General information

Product:
DAFA ProFoil

Type of EPD:
Product Specific

Program Operator:
The Norwegian EPD Foundation
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Declaration Number:
NEPD-4554-3811-EN

This declaration is based on Product Category Rules:
NPCR PART A: Construction products and services version 2.0, NPCR PART B: Roof waterproofing version 2.0

Statements:
The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to the manufacturer, life cycle assessment data and evidences.

Declared unit:
One square meter (1 m^2 plastic foil.

Verification:
Independent verification of the declaration and data, according to ISO14025:2010

internal ☐ external ☒

Independent verifier approved by EPD Norway
Linda Høibye
Life Cycle Assessment Consulting

Owner of the declaration:
DAFA Building Solutions A/S
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Manufacturer:
DAFA Building Solutions A/S
Holmstrupgaardvej 1, DK 8220 Brabrand
Denmark

Place of production:
Germany

Management system:
ISO 9001, ISO 14001

Organisation no:
41854510

Issue date:
19.06.2023

Valid to:
19.06.2028

Year of study:
2023

Comparability:
The EPD of construction products may not be comparable if they do not comply with EN 15804 and are seen in a building context.

Approved by manager of EPD Norway

Product

Product description:

1 m² installed plastic foil used as a vapor barrier in construction with a technical lifetime of 60 years. DAFA ProFoil is used in walls and as a ceiling component. DAFA ProFoil is manufactured at a production site in Germany and imported to Denmark for storage at two locations.

DAFA ProFoil	Amount
Declared unit [m2 of plastic foil]	1
Density [kg/m2]	0.184
Thickness [µm]	200
Conversion factor [1 kg]	5.43
Production volume of year of study [kg]	307,719
Total m2 produced in production year [m2]	1,672,389
Relative production volume [%]	12

Product specification:

DAFA ProFoil: A vapor barrier foil is a part of the DAFA AirStop System product series. DAFA ProFoil is characterized by high breaking strength during construction where this aspect is critical. DAFA ProFoil is a CE marked polyethylene material. The foil's multilayer structure gives it high tensile and tear strength, despite only being 0.20 mm thick. The foil is used in ceiling, wall, and floor structures. DAFA ProFoil is manufactured through an extrusion process.

Materials	KG	%
Polyethylene	1.79E-01	97.20
Mineral filler batch	3.68E-03	2.00
UV-batch	9.20E-04	0.50
Color batch	5.52E-04	0.30
Packaging		
Containerboard	1.12E-02	82.01
Pallet	5.11E-05	0.37
Packaging film	2.41E-03	17.62

Technical data:

DAFA ProFoil manufactured cf. EN 13984. Technical data can be found through the following link: https://dafa-build.com/en/downloads/building-materials/dafa-airstop-system-en

Market:

Denmark

Technical service life:

60 years

LCA: Calculation rules

Declared unit:

1 m² installed plastic foil.

Data quality:

Product-specific data is delivered by DAFA Building Solution A/S. Product-specific data is sourced from the production site located in Germany, and two warehouses located in Denmark, where ProFoil is stored. Generic data is from Ecoinvent 3.8 (2022) "Allocation cut-off by classification". Product-specific data is representative of the year 2021 and was collected in 2022.

Allocation:

Allocation is done in accordance with the provisions of EN 15804+A2. Allocation of energy, water, and waste from production is calculated by a physical allocation factor based on the manufacturer's input. For waste produced at the manufacturing, the benefits for reuse, recycling and recovery are allocated by using this allocation factor.

System boundary:

Figure 1 shows the system boundaries for the analysis. The analysis is a cradle-to-gate, with module options A4, A5, C1, C2, C3, C4, and D. Note: the boundary around A1 indicates processes tied to the production in Germany.

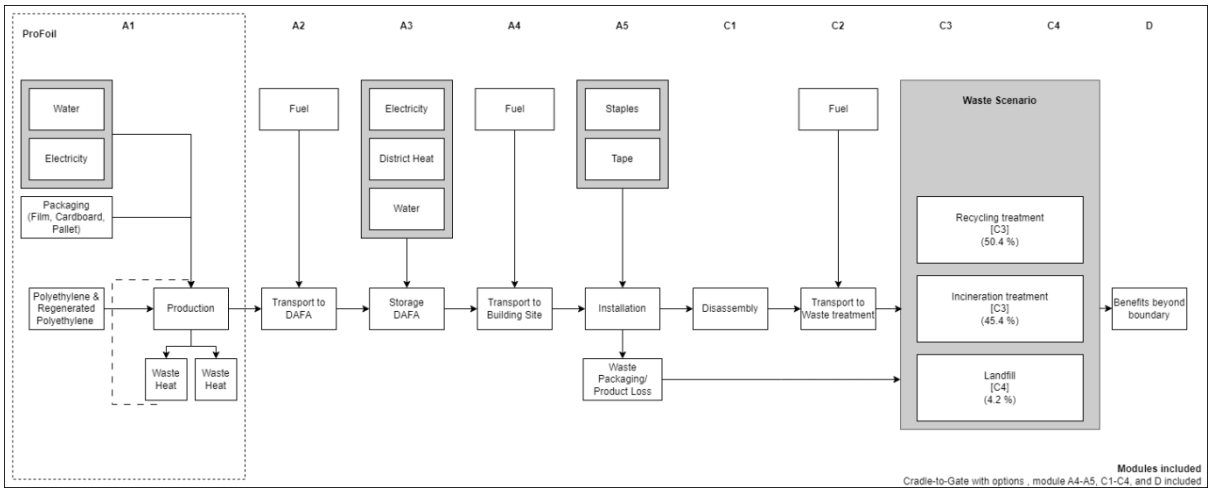

Figure 1: Modules covered in the EPD

Cut-off criteria:

The general rules apply for the exclusion of inputs and outputs in the LCA which complies with 15804:2012+A2:2019. 6.3.6. In cases of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that. The total neglected input flows, e.g., per module A1-A3, A4-A5, and B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5 % of energy usage and mass.

All major raw materials and all the essential energy is included. This cut-off rule does not apply to hazardous materials and substances. The following processes and materials have been excluded based on specified cut-off criteria.

Process excluded from the study	Cut-off criteria	Quantified contribution from process	Exclusion Justification
Module A1: Packaging from RMA, such as reusable big bags, and pallets	Environmental significance	<1%	As the product at this stage is intermediate, it is assumed that the product is moved utilizing pragmatic reusable packaging, i.e. pallets or big bags.
Module A3: Waste generated in operations at DAFA warehouses.	Environmental significance	<1%	As no alternation of either product or product packaging are performed once the product arrives at DAFA's warehouses (A3), the waste generation related to this process is expected to be marginal.
Module A5: Minor installation activities, such as the *potential use of an* electric staple gun.	Energy significance	<1%	The installation *can potentially* make use of electric equipment either through an electric, or compressed air staple gun (normal practice is manual stapling). As neither of these is necessary, it has been excluded through cut off.
Module C1: Minor dismantling activities such as the potential use of an electric drill	Energy significance	<1%	The dismantling *can potentially* make use of electric equipment like an electric drill, or something of the like. None of this is however necessary as manual labor is usually utilized and has therefore excluded through cut off.
Module D: Benefits tied to: Steel (staples), N-olefins (color), polycarboxylates (uv-stabilizer), Calcium carbonate (mineral batch).	Energy significance	<1%	The materials either has a minor contribution within the product and are therefore recycled as "part of the product", or has a very small calorific value which in turn result in an insignificant benefit at energy recovery.

LCA: Additional technical information

Product stage (A1-A3)

Module A1 is the manufacturing of DAFA ProFoil at the production site located in Germany. All raw materials are sourced from within Germanys borders with an average transport distance of 500 km. DAFA ProFoil is manufactured from petrochemical-based virgin polyethylene. DAFA ProFoil is manufactured through an extrusion manufacturing process. Packaging of the product is performed at the production site, where the product is rolled onto a cardboard core, and wrapped in packaging film. Production in Germany is based on the national residual electricity mix and utilize excess heat generated during production for facility heating.

Module A2 is transport of DAFA ProFoil by truck from the production site located in Germany to DAFA's two warehouse sites. Transport data is applied based on communication with suppliers.

Module A3 is DAFA's own warehouse activities. This includes water, electricity, and heating related activities. DAFA ProFoil is stored at two warehouses in Brabrand and Stilling, in Denmark. The Danish residual electricity mix is applied for DAFA's own activities. DAFA Does not alter the structure, or packaging of the product once received in Denmark.

Transport from production place to installation/user (A4)

Transport in A4 is based on data from an outsourced logistical company, with data provided by said company.

Type	Capacity utilization (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption (l/tkm)	value (l/t)
Truck	80	Lorry 16-32 metric ton, EURO5	204	0.004	0.87

Installation (A5)

The installation of the vapor barrier results in a 10% product loss, which is considered when fulfilling the declared unit of 1 m2. Furthermore, tape and staples are needed for the installation.

	Unit	Value
Tape	kg	1.77E-04
Staples	kg	1.75E-03
Material loss	kg	1.84E-02
Packaging waste	kg	1.37E-02

End of Life (C1, C3, C4)

The product does not contribute to Module C1. This is because no process is tied to the disassembling of foils and does not require handling during the demolition/rebuilding of a structure. The following scenario is applied. Waste sent to recycling is 50.4%, Waste sent to energy recovery is 45.4%, and Waste sent to landfill is 4.2%.

	Unit	Value
Sent for recycling	kg	9.29E-02
Sent for energy recovery	kg	8.35E-02
Sent to landfill	kg	7.74E-03

Transport to waste processing (C2)

Module C2 Transport from the building/demolition site to the waste treatment/recycling facility is estimated based on national statistics for transport.

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption (l/tkm)	value (l/t)
Truck	59	lorry >32 metric ton, EURO6	93	0.04	3.74

Benefits and loads beyond the system boundary (D)

The energy recovered mitigates 25% electricity, and 75% heat, with a 5 % loss factored in.

	Unit	Value
Energy mitigation **(Electricity)**	kWh/m2	2.62E-01

Energy mitigation **(Thermal)**	kWh/m2	1.17E+00
Recycling mitigation **(PE)**	kg/m2	1.11E-01

LCA: Results

LCA calculations are based on data collected during the study period that represent an average tonne (mass-weighted) per declared unit.

System boundaries (X=included, MND= module not declared)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

Core environmental impact indicators

Reading example: 9,0 E-03 = 9,0*10-3 = 0,009

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	6.90E-01	8.43E-03	5.71E-02	0.00E+00	5.29E-03	2.31E-01	1.36E-02	-1.56E-01
GWP-fossil	kg CO2 eq.	7.03E-01	8.40E-03	3.79E-02	0.00E+00	5.28E-03	2.31E-01	1.36E-02	-1.35E-01
GWP-biogenic	kg CO2 eq.	-1.33E-02	2.26E-05	1.92E-02	0.00E+00	1.42E-05	2.17E-05	1.01E-06	-2.04E-02
GWP-LULUC	kg CO2 eq.	4.01E-04	3.36E-06	1.07E-05	0.00E+00	2.11E-06	2.52E-05	9.64E-08	-1.16E-04
ODP	kg CFC11 eq.	6.14E-08	1.95E-09	9.41E-10	0.00E+00	1.22E-09	3.74E-09	3.56E-11	-7.25E-09
AP	mol H^+ eq.	2.48E-03	2.39E-05	6.84E-05	0.00E+00	1.50E-05	1.47E-04	2.54E-06	-6.80E-04
EP-freshwater	kg P eq.	1.46E-04	5.51E-07	3.95E-06	0.00E+00	3.46E-07	5.65E-06	2.41E-08	-5.88E-05
EP-marine	kg N eq.	5.07E-04	4.85E-06	3.07E-05	0.00E+00	3.04E-06	6.28E-05	2.70E-06	-2.39E-04
EP-terrestial	mol N eq.	5.21E-03	5.29E-05	1.57E-04	0.00E+00	3.32E-05	5.21E-04	1.22E-05	-1.68E-03
POCP	kg NMVOC eq.	1.67E-03	1.37E-05	4.31E-05	0.00E+00	8.61E-06	1.28E-04	3.48E-06	-3.24E-04
ADP-M&M	kg Sb eq.	3.57E-06	2.98E-08	2.70E-07	0.00E+00	1.87E-08	2.03E-07	6.96E-10	-8.12E-07
ADP-fossil	MJ	1.93E+01	1.27E-01	1.48E-01	0.00E+00	8.00E-02	3.77E-01	2.94E-03	-1.79E+00
WDP	m^3	9.10E-01	3.88E-04	4.44E-03	0.00E+00	2.43E-04	9.25E-03	5.00E-05	-7.97E-02

GWP-total: *Global Warming Potential;* ***GWP-fossil:*** *Global Warming Potential fossil fuels;* ***GWP-biogenic:*** *Global Warming Potential biogenic;* ***GWP-LULUC:*** *Global Warming Potential land use and land use change;* ***ODP:*** *Depletion potential of the stratospheric ozone layer;* ***AP:*** *Acidification potential, Accumulated Exceedance;* ***EP-freshwater:*** *Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional Norwegian requirements" for indicator given as PO4 eq.* ***EP-marine:*** *Eutrophication potential, fraction of nutrients reaching freshwater end compartment;* ***EP-terrestial:*** *Eutrophication potential, Accumulated Exceedance;* ***POCP****: Formation potential of tropospheric ozone;* ***ADP-M&M****: Abiotic depletion potential for non-fossil resources (minerals and metals);* ***ADP-fossil:*** *Abiotic depletion potential for fossil resources;* ***WDP:*** *Water deprivation potential, deprivation weighted water consumption*

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	3.23E-08	5.32E-10	8.73E-10	0.00E+00	3.34E-10	2.02E-09	4.58E-11	-1.58E-08
IRP	kBq U235 eq.	7.93E-02	6.56E-04	1.08E-03	0.00E+00	4.12E-04	2.14E-03	1.11E-05	-2.49E-02
ETP-fw	CTUe	6.43E+00	9.99E-02	4.09E-01	0.00E+00	6.27E-02	8.66E-01	1.26E-02	-4.93E+00
HTP-c	CTUh	2.49E-10	3.22E-12	2.09E-10	0.00E+00	2.02E-12	8.07E-11	2.10E-12	-1.12E-10
HTP-nc	CTUh	6.57E-09	1.01E-10	3.53E-10	0.00E+00	6.34E-11	7.35E-10	2.65E-11	-8.87E-09
SQP	Dimensionless	7.09E+00	9.20E-02	9.40E-02	0.00E+00	5.78E-02	3.07E-01	3.13E-03	-2.62E+00

PM: *Particulate matter emissions;* ***IRP:*** *Ionising radiation, human health;* ***ETP-fw:*** *Ecotoxicity (freshwater);* ***ETP-c:*** *Human toxicity, cancer effects;* ***HTP-nc:*** *Human toxicity, non-cancer effects;* ***SQP:*** *Land use related impacts / soil quality*

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 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 / level 2	Acidification potential, Accumulated Exceedance (AP)	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 / level 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

Resource use

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	9.06E-01	1.82E-03	2.59E-02	0.00E+00	1.14E-03	2.02E-02	5.33E-05	-6.32E-01
RPEM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPE	MJ	9.06E-01	1.82E-03	2.59E-02	0.00E+00	1.14E-03	2.02E-02	5.33E-05	-6.32E-01
NRPE	MJ	1.48E+00	2.70E-03	1.55E-02	0.00E+00	1.69E-03	2.86E-02	6.03E-05	-4.19E-01

NRPM	MJ	1.78E+01	1.25E-01	1.33E-01	0.00E+00	7.83E-02	3.48E-01	2.88E-03	-1.37E+00
TRPE	MJ	1.93E+01	1.27E-01	1.48E-01	0.00E+00	8.00E-02	3.77E-01	2.94E-03	-1.79E+00
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	m3	8.70E-01	3.80E-04	4.36E-03	0.00E+00	2.39E-04	8.94E-03	0.00E+00	-7.85E-02

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life – Waste

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	KG	1.03E-05	3.33E-07	1.53E-07	0.00E+00	2.09E-07	6.99E-07	1.65E-08	-1.69E-06
NHW	KG	3.26E-01	6.67E-03	1.90E-02	0.00E+00	4.19E-03	1.91E-02	2.36E-03	-3.51E-02
RW	KG	4.04E-05	8.61E-07	4.88E-07	0.00E+00	5.40E-07	1.40E-06	1.33E-08	-8.19E-06

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	1.69E-02	0.00E+00	0.00E+00	1.11E-01	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	1.52E-02	0.00E+00	0.00E+00	9.95E-02	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	1.05E-01	0.00E+00	0.00E+00	6.29E-01	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	0.00E+00	3.14E-01	0.00E+00	0.00E+00	1.89E+00	0.00E+00	0.00E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0
Biogenic carbon content in the accompanying packaging	kg C	5.83E-03

Additional Norwegian requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

A national residual mix has been applied for the original manufacturing (A1) and DAFA-specific activities (A3).

Electricity mix	Applied in	Data Source	Amount	Unit
Electricity, medium voltage {DE_Residual}	A1	Ecoinvent 3.8	0.762	kg CO2 eq./kWh
Electricity, low voltage {DK_Residual}	A3	Ecoinvent 3.8	0.523	kg CO2 eq./kWh

Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-IOBC	kg CO2 eq.	7.04E-01	8.41E-03	3.79E-02	0.00E+00	5.28E-03	2.31E-01	1.36E-02	-1.36E-01

GWP-IOBC *Global warming potential calculated according to the principle of instantaneous oxidation.*

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- ☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- ☒ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- ☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- ☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Name	CAS no.	Amount
-	-	-

Indoor environment

Not relevant

Carbon Footprint

Carbon footprint according to ISO 14067 has not been worked out for the product.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804 +A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products

The Norwegian EPD foundation (2021) NPCR PART A: Construction products and services version 2.0

The Norwegian EPD foundation (2022) NPCR PART B: Roof waterproofing version 2.0

Ecoinvent v3.8, 2022, Allocation, cut-off by classification. Swiss Centre of Life Cycle Inventories.

Association of issuing bodies 2021, European Residual Mixes 2021: https://www.aib-net.org/facts/european-residual-mix

District heating mix, Kredsloeb, 2022:https://www.kredslob.dk/professionel/produkter-og-services/fjernvarme/miljoedeklaration-emissionsdata

Statistics Denmark, Transport: https://www.statistikbanken.dk/NVG1

Statistics Denmark, Transport: https://www.statistikbanken.dk/NVG41

Statistics Denmark, Waste: https://www.statistikbanken.dk/20294

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EPD for the best environmental decision

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