ENVIRONMENTAL PRODUCT INFORMATION

RENAULT TRUCKS D Z.E.

renault-trucks.com

RENAULT TRUCKS

Renault Trucks is committed to improving sustainable goods mobility and is striving to reduce the effects its products have on the environment. Renault Trucks vehicles are designed to comply with legislation limiting atmospheric pollution and also to continue lowering fuel consumption which results in reducing carbon dioxide emissions.

Together with ever more fuel efficient transport solutions, Renault Trucks offers a full range of vehicles powered by alternatives to diesel fuel to enable operation in any environment: 100% electric; compressed natural gas; biofuels.

Renault Trucks implements an environmental policy based on specific commitments and a stringent management system that covers its dealer network, suppliers and partners. Its vehicles are manufactured in ISO 14001 certified production plants. It is geared to limiting its consumption of energy, water and raw materials but also to reducing waste production. Its products are designed to allow maximum reuse of the materials that have gone into their production.

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ENVIRONMENTAL PRODUCT INFORMATION

Environmental product information is drawn from life cycle analyses (LCAs) carried out on our vehicles. These cover all phases in a truck's life, from the production of raw materials right through to final dismantling and recycling. It provides data concerning the environmental impact of each one of these phases. In some cases, the LCA, which is far-reaching and complex, includes approximations. The results reveal the most important environmental parameters in the product life cycle.

THE THEMES

The environmental product information studies the impact of:

- **materials:** extraction and processing of raw materials used to produce the vehicle.
- **production:** manufacturing processes used by the plants, component production at suppliers and on site transport of parts.
- **use phase:** production and consumption of electric energy. Homologation trials carried out for each type of engine as well as on-road tests make it possible to ascertain the effects of energy consumption. Depending on the conditions of use, a truck's actual energy consumption can differ from the published results.
- **maintenance:** consumables and materials used in preventive maintenance and the production of parts (impact calculated on the basis of average values).
- **end of life management:** dismantling of products, management of waste and recycling the truck's materials.

THE RESULTS

The results shown include:

- the vehicle's bill of materials
- the rates of recyclability and recoverability as defined by the ISO 22628 standard
- the inventory results which show the data for the resources used and the emissions produced (pollution and waste).
- the assessment of the potential contribution to global warming.

BENCHMARK VALUES

Life cycle analysis results vary considerably depending on the data used for the calculations, the most important being energy consumption, mileage, vehicle configuration. The results shown here are based on the benchmark values for a **Renault Trucks D Z.E**., a 4x2 rigid truck with dry freight body designed for distribution, throughout its entire life cycle. It is important to stress that energy consumption, as well as the mileage, can vary considerably according to the conditions of use

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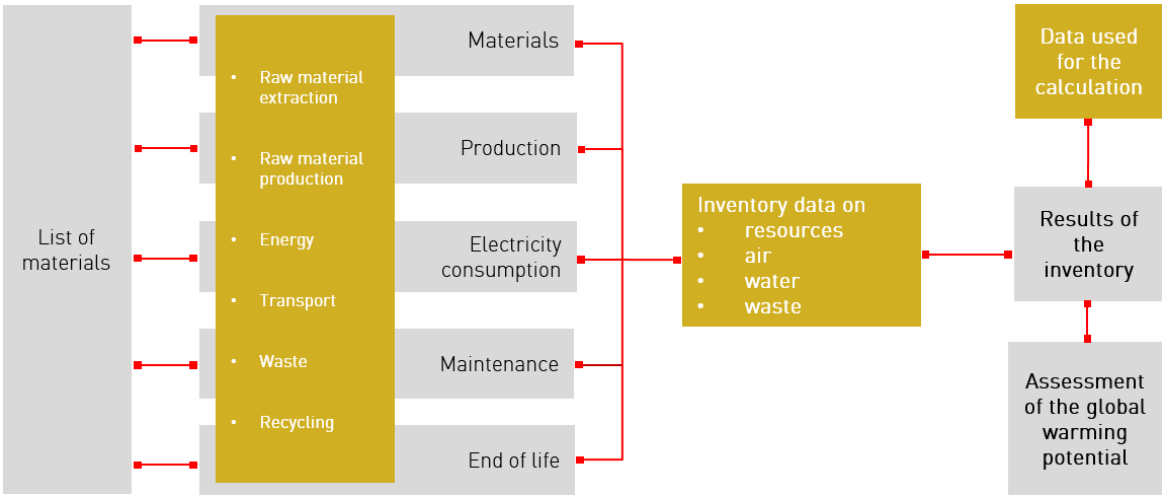
METHOD



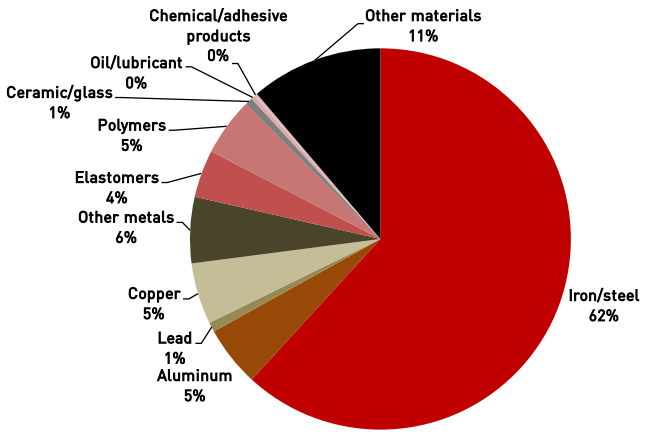
DATA USED FOR THE CALCULATION

Vehicle model	Emission level	Engine type	Vehicle type	Number of batteries	Distance (km)
Renault Trucks D Z.E.	Euro VI	185 kW ; 250 hp	4x2 rigid	4	600,000

Bill of materials

Bill of materials used in the vehicle and taken into account for calculating the life cycle analyses.

Materials	kg
Iron/steel	4557
Aluminum	378,5
Lead	59,8
Copper	383,2
Other metals	413,4
Elastomers	298
Polymers	362
Ceramic/glass	49,3
Oil/lubricant	24,1
Chemical/adhesive products	19,6
Other materials	828,4
TOTAL	**7373,3**



ENVIRONMENTAL PRODUCT INFORMATION

Rate of recyclability and recoverability

The vehicles are designed to ensure that the maximum amount of materials used in their construction can be reused.

Rate of recyclability* 92,4%
Rate of recoverability*97%

* Calculations according to the ISO 22628 standard: The rate of recoverability is the percentage of the vehicle's mass potentially able to be reused, recycled or recovered as energy (incineration with energy recovery); it is therefore always higher than the rate of recyclability.

Inventory results

	Unit	Materials	Production	Energy consumption	Maintenance	End of life	Total	Battery exchange
Electricity renewable	MWh	8,60	4,54	According to country and primary energy source	0,01	0,11	13	5
Electricity non-renewable	MWh	7,38	15,06		0,005	0,18	23	18
Other renewable energy	MWh	0,035	0,000		0,000	-0,0002	0	0
Other non-renewable energy	MWh	88,1	41,2		0,0	-24,7	105	58
Materials	kg	7373	0		11	-5054	2331	
CO	kg	101,3	3,12		0,0	-56,5	48	19
CO_2	kg	23396	11677		11	-5630	29454	18595
HC/VOC	kg	72,6	26,9		0,0	-21,3	78	47
NOx	kg	63,5	15,13		0,0	-14,8	64	35
SO_2	kg	348,2	6,62		0,0	-75,1	280	233
Particulates	kg	24,3	1,85		0,01	-4,34	22	17
Biological oxygen demand	kg	16,5	0,01		0,00	-0,26	16	16
Chemical oxygen demand	kg	23,2	9,93		0,01	0,02	33	25
CO_2-eq	kg	26106,4	12430		12	-6297,1	32251	19947
Use of water (excluding cooling)	m3		3,95					
Use of water for cooling	m3		0,08					
Non-hazardous waste treated	kg		133,6					
Non-hazardous waste to landfill	kg		0,22					
Hazardous waste treated	kg		79					
Hazardous waste to landfill	kg		0,6					

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	Unit	BE	CH	SP	FR	GB	IT	LU	NL	NO	SW	DE	EU28
Electricity renewable	MWh	308	449	631	188	270	673	603	247	653	473	509	406
Electricity non renewable	MWh	703	615	339	1196	335	119	350	116	20	563	272	451
Other renewable energy	MWh	0	0	0	0	0	0	0	0	0	0	0	0
Other non renewable	MWh	412	164	554	89	842	740	858	926	30	42	816	630
Materials	kg	0	0	0	0	0	0	0	0	0	0	0	0
CO	kg	99	49	106	24	183	138	150	99	10	90	154	157
CO_2	kg	113060	63833	165289	26773	226495	196603	264580	267368	15278	21734	288922	201828
HC/VOC	kg	219	110	421	62	642	662	423	537	13	33	432	408
NO x	kg	157	91	339	61	455	254	276	275	10	46	324	304
SO_2	kg	57	51	259	47	343	175	145	114	5	24	190	328
PM	kg	16	13	36	8	46	28	44	39	1	6	60	49
BOD	kg	0	0	0	0	1	1	1	0	0	0	1	0
COD	kg	98	69	238	21	30	178	279	322	3	5	407	236
CO_2 eq.	kg	119467	67424	177321	28696	245062	215599	278233	283174	15684	22873	303761	214164

	Unit	Hard Coal	Brown Coal/ Lignite	Natural Gas	Hydro Power	Nuclear Power	Wind Power	PV Solar Cells	Solar Thermal	Biomass
Electricity renewable	MWh	6	12	2	613	1	1287	3570	4584	1693
Electricity non renewable	MWh	4	6	0	0	1417	1	21	13	4
Other renewable energy	MWh	0	0	0	0	0	0	0	0	0
Other non renewable	MWh	1453	1417	1128	3	12	21	134	68	59
Materials	kg	0	0	0	0	0	0	0	0	0
CO	kg	100	228	97	7	4	22	56	44	591
CO_2	kg	485959	577188	232689	3012	2271	5866	39055	19647	15042
HC/VOC	kg	1256	28	649	2	7	12	140	48	105
NO x	kg	573	380	189	4	11	12	81	44	475
SO_2	kg	317	310	41	2	8	10	101	25	266
PM	kg	96	127	2	1	3	4	63	8	44
BOD	kg	0	0	0	0	0	0	0	0	0
COD	kg	996	794	4	1	1	3	30	11	480
CO_2 eq.	kg	523944	582591	251102	3063	2424	6230	42357	24494	21083

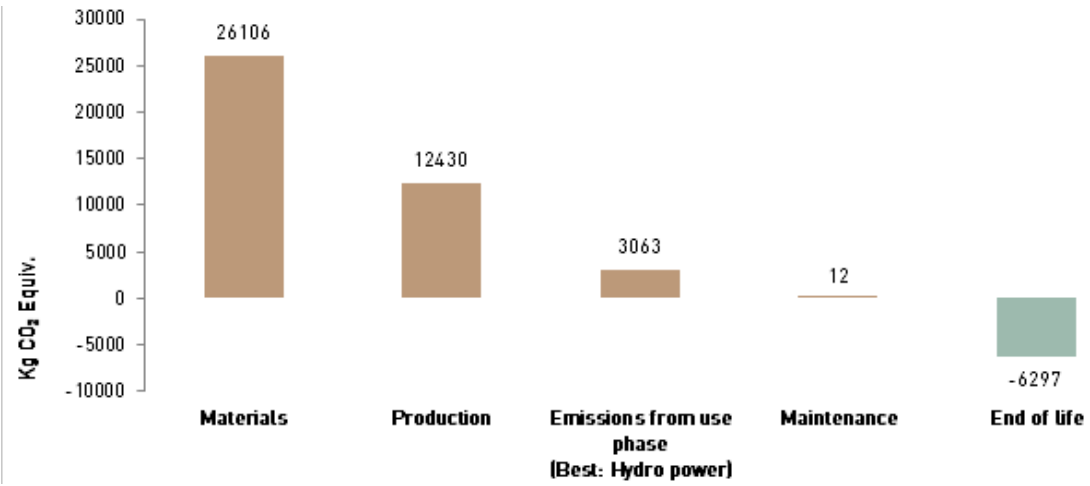
ASSESMENT OF THE IMPACT ON THE ENVIRONMENT

Assessing a product's environmental impact throughout its lifetime makes it possible to determine which aspects must be studied to improve its overall environmental performance. This assessment may be qualitative but also quantitative by using appropriate methods and tools

GLOBAL WARMING POTENTIAL

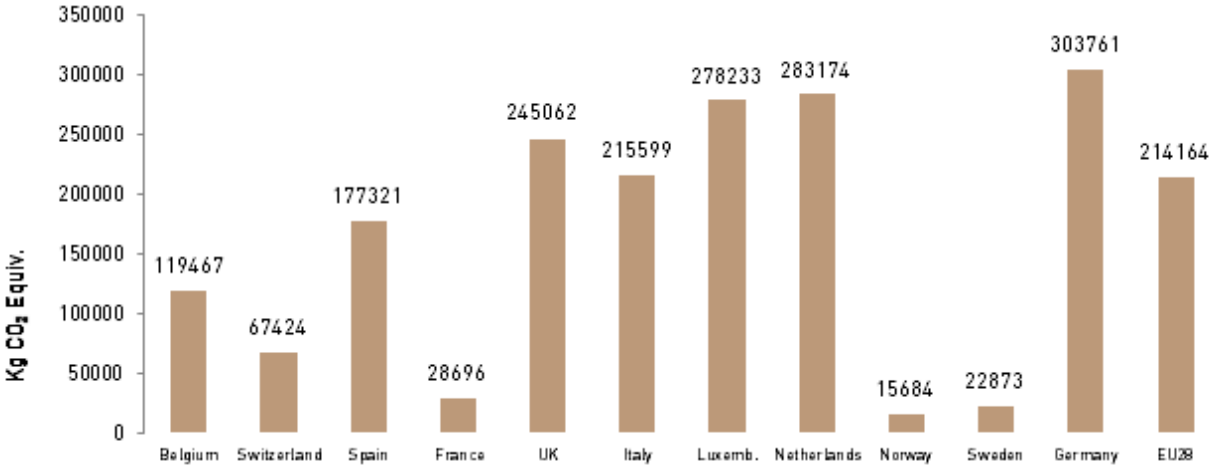
Life cycle analysis makes it possible to determine a vehicle's global warming potential throughout its operational life. This potential consists of the various greenhouse gas emissions it produces that affect the climatic system. It is expressed as the equivalent quantitiy of Carbon Dioxide (kg equ. CO_2).

Life cycle emissions



Global warming potential for the different life cycles of Renault Trucks D Z.E.. The use phase shows the best case.

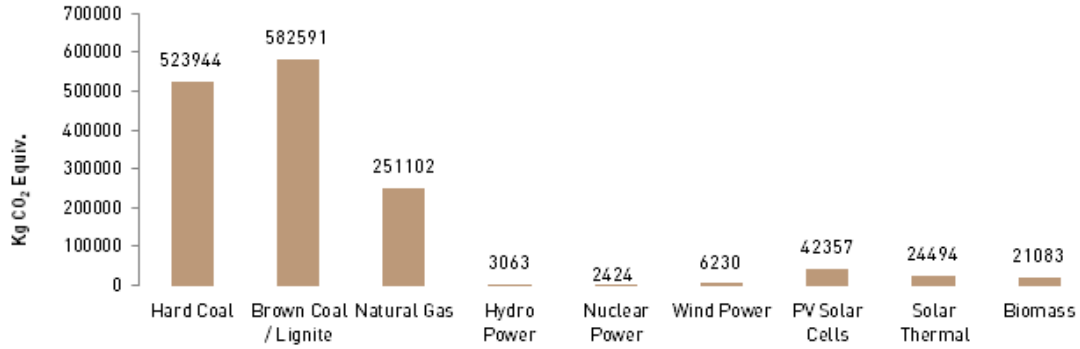
Use phase emissions from production of electricity - National/Regional average



Use phase emissions fom production of electricity. Main markets for Renault Trucks D Z.E. are presented.

ASSESMENT OF THE IMPACT ON THE ENVIRONMENT

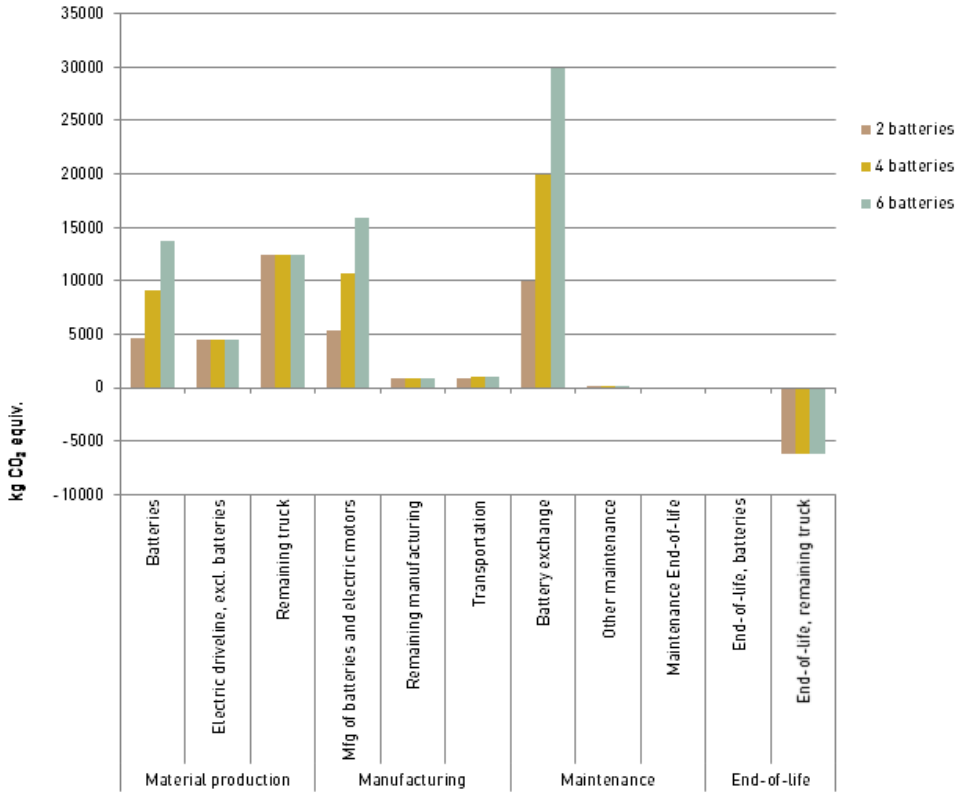
Use phase emissions from production of electricity - Energy sources



Use phase emissions from production of electricity. In the graph selected electricity sources are presented

The type of electricity used during operation is the most important parameter determining the climate impact of an electric truck. The total life cycle result becomes completely different whether different national grid mixes in the EU are used.

CO_2 emissions from production of materials, parts and manufacturing



Climate impact for the truck life cycle, divided into parts. Renault Trucks D.

Impacts related to the batteries accounts for a major part of the total impact. Based on the model made and the assumption of one battery exchange 62-83% of the truck life cycle climate impact are related to the batteries, depending on model and number of batteries. 33-44% are from battery manufacturing as modelled with Korean electricity grid mix (0,60 kg CO2 eq./kWh, which is higher than e.g. the figure for EU-28 average grid mix).

ASSESSMENT OF THE IMPACT ON THE ENVIRONMENT

CONCLUSIONS

The type of electricity used during operation is the most important parameter determining the climate impact of an electric truck. The total life cycle result becomes completely different whether different national grid mixes in the EU are used. When using low carbon electricity, Renault D electric enables a drastic decrease in life cycle CO_2 equiv. emissions.

Based on the model made and the assumption of one battery exchange, 62-83% of the truck life cycle climate impact are related to the batteries depending on model and number of batteries.

The introduction of new electric vehicles in Renault Trucks range is an opportunity to substantially reduce the CO_2 emissions from products over their entire life. Renault Trucks is continuing its efforts to reduce batteries environmental impact by securing materials supply and recycling and by using new technologies.

Find out more about the environment at Renault Trucks:
http://corporate.renault-trucks.com/en/environment/

renault-trucks.com

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