.41	-0.32	-0.41	-0.31
Photochemical ozone formation		kg NMVOC eq.	-0.12	-0.13	-0.14	-0.10	-0.13	-0.10	-0.13	-0.10
Depletion of abiotic resources - minerals and metals		kg Sb eq.	-1.4E-07	-1.8E-07	-1.8E-07	-1.3E-07	-1.9E-07	-1.3E-07	-1.9E-07	-1.3E-07
Depletion of abiotic resources - fossil fuels		MJ. net calorific value	-2557	-2893	-2937	-2258	-2760	-2238	-2760	-2158
Water use		m^3 world eq. deprived	-2.9	-3.3	-3.4	-2.6	-3.2	-2.6	-3.2	-2.5

Core environmental indicators			15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA	22 AG 160/220
Impact category		Unit	D	D	D	D	D	D	D	D
Climate change	Total	kg CO_2 eq.	-13	-11	-14	-14	-15	-12	-12	-8,5
	Fossil	kg CO_2 eq.	-13	-11	-14	-14	-15	-12	-12	-8,5
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.014	9.0E-03	0.013	0.013	0.013	0.014	0.014	0,010
	GWP-GHG	kg CO_2 eq.	-13	-11	-14	-14	-14	-11	-11	-8,3
Ozone depletion		kg CFC 11 eq.	-3.0E-11	-1.9E-11	-2.8E-11	-2.8E-11	-2.8E-11	-3.1E-11	-3.1E-11	-2.2E-11
Acidification		mol H^+ eq.	-0.14	-0.12	-0.15	-0.15	-0.16	-0.13	-0.13	-0.092
Eutrophication aquatic freshwater		kg P eq.	4.8E-06	3.2E-06	4.6E-06	4.6E-06	4.6E-06	4.9E-06	4.9E-06	3.5E-06
Eutrophication aquatic marine		kg N eq.	-0.036	-0.029	-0.037	-0.037	-0.038	-0.032	-0.032	-0.023
Eutrophication terrestrial		mol N eq.	-0.40	-0.33	-0.41	-0.41	-0.42	-0.36	-0.36	-0.26
Photochemical ozone formation		kg NMVOC eq.	-0.13	-0.11	-0.13	-0.13	-0.14	-0.11	-0.11	-0.081
Depletion of abiotic resources - minerals and metals		kg Sb eq.	-1.9E-07	-1.2E-07	-1.8E-07	-1.8E-07	-1.8E-07	-2.0E-07	-2.0E-07	-1.4E-07
Depletion of abiotic resources - fossil fuels		MJ. net calorific value	-2671	-2327	-2848	-2848	-2937	-2315	-2315	-1675
Water use		m^3 world eq. deprived	-3.1	-2.6	-3.3	-3.3	-3.4	-2.7	-2.7	-2.0

Core environmental indicators			23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150	29 AG 22 100/150 LTA	30 AG 22 70/100
Impact category		Unit	D	D	D	D	D	D	D	D
Climate change	Total	kg CO_2 eq.	-8.2	-9.7	-12	-13	-12	-8.1	-8.0	-11
	Fossil	kg CO_2 eq.	-8.2	-9.7	-12	-13	-12	-8.1	-8.1	-11
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	9.6E-03	0.010	0.014	0.011	0.010	9.7E-03	9.7E-03	0,014
	GWP-GHG	kg CO_2 eq.	-8.1	-9.6	-12	-12	-12	-7.9	-7.9	-11
Ozone depletion		kg CFC 11 eq.	-2.1E-11	-2.2E-11	-3.1E-11	-2.5E-11	-2.3E-11	-2.2E-11	-2.2E-11	-3.1E-11
Acidification		mol H^+ eq.	-0.089	-0.10	-0.13	-0.14	-0.13	-0.088	-0.087	-0.12
Eutrophication aquatic freshwater		kg P eq.	3.4E-06	3.6E-06	4.9E-06	4.0E-06	3.7E-06	3.4E-06	3.4E-06	4.9E-06
Eutrophication aquatic marine		kg N eq.	-0.023	-0.026	-0.033	-0.033	-0.032	-0.022	-0.022	-0.031
Eutrophication terrestrial		mol N eq.	-0.25	-0.29	-0.37	-0.37	-0.36	-0.25	-0.25	-0.34
Photochemical ozone formation		kg NMVOC eq.	-0.079	-0.092	-0.12	-0.12	-0.12	-0.078	-0.077	-0.11
Depletion of abiotic resources - minerals and metals		kg Sb eq.	-1.4E-07	-1.4E-07	-2.0E-07	-1.6E-07	-1.4E-07	-1.4E-07	-1.4E-07	-2.0E-07
Depletion of abiotic resources - fossil fuels		MJ. net calorific value	-1630	-1945	-2404	-2567	-2527	-1597	-1590	-2182
Water use		m^3 world eq. deprived	-1.9	-2.3	-2.8	-2.9	-2.9	-1.9	-1.9	-2.6

Core environmental indicators			31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA	36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA
Impact category		Unit	D	D	D	D	D	D	D	D
Climate change	Total	kg CO_2 eq.	-11	-15	-12	-9.8	-9.8	-10	-8.7	-8,8
	Fossil	kg CO_2 eq.	-11	-15	-12	-9.8	-9.8	-10	-8.7	-8,8
	Biogenic*	kg CO_2 eq.	0	0	0	0	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.014	0.013	0.011	9.5E-03	9.5E-03	9.5E-03	9.7E-03	9,9E-03
	GWP-GHG	kg CO_2 eq.	-11	-15	-12	-9.6	-9.7	-10	-8.6	-8,7
Ozone depletion		kg CFC 11 eq.	-3.1E-11	-2.8E-11	-2.5E-11	-2.1E-11	-2.1E-11	-2.1E-11	-2.2E-11	-2.2E-11
Acidification		mol H^+ eq.	-0.12	-0.16	-0.13	-0.10	-0.11	-0.11	-0.094	-0.095
Eutrophication aquatic freshwater		kg P eq.	4.9E-06	4.6E-06	4.0E-06	3.4E-06	3.4E-06	3.3E-06	3.4E-06	3.5E-06
Eutrophication aquatic marine		kg N eq.	-0.031	-0.039	-0.032	-0.026	-0.026	-0.027	-0.024	-0.024
Eutrophication terrestrial		mol N eq.	-0.34	-0.43	-0.35	-0.29	-0.29	-0.30	-0.26	-0.27
Photochemical ozone formation		kg NMVOC eq.	-0.11	-0.14	-0.11	-0.092	-0.092	-0.096	-0.083	-0.084
Depletion of abiotic resources - minerals and metals		kg Sb eq.	-2.0E-07	-1.8E-07	-1.6E-07	-1.3E-07	-1.3E-07	-1.3E-07	-1.4E-07	-1.4E-07
Depletion of abiotic resources - fossil fuels		MJ. net calorific value	-2182	-2981	-2406	-1970	-1973	-2072	-1730	-1751
Water use		m^3 world eq. deprived	-2.6	-3.4	-2.8	-2.3	-2.3	-2.4	-2.0	-2.0

Core environmental indicators			39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Impact category		Unit	D	D	D	D
Climate change	Total	kg CO_2 eq.	-10	-7.8	-14	-15
	Fossil	kg CO_2 eq.	-10	-7.9	-14	-15
	Biogenic*	kg CO_2 eq.	0	0	0	0
	Land use and land use change	kg CO_2 eq.	0.014	0.010	0.013	0,013
	GWP-GHG	kg CO_2 eq.	-10	-7.7	-14	-14
Ozone depletion		kg CFC 11 eq.	-3.1E-11	-2.2E-11	-2.8E-11	-2.8E-11
Acidification		mol H^+ eq.	-0.11	-0.085	-0.15	-0.15
Eutrophication aquatic freshwater		kg P eq.	4.9E-06	3.5E-06	4.6E-06	4.5E-06
Eutrophication aquatic marine		kg N eq.	-0.029	-0.022	-0.038	-0.038
Eutrophication terrestrial		mol N eq.	-0.32	-0.24	-0.42	-0.42
Photochemical ozone formation		kg NMVOC eq.	-0.10	-0.076	-0.13	-0.14
Depletion of abiotic resources - minerals and metals		kg Sb eq.	-2.0E-07	-1.4E-07	-1.8E-07	-1.8E-07
Depletion of abiotic resources - fossil fuels		MJ. net calorific value	-2004	-1542	-2893	-2937
Water use		m^3 world eq. deprived	-2.4	-1.8	-3.3	-3.4

* This indicator is set to zero, due to inconsistencies in the dataset used delivered by Sphera. Though, net result over the life cycle is zero since carbon uptake and emission is zero during a life-cycle.

Table 9: Results of the LCA (modules A1- A3) – Resource use per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA).

Use of resources		1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA	7 ABS 11 100/150
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	336	311	336	307	337	311	393
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	64
Total use of renewable primary energy	MJ, net calorific value	336	311	336	307	337	311	457
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	212	237	217	212	228	247	240
Use of non-renewable primary energy as raw materials	MJ, net calorific value	2120	2582	2210	2184	2385	2751	2450
Total use of non-renewable primary energy	MJ, net calorific value	2332	2819	2427	2397	2612	2999	2690
Use of secondary material	kg	341	72	338	353	285	72	290
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.23	0.25	0.23	0.23	0.24	0.25	0.25

Use of resources		8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	367	360	336	311	336	311	336
Use of renewable primary energy as raw materials	MJ, net calorific value	64	56	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	431	416	336	311	336	311	336
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	257	247	214	240	212	240	208
Use of non-renewable primary energy as raw materials	MJ, net calorific value	2768	2809	2148	2624	2129	2624	2052
Total use of non-renewable primary energy	MJ, net calorific value	3025	3056	2362	2865	2341	2865	2260
Use of secondary material	kg	113	105	340	59	351	59	347
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.26	0.26	0.23	0.25	0.23	0.25	0.23

Use of resources		15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	311	406	381	386	381	340	311
Use of renewable primary energy as raw materials	MJ, net calorific value	0	80	80	53	80	0	0
Total use of renewable primary energy	MJ, net calorific value	311	486	461	439	461	340	311
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	235	230	257	256	262	218	215
Use of non-renewable primary energy as raw materials	MJ, net calorific value	2540	2235	2730	2723	2815	2201	2201
Total use of non-renewable primary energy	MJ, net calorific value	2775	2465	2988	2979	3077	2419	2416
Use of secondary material	kg	59	380	102	101	102	46	46
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.25	0.24	0.26	0.26	0.26	0.25	0.24

Use of resources		22 AG 160/220	23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	336	307	336	311	338	337	336
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	336	307	336	311	338	337	336
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	181	175	196	220	231	229	176
Use of non-renewable primary energy as raw materials	MJ, net calorific value	1593	1549	1850	2286	2442	2404	1518
Total use of non-renewable primary energy	MJ, net calorific value	1773	1724	2046	2506	2673	2633	1694
Use of secondary material	kg	309	335	306	45	212	279	328
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.22	0.21	0.23	0.24	0.25	0.24	0.22

Use of resources		29 AG 22 100/150 LTA	30 AG 22 70/100	31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	307	340	311	340	338	336	307
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	307	340	311	340	338	336	307
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	173	211	208	255	211	197	194
Use of non-renewable primary energy as raw materials	MJ, net calorific value	1512	2074	2074	2836	2289	1873	1877
Total use of non-renewable primary energy	MJ, net calorific value	1684	2285	2282	3091	2500	2071	2071
Use of secondary material	kg	332	46	46	100	220	346	344
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.21	0.24	0.24	0.26	0.24	0.23	0.22

Use of resources		36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA	39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Parameter	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	336	336	307	340	307	431	417
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	72	56
Total use of renewable primary energy	MJ, net calorific value	336	336	307	340	307	503	473
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	203	184	182	201	170	507	510
Use of non-renewable primary energy as raw materials	MJ, net calorific value	1971	1645	1665	1905	1466	2737	2775
Total use of non-renewable primary energy	MJ, net calorific value	2174	1829	1846	2105	1636	3245	3286
Use of secondary material	kg	348	328	317	46	309	106	113
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.23	0.22	0.22	0.24	0.21	0.73	0.73

Table 10: Results of the LCA (modules C and D) – Resource use per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA). S1=Scenario 1, S2=Scenario 2.

Use of resources		1-42 All asphalt mixtures				1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA
Parameter	Unit	C1 (S1/S2)	C2	C3	C4	D	D	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	2.0/0.59	3.7	0	0	-9.2	-13	-9.2	-9.0	-9.9	-13
Use of renewable primary energy as raw materials	MJ, net calorific value	0/0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	2.0/0.59	3.7	0	0	-9.2	-13	-9.2	-9.0	-9.9	-13
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	28/8.3	51	0	0	-109	-133	-113	-112	-122	-141
Use of non-renewable primary energy as raw materials	MJ, net calorific value	0/0	0	0	0	-2120	-2582	-2210	-2184	-2385	-2751
Total use of non-renewable primary energy	MJ, net calorific value	28/8.3	51	0	0	-2229	-2715	-2323	-2296	-2507	-2893
Use of secondary material	kg	0/0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0/0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0/0	0	0	0	0	0	0	0	0	0
Use of net fresh water	m^3	0.022/6.5E-04	4.1E-03	0	0	-0.084	-0.11	-0.087	-0.085	-0.093	-0.11

Use of resources		7 ABS 11 100/150	8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Parameter	Unit	D	D	D	D	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	-9.8	-12	-12	-9.2	-13	-9.0	-13	-9.1
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	-9.8	-12	-12	-9.2	-13	-9.0	-13	-9.1
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	-124	-141	-143	-110	-135	-109	-135	-105
Use of non-renewable primary energy as raw materials	MJ, net calorific value	-2433	-2751	-2794	-2148	-2624	-2129	-2624	-2052
Total use of non-renewable primary energy	MJ, net calorific value	-2557	-2892	-2937	-2258	-2760	-2238	-2760	-2158
Use of secondary material	kg	0	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of net fresh water	m^3	-0.094	-0.11	-0.11	-0.085	-0.11	-0.084	-0.11	-0.082

Use of resources		15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA	22 AG 160/220
Parameter	Unit	D	D	D	D	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	-13	-8.5	-12	-13	-12	-14	-14	-9.8
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	-13	-8.5	-12	-13	-12	-14	-14	-9.8
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	-131	-113	-139	-139	-143	-114	-114	-83
Use of non-renewable primary energy as raw materials	MJ, net calorific value	-2540	-2214	-2709	-2709	-2794	-2201	-2201	-1593
Total use of non-renewable primary energy	MJ, net calorific value	-2671	-2327	-2848	-2848	-2937	-2315	-2315	-1675
Use of secondary material	kg	0	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of net fresh water	m^3	-0.11	-0.085	-0.11	-0.11	-0.11	-0.10	-0.10	-0.072

Use of resources		23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150	29 AG 22 100/150 LTA	30 AG 22 70/100
Parameter	Unit	D	D	D	D	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	-9.5	-9.8	-14	-11	-10	-9.6	-9.5	-14
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	-9.5	-9.8	-14	-11	-10	-9.6	-9.5	-14
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	-80	-95	-118	-125	-123	-79	-79	-108
Use of non-renewable primary energy as raw materials	MJ, net calorific value	-1549	-1850	-2286	-2442	-2404	-1518	-1512	-2074
Total use of non-renewable primary energy	MJ, net calorific value	-1630	-1945	-2404	-2567	-2527	-1597	-1590	-2182
Use of secondary material	kg	0	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of net fresh water	m^3	-0.070	-0.079	-0.10	-0.098	-0.094	-0.070	-0.069	-0.097

Use of resources		31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA	36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA
Parameter	Unit	D	D	D	D	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	-14	-12	-11	-9.2	-9.2	-9.1	-9.5	-9.7
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	-14	-12	-11	-9.2	-9.2	-9.1	-9.5	-9.7
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	-108	-145	-118	-96	-97	-101	-85	-86
Use of non-renewable primary energy as raw materials	MJ, net calorific value	-2074	-2836	-2289	-1873	-1877	-1971	-1645	-1665
Total use of non-renewable primary energy	MJ, net calorific value	-2182	-2981	-2406	-1970	-1973	-2072	-1730	-1751
Use of secondary material	kg	0	0	0	0	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0	0	0
Use of net fresh water	m^3	-0.097	-0.11	-0.094	-0.078	-0.078	-0.080	-0.073	-0.074

Use of resources		39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Parameter	Unit	D	D	D	D
Use of renewable primary energy excl. renewable primary energy resources used as raw materials	MJ, net calorific value	-14	-9.9	-12	-12
Use of renewable primary energy as raw materials	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy	MJ, net calorific value	-14	-9.9	-12	-12
Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials	MJ, net calorific value	-100	-76	-141	-143
Use of non-renewable primary energy as raw materials	MJ, net calorific value	-1905	-1466	-2751	-2794
Total use of non-renewable primary energy	MJ, net calorific value	-2004	-1542	-2893	-2937
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of net fresh water	m^3	-0.092	-0.069	-0.11	-0.11

Table 11: Results of the LCA (modules A1- A3) – Waste categories and output flows per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA).

Waste categories & output flows		1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA	7 ABS 11 100/150
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	4.3E-03	6.1E-03	4.3E-03	4.2E-03	4.6E-03	6.0E-03	4.5E-03
Non-hazardous waste disposed	kg	0.37	0.34	0.37	0.34	0.37	0.34	0.43
Radioactive waste disposed	kg	6.3E-04	6.2E-04	6.3E-04	5.8E-04	6.4E-04	6.2E-04	9.2E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.015	0.018	0.015	0.015	0.016	0.018	0.016
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Waste categories & output flows		8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	5.7E-03	5.8E-03	4.3E-03	6.2E-03	4.2E-03	6.2E-03	4.2E-03
Non-hazardous waste disposed	kg	0.41	0.40	0.37	0.34	0.37	0.34	0.37
Radioactive waste disposed	kg	8.9E-04	8.5E-04	6.3E-04	6.2E-04	6.3E-04	6.2E-04	6.3E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.017	0.017	0.015	0.018	0.015	0.018	0.015
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Waste categories & output flows		15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	6.2E-03	3.9E-03	5.8E-03	5.8E-03	5.8E-03	6.3E-03	6.3E-03
Non-hazardous waste disposed	kg	0.34	0.45	0.42	0.42	0.42	0.37	0.34
Radioactive waste disposed	kg	6.2E-04	9.8E-04	9.7E-04	8.9E-04	9.7E-04	6.6E-04	6.2E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.018	0.015	0.017	0.017	0.017	0.018	0.018
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Waste categories & output flows		22 AG 160/220	23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	4.6E-03	4.4E-03	4.6E-03	6.3E-03	5.1E-03	4.7E-03	4.5E-03
Non-hazardous waste disposed	kg	0.37	0.34	0.37	0.34	0.37	0.37	0.37
Radioactive waste disposed	kg	6.3E-04	5.8E-04	6.3E-04	6.2E-04	6.4E-04	6.4E-04	6.2E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.016	0,016	0,016	0,018	0,016	0,016	0,016
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Waste categories & output flows		29 AG 22 100/150 LTA	30 AG 22 70/100	31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	4.4E-03	6.3E-03	6.3E-03	5.8E-03	5.1E-03	4.3E-03	4.3E-03
Non-hazardous waste disposed	kg	0.34	0.37	0.34	0.37	0.36	0.37	0.34
Radioactive waste disposed	kg	5.8E-04	6.6E-04	6.2E-04	6.6E-04	6.3E-04	6.2E-04	5.8E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.016	0.018	0.018	0.017	0.016	0.015	0.015
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Waste categories & output flows		36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA	39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Parameter/Indicator	Unit	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
Hazardous waste disposed	kg	4.2E-03	4.4E-03	4.5E-03	6.4E-03	4.6E-03	5.8E-03	5.7E-03
Non-hazardous waste disposed	kg	0.37	0.37	0.34	0.37	0.34	0.47	0.45
Radioactive waste disposed	kg	6.3E-04	6.2E-04	5.8E-04	6.6E-04	5.8E-04	1.0E-03	9.4E-04
Components for re-use	kg	0	0	0	0	0	0	0
Materials for recycling	kg	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Materials for energy recovery	kg	0.015	0.016	0.016	0.018	0.016	0.017	0.017
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0

Table 12: Results of the LCA (modules C and D) – Waste categories and output flows per declared unit of specific asphalt mixtures. The table presents results for asphalt mixtures containing the actual annual mean share of Reclaimed Asphalt (RA). S1=Scenario 1, S2=Scenario 2.

Waste categories & output flows		1-42 All asphalt mixtures				1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA
Parameter/Indicator	Unit	C1 (S1/S2)	C2	C3	C4	D	D	D	D	D	D
Hazardous waste disposed	kg	1.0E-10/3.1E-11	1.6E-10	0	0	-4.3E-03	-6.1E-03	-4.3E-03	-4.2E-03	-4.7E-03	-6.1E-03
Non-hazardous waste disposed	kg	9.7E-03/1.2E-03	7.8E-03	0	0	-9.9E-03	-0.014	-9.9E-03	-9.7E-03	-0.011	-0.014
Radioactive waste disposed	kg	3.7E-05/1.1E-05	9.6E-05	0	0	-6.8E-05	-9.7E-05	-6.8E-05	-6.7E-05	-7.4E-05	-9.7E-05
Components for re-use	kg	0/0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0/0	0	1000	0	0	0	0	0	0	0
Materials for energy recovery	kg	0/0	0	0	0	-5.6E-03	-7.9E-03	-5.6E-03	-5.5E-03	-6.0E-03	-7.9E-03
Exported energy	MJ per energy carrier	0/0	0	0	0	0	0	0	0	0	0

Waste categories & output flows		7 ABS 11 100/150	8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Parameter/Indicator	Unit	D	D	D	D	D	D	D	D
Hazardous waste disposed	kg	-4.6E-03	-5.8E-03	-5.8E-03	-4.3E-03	-6.2E-03	-4.3E-03	-6.2E-03	-4.3E-03
Non-hazardous waste disposed	kg	-0.011	-0.013	-0.013	-9.9E-03	-0.014	-9.8E-03	-0.014	-9.9E-03
Radioactive waste disposed	kg	-7.3E-05	-9.2E-05	-9.2E-05	-6.8E-05	-9.9E-05	-6.7E-05	-9.9E-05	-6.8E-05
Components for re-use	kg	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	-6.0E-03	-7.5E-03	-7.5E-03	-5.6E-03	-8.0E-03	-5.5E-03	-8.0E-03	-5.5E-03
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0	0

Waste categories & output flows		15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA	22 AG 160/220
Parameter/Indicator	Unit	D	D	D	D	D	D	D	D
Hazardous waste disposed	kg	-6.2E-03	-4.0E-03	-5.9E-03	-5.9E-03	-5.9E-03	-6.4E-03	-6.4E-03	-4.6E-03
Non-hazardous waste disposed	kg	-0.014	-9.2E-03	-0.014	-0.014	-0.014	-0.015	-0.015	-0.011
Radioactive waste disposed	kg	-9.9E-05	-6.3E-05	-9.3E-05	-9.3E-05	-9.3E-05	-1.0E-04	-1.0E-04	-7.4E-05
Components for re-use	kg	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	-8.0E-03	-5.2E-03	-7.6E-03	-7.6E-03	-7.6E-03	-8.2E-03	-8.2E-03	-6.0E-03
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0	0

Waste categories & output flows		23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150	29 AG 22 100/150 LTA	30 AG 22 70/100
Parameter/Indicator	Unit	D	D	D	D	D	D	D	D
Hazardous waste disposed	kg	-4.5E-03	-4.6E-03	-6.4E-03	-5.2E-03	-4.7E-03	-4.5E-03	-4.5E-03	-6.4E-03
Non-hazardous waste disposed	kg	-0.010	-0.011	-0.015	-0.012	-0.011	-0.010	-0.010	-0.015
Radioactive waste disposed	kg	-7.1E-05	-7.3E-05	-1.0E-04	-8.2E-05	-7.4E-05	-7.2E-05	-7.2E-05	-1.0E-04
Components for re-use	kg	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	-5.7E-03	-5.9E-03	-8.2E-03	-6.7E-03	-6.1E-03	-5.8E-03	-5.8E-03	-8.2E-03
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0	0

Waste categories & output flows		31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA	36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA
Parameter/Indicator	Unit	D	D	D	D	D	D	D	D
Hazardous waste disposed	kg	-6.4E-03	-5.9E-03	-5.1E-03	-4.3E-03	-4.3E-03	-4.3E-03	-4.5E-03	-4.6E-03
Non-hazardous waste disposed	kg	-0.015	-0.014	-0.012	-0.010	-0.010	-9.9E-03	-0.010	-0.011
Radioactive waste disposed	kg	-1.0E-04	-9.3E-05	-8.1E-05	-6.9E-05	-6.9E-05	-6.8E-05	-7.2E-05	-7.3E-05
Components for re-use	kg	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	-8.2E-03	-7.6E-03	-6.6E-03	-5.6E-03	-5.6E-03	-5.5E-03	-5.8E-03	-5.9E-03
Exported energy	MJ per energy carrier	0	0	0	0	0	0	0	0

Waste categories & output flows		39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Parameter/Indicator	Unit	D	D	D	D
Hazardous waste disposed	kg	-6.4E-03	-4.7E-03	-5.9E-03	-5.8E-03
Non-hazardous waste disposed	kg	-0.015	-0.011	-0.013	-0.013
Radioactive waste disposed	kg	-1.0E-04	-7.4E-05	-9.3E-05	-9.2E-05
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	0
Materials for energy recovery	kg	-8.3E-03	-6.0E-03	-7.6E-03	-7.5E-03
Exported energy	MJ per energy carrier	0	0	0	0

Table 13: Additional environmental impact indicators are only declared in the Annex to the General background report.

Impact category	Unit	Module A1-D
Particulate matter emissions	Disease incidence	Not declared in EPD, see Background Annex Report
Ionizing radiation, human health	kBq U235 eq.	Not declared in EPD, see Background Annex Report
Eco-toxicity (freshwater)	CTUe	Not declared in EPD, see Background Annex Report
Human toxicity, cancer effects	CTUh	Not declared in EPD, see Background Annex Report
Human toxicity, non-cancer effects	CTUh	Not declared in EPD, see Background Annex Report
Land use related impacts/Soil quality	dimensionless	Not declared in EPD, see Background Annex Report

Table 14: Classification of disclaimers to the declaration of core and additional environmental impact indicators.

ILCD classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

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.

Note that Table 15 and 16 are additional results and do only present the result for the impact category GWP-GHG, for no RA, the annual actual mean share of RA (as presented in Table 7 and 8) and the maximum possible share of RA.

Table 15: Results of the LCA (modules A1-A3) – GWP-GHG for three different RA content, (1) no RA content, (2) the actual annual mean share of RA and (3) the maximum possible share of RA in the various asphalt mixtures.

Core environmental indicators			1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA	7 ABS 11 100/150
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	22	22	23	22	23	23	24
		Mean RA	19	22	20	19	21	23	22
		Max RA	19	19	19	19	20	19	21
Core environmental indicators			8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	24	23	22	22	22	22	22
		Mean RA	24	23	20	22	19	22	19
		Max RA	21	20	19	19	19	19	19
Core environmental indicators			15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	22	24	24	24	24	20	20
		Mean RA	22	21	24	24	24	20	20
		Max RA	18	21	21	21	21	17	16
Core environmental indicators			22 AG 160/220	23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	19	19	21	20	23	23	19
		Mean RA	17	16	18	20	21	21	16
		Max RA	16	15	17	17	20	21	16
Core environmental indicators			29 AG 22 100/150 LTA	30 AG 22 70/100	31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	19	19	19	24	21	21	21
		Mean RA	16	19	19	24	19	18	18
		Max RA	15	16	16	24	19	18	17
Core environmental indicators			36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA	39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100- 75	42 ABS 11 40/100- 75
Impact category	Unit	RA content	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3	A1-A3
GWP-GHG	kg CO_2 eq.	No RA	22	20	19	18	18	36	36
		Mean RA	19	17	17	18	16	36	36
		Max RA	18	16	16	15	15	36	36

Table 16: Results of the LCA (modules C and D) – GWP-GHG for three different RA content, (1) no RA content, (2) the actual annual mean share of RA and (3) the maximum possible share of RA in the various asphalt mixtures.

Core environmental indicators			1-42 All asphalt mixtures				1 ABT 11 160/220	2 ABT 11 160/220 LTA	3 ABT 11 100/150	4 ABT 11 100/150 LTA	5 ABT 11 70/100	6 ABT 11 70/100 LTA
Impact category	Unit	RA content	C1 (S1/S2)	C2	C3	C4	D	D	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	2.2/0.65	3.8	0	0	-13	-13	-14	-14	-14	-14
		Mean RA	2.2/0.65	3.8	0	0	-11	-13	-11	-11	-12	-14
		Max RA	2.2/0.65	3.8	0	0	-10	-10	-11	-11	-11	-11

Core environmental indicators			7 ABS 11 100/150	8 ABS 11 100/150 LTA	9 ABS 11 70/100 LTA	10 ABT 16 70/100	11 ABT 16 70/100 LTA	12 ABT 16 100/150	13 ABT 16 100/150 LTA	14 ABT 16 160/220
Impact category	Unit	RA content	D	D	D	D	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	-14	-14	-14	-14	-14	-14	-14	-13
		Mean RA	-12	-14	-14	-11	-14	-11	-14	-10
		Max RA	-12	-12	-12	-10	-10	-10	-10	-10

Core environmental indicators			15 ABT 16 160/220 LTA	16 ABS 16 100/150	17 ABS 16 100/150 LTA	18 ABS 16 70/100	19 ABS 16 70/100 LTA	20 AG 16 70/100	21 AG 16 70/100 LTA	22 AG 160/220
Impact category	Unit	RA content	D	D	D	D	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	-13	-14	-14	-14	-14	-11	-11	-11
		Mean RA	-13	-11	-14	-14	-14	-11	-11	-8.3
		Max RA	-10	-11	-11	-11	-12	-8,5	-8,5	-7,7

Core environmental indicators			23 AG 160/220 LTA	24 ABb 16 70/100	25 ABb 16 70/100 LTA	26 ABTS 8 160/220	27 ABTS 8 100/150	28 AG 22 100/150	29 AG 22 100/150 LTA	30 AG 22 70/100
Impact category	Unit	RA content	D	D	D	D	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	-11	-12	-12	-14	-14	-10	-10	-11
		Mean RA	-8.1	-9.6	-12	-12	-12	-7.9	-7.9	-11
		Max RA	-7,7	-8,9	-8,9	-12	-12	-7,5	-7,5	-7,9

Core environmental indicators			31 AG 22 70/100 LTA	32 ABT 4 160/220	33 ABT 11 160/220 Hand	34 ABb 16 50/70	35 ABb 16 50/70 LTA	36 ABb 11 50/70	37 AG 16 100/150	38 AG 16 100/150 LTA
Impact category	Unit	RA content	D	D	D	D	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	-11	-15	-13	-12	-12	-13	-11	-11
		Mean RA	-11	-15	-12	-9.6	-9.7	-10	-8.6	-8.7
		Max RA	-7,9	-15	-11	-9,3	-9,3	-9,7	-8,1	-8,1

Core environmental indicators			39 AG 22 160/220	40 AG 22 160/220 LTA	41 ABS 16 40/100-75	42 ABS 11 40/100-75
Impact category	Unit	RA content	D	D	D	D
GWP-GHG	kg CO_2 eq.	No RA	-10	-10	-14	-14
		Mean RA	-10	-7.7	-14	-14
		Max RA	-7,0	-7,0	-14	-14

General information

Components in asphalt, such as aggregates and bitumen, are finite resources. Bitumen is a fossil resource. To extract aggregates or oil will affect the environment.

The production of asphalt mixtures requires equipment and vehicles running on fossil and renewable energy. The operations, including transports, cause mainly emissions and dust to air and disturbances such as noise.

Asphalt production is, depending on size, country and activities, regulated through specific legislation or site-specific decisions from authorities.

NCC's stationary plants in Denmark, Finland and Sweden are certified according to ISO 14001. The Business Management System in NCC Industry, including Norway, contains routines corresponding to this standard.

In the Nordic countries (Iceland excluded) approximately 1 tonne of asphalt mixtures per capita and year are produced and paved at our roads (EAPA, 2017). No asphalt is disposed during manufacture, application, maintenance or in the end-of life.

Since asphalt is a valuable resource, it is recycled into new asphalt mixtures. In NCC, Division Asphalt, 26% - as an average – of the produced asphalt mixtures originated from Reclaimed Asphalt (RA) in 2022.

Explanatory material is given in the background report to this EPD.

To read more about NCCs general sustainability work, please refer to our webpage: https://www.ncc.com/sustainability

Release of dangerous substances to indoor air, soil and water during the use stage

According to EN 15804, the EPD does not need to give this information if the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available. This criterion is fulfilled for asphalt material.

Scenario information

For modules other than A1-A3, scenario-based information shall be declared for the products.

Module C
Scenario 1:
Pavement milling of asphalt is carried out in this scenario. It is further transported to the waste processing where it is crushed and sieved. It is assumed that all asphalt mixtures are recyclable, why no asphalt is sent for disposal. Crushing of RA is accounted for in the next life cycle, to avoid double counting.

Scenario 2:
Asphalt excavation resulting in asphalt slabs is carried out in this scenario. It is further transported to the waste processing where it is crushed and sieved. It is assumed that all asphalt mixtures are recyclable, why no asphalt is sent for disposal. Crushing of RA is accounted for in the next life cycle, to avoid double counting.

Table 17: Scenario-based information for end of life.

Scenario information	Unit (per declared unit)	Scenario 1 and 2
	kg collected separately	1000
	kg collected with mixed construction waste	0
	kg for re-use	0
	kg for recycling	1000
	kg for energy recovery	0
	kg product or material for final disposal	0
Assumptions for scenario development, e.g. transportation	units as appropriate	Further scenario-based information is presented in the Annex of the Background Report

Module D
Information in module D aims at transparency of the environmental benefits or loads resulting from reusable products, recyclable materials and/or useful

energy carriers leaving a product system e.g. as secondary materials or fuels.

Loads are assigned to module D for materials and fuels (that have left the system from any of the modules A4-C4) where further processing occur after the end-of-waste state is reached. This, in order to replace primary material or fuel input in another product system.

Benefits are assigned to module D for materials and fuels (that have left the system in any of the modules A4-C4) that can substitute primary material of fuels that do not need to be produced. A functional equivalence must be reached.

The substitution effect is only calculating the resulting net output flow. The net output flow for the asphalt mixtures declared can be found in Table 18.

Table 18: Net output flow for module D per declared unit.

#	Asphalt mixture	Mass (kg)
1	ABT 11 160/220	669
2	ABT 11 160/220 LTA	938
3	ABT 11 100/150	672
4	ABT 11 100/150 LTA	657
5	ABT 11 70/100	725
6	ABT 11 70/100 LTA	938
7	ABS 11 100/150	716
8	ABS 11 100/150 LTA	893
9	ABS 11 70/100 LTA	897
10	ABT 16 70/100	670
11	ABT 16 70/100 LTA	951
12	ABT 16 100/150	659
13	ABT 16 100/150 LTA	951
14	ABT 16 160/220	663
15	ABT 16 160/220 LTA	951
16	ABS 16 100/150	625
17	ABS 16 100/150 LTA	903
18	ABS 16 70/100	906
19	ABS 16 70/100 LTA	903
20	AG 16 70/100	964
21	AG 16 70/100 LTA	964
22	AG 160/220	701
23	AG 160/220 LTA	675
24	ABb 16 70/100	704
25	ABb 16 70/100 LTA	965
26	ABTS 8 160/220	798
27	ABTS 8 100/150	731
28	AG 22 100/150	682
29	AG 22 100/150 LTA	678
30	AG 22 70/100	964
31	AG 22 70/100 LTA	964
32	ABT 4 160/220	910
33	ABT 11 160/220 Hand	785
34	ABb 16 50/70	664
35	ABb 16 50/70 LTA	666
36	ABb 11 50/70	662
37	AG 16 100/150	682
38	AG 16 100/150 LTA	693
39	AG 22 160/220	964
40	AG 22 160/220 LTA	701
41	ABS 16 40/100-75	900
42	ABS 11 40/100-75	894

Loads accounted for are crushing of the RA (the same in both scenarios).

Benefits accounted for are aggregates and bitumen material which are replaced by RA (the same in both scenarios).

The specific calculation procedure is described in the Annex of the Background Report.

Programme information

This EPD is developed by NCC Industry Nordic AB. It is a result from an EPD certification process verified by Bureau Veritas. The EPD is valid for five years (after which it can be revised and reissued). NCC Industry Nordic AB is the declaration owner and has the liability and responsibility for the EPD.

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

EPDs within the same product category but from different programmes may not be comparable.

The aim of this EPD is that it shall provide objective and reliable information on the environmental impact of the production of the declared product.

The intended use of the EPD is for business-to-business communication.

Table 19: Verification details.

CEN standard EN 15804 serves as the core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction products, version 1.11
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☒ EPD process certification (Internal) ☐ EPD verification (External)
Certification body:	Bureau Veritas
Accredited:	SWEDAC
Procedure for follow-up of data during EPD validity involves third party verifier:	☒ Yes ☐ No

Address of programme operator: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com

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Differences versus previous versions

Table 20: Versions of this EPD.

Date of revision	Description of difference versus previous versions
2021-09-30	Original version
2022-02-18	Editorial change
2023-07-05	EPD update due to (1) significant changes to the result when using data from 2022 compared to 2020 and (2) different asphalt mixtures are declared than in previous version.