DEME

Dredging, Environmental
& Marine Engineering

Energy Management Progress Report

2018

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1 INTRODUCTION

This report describes the progress and the energy reduction initiatives within DEME for the first half of the year 2018, in accordance to the requirements of the CO_2 –Performance Ladder.

Emphasis is placed on the DEME activities of relevant DEME companies (offices and projects) within Belgium and the Netherlands; known as the DEME CO_2 Performance Ladder boundary.

The companies included in this report are as following:
- Dredging International NV (BE)
- Baggerwerken Decloedt en Zoon NV (BE)
- GeoSea NV (BE)
- GeoSea Maintenance NV (BE)
- EverSea NV (BE)
- DEME Environmental Contractors NV (BE)
- DEME Building Materials NV (BE)
- DEME Blue Energy NV (BE)
- DEME Infra Marine Contractors NV (BE)
- DEME Infra Marine Contractors BV (NL)
- De Vries & Van de Wiel BV (NL)

2 BOUNDARIES

2.1 Organisational boundaries

DEME N.V. uses the operational control approach according to the GHG Protocol to determine the organisational boundary of its emissions' inventory.

2.2 Operational boundaries

To define the operational boundaries, the CO_2 emissions are categorised in different scopes:

- **Scope 1** contains all direct emissions. Direct emissions occur from sources that are owned or controlled by the company, such as the consumption of fuel and natural gas.

- **Scope 2** covers indirect emissions from the consumption of purchased electricity. Scope 2 emissions physically occur at the facility where electricity is generated.

- **Scope 3** is a reporting category that includes all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. This includes air travel and subcontractors' equipment for example.

3 QUANTIFICATION METHODOLOGY

The identification of CO_2 sources provides the basis for the quantification of carbon dioxide. Multiplying the data from the emission sources each with their relevant CO_2 emission factor results in the carbon footprint (in T CO_2).

The combustion of biomass is not applicable. GHG sinks and removals are not applicable.

3.1 Changes in quantification methodology or base year

Changes in the quantification methodology or base year will be conducted in light of quality improvement to the reported data, transparent towards the intended users.

3.2 Exclusion of CO_2 emission sources

According to ISO 14064-1; direct or indirect GHG sources whose contribution to GHG emissions or removals is not material or whose quantification would not be technically feasible or cost effective, may be excluded from quantification.

The following CO_2 sources were excluded from the DEME carbon footprint.

a) Cutting & welding gases

Gases such as acetylene and oxygen are occasionally used on worksites and on ships for cutting and welding purposes when repairing equipment. The research on the significance of cutting and welding gases indicates that the data collection would not be proportional with the significance in the carbon footprint report at this time.

b) Lubricants

Various sorts of lubricants are used in normal conditions i.e. to protect internal combustion engines and reduce friction between moving surfaces. Waste oil is processed according to IMO MARPOL requirements. Lubricants are not included in the CO_2 emission inventory at this time.

c) Air conditioning refrigerants

Air conditioning refrigerants are purchased on an ad hoc basis, their consumption can be found in offices and on board ship's logs; however the leakage of these gases is minimal and not material.

d) Scope 3 emissions

Not all scope 3 emissions are reported by DEME. Only the most essential emissions that can be monitored and for which reduction measures can be taken, are considered.

For more details see Document [DEME-QHSE-DOC-002].

3.3 CO_2 emission factors

Most of the CO_2 emissions are calculated based on the CO_2 emission factors listed on the website www.CO2emissiefactoren.nl. as prescribed by the CO_2 Performance ladder handbook 3.0.

For activities which are not listed on the website, different sources are consulted. The table below gives an overview of the other sources.

Table 1: Overview CO_2- emission factors 'other sources'

Activity	CO_2 emission factor
procurement of steel	Conversion factor steel: 2.100 kg CO_2/tonne steel (cradle to gate primary steel). Study Tata Steel
procurement of concrete	Conversion factor concrete: SBK database. 54 kg CO_2/tonne concrete
waste processing	Conversion factor for residual waste incinertion: 1,83 kg CO_2/tonne waste. Chain analyse waste incineration GDF Suez Netherlands dd. 18.08.2016

3.4 Quality control

To guarantee the quality of the CO_2 emission inventory, internal routine checks are performed in combination with external verification assessments.

4 EMISSIONS & REDUCTIONS - COMPANY LEVEL

The carbon footprint described in this report is intended for the use within the CO_2 Performance ladder boundary. The CO_2 inventory is compiled under the responsibility of the DEME Corporate QHSE-S Manager and in accordance to the ISO 14064 principles (relevance, completeness, consistency, accuracy and transparency).

4.1 DEME Emissions

The CO_2 emissions for DEME activities in Belgium and the Netherlands (CO_2 Performance Ladder boundary) for the year 2018 are stated in the table below.

Table 2: Evolution Scope 1 CO_2 emissions

In tonnes CO_2	2018
Scope 1:	**129.751**
- DEME marine equipment MGO	112.423
- Diesel all site (excl. personnel transport)	10.344
- Diesel cars (personnel transport)	4.731
- Natural gas	182
- Office heating diesel	1.237
- Unleaded cars (personnel transport)	626
- LNG	208
Scope 2:	**3.766**
- Air travel	1.117
- Belgium use of private car	177
- Electricity	2.472
Grand total	**133.517**

The evolution of the scope 1 CO_2 emissions are stated in the figure below.

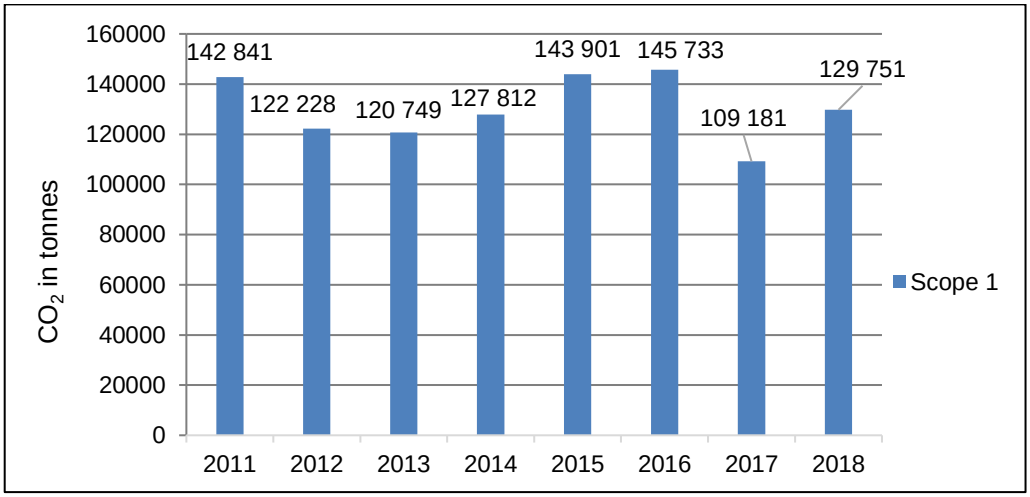

Figure 1: Evolution Scope 1 CO_2 emissions

An overview of the CO_2 emissions (Scope 1 & 2) for DEME activities in Belgium and the Netherlands (CO_2 Performance Ladder boundary) per year from 2011 is shown in Figure 2.

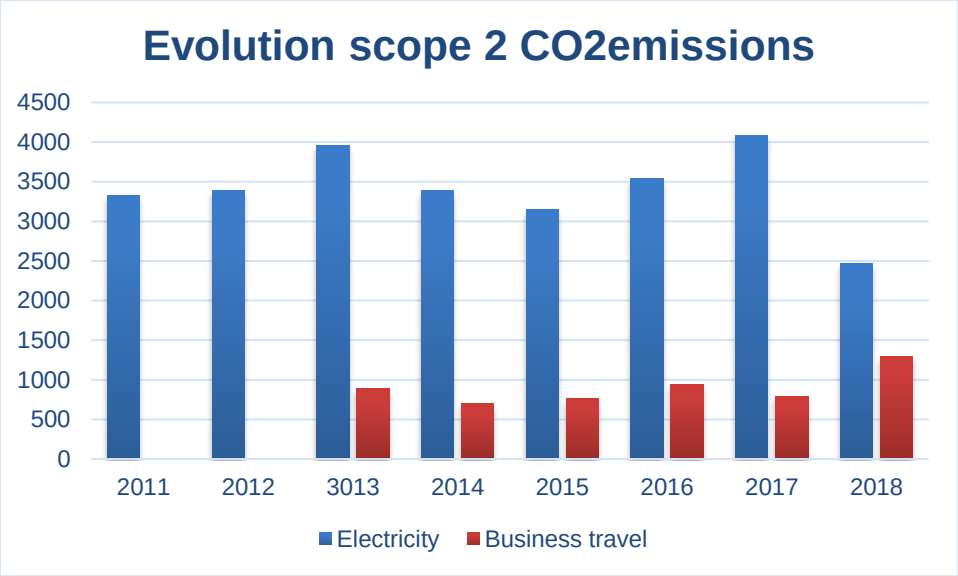

Figure 2: Evolution Scope 2 CO_2 emissions

Note:

For 2011 and 2012 there is no separate business travel data available for DEME activities in Belgium and the Netherlands. However the total emissions for business travel for DEME's worldwide activities amounted to 24,304 tonnes in 2011 and 27,188 tonnes in 2012. The reduction in 2018 is due to the CO2 emission factor 'stroom onbekend' grey + green electricity. The use of green electricity is increased in 2018.

4.2 Reduction targets

DEME has established different targets for scope 1, 2 & 3.

Scope 1

• Fuel efficiency	7% efficiency improvement by 2022	worldwide	(base year: 2011)
• Lease cars	95 grams CO_2 / kilometre by 2022	NL-BE	

Scope 2

• Electricity HQ	head office CO_2 neutrality by 2025	BE
• Electricity on sites	15% renewable energy by 2022	NL-BE

Scope 3

• Scope 3 emissions*	3% reduction in CO_2 intensity° by 2022	NL-BE	(base year: 2016)
• Vessel operations GeoSea	5% efficiency improvement by 2022	NL-BE	(base year: 2016)
• Maritime transport DBM	6% reduction in CO_2 intensity+ by 2022	NL-BE	(base year: 2015)

* scope 3 = transport, fuel consumption hired dry earthmoving equipment & vessels, domestic waste & commuter travel
° CO_2 intensity = CO_2 per turnover
+ CO_2 intensity = CO_2/ton km

4.2.1 Scope 1

Fuel efficiency

As a result of serious efforts at project level, following energy -efficiency improvements have been achieved:

Table 3: Energy -efficiency Scope 1

Year	Non-recurring reductions Scope 1 (in tonnes)	Progress energy efficiency yearly (%)
2012	11.368	1.97%
2013	18.306	3.17%
2014	19.677	3.41%
2015	17.195	2.98%
2016	21.816	3.78%
2017	22.397	3.88%
2018	29.038	4.6%

DEME has set a goal to improve its efficiency to at least 7% by 2022 compared to 2011. There is a positive trend visible. The efficiency has already increased to 4,6%.

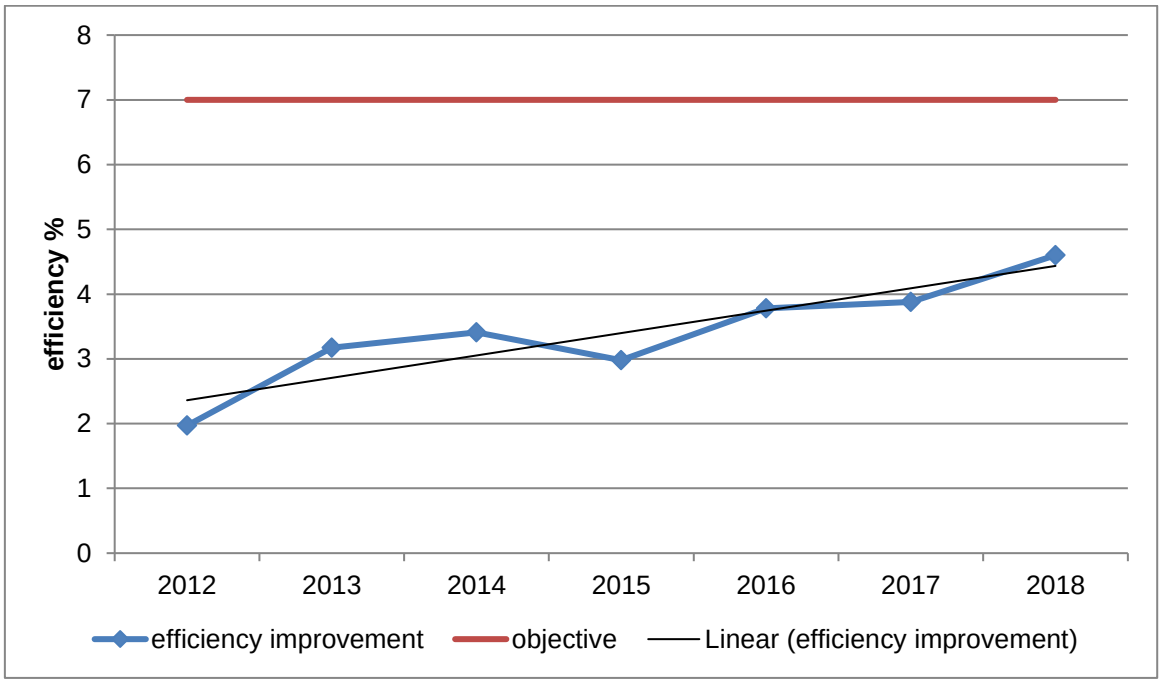

Figure 3: Efficiency improvement

Lease cars

In terms of CO_2 reduction, DEME is optimising its lease vehicle fleet. The evolution of CO_2 emissions is represented in the figure below.

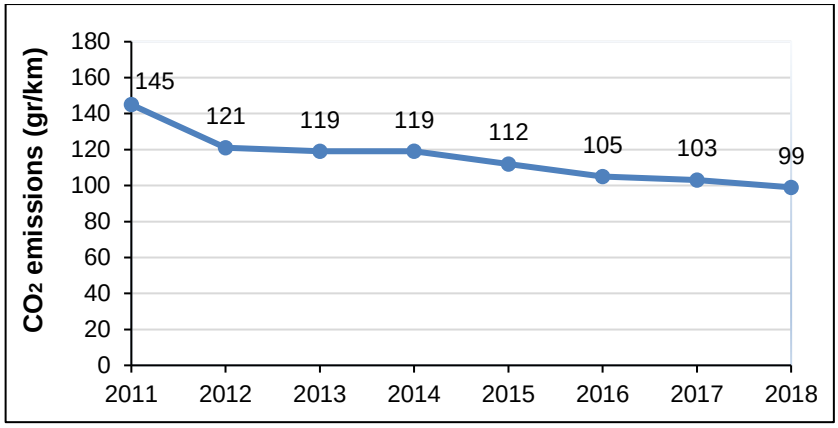

Figure 4: Evolution CO_2-emissions DEME lease car fleets

The results demonstrate a positive trend, which is entirely in line with the DEME reduction target. DEME aims for an average emission of 95 grams CO_2 per kilometre by 2022.

In the chart below the distribution by type of fuel is proposed. The chart shows that the major part of DEME's fleet makes use of a diesel engine.

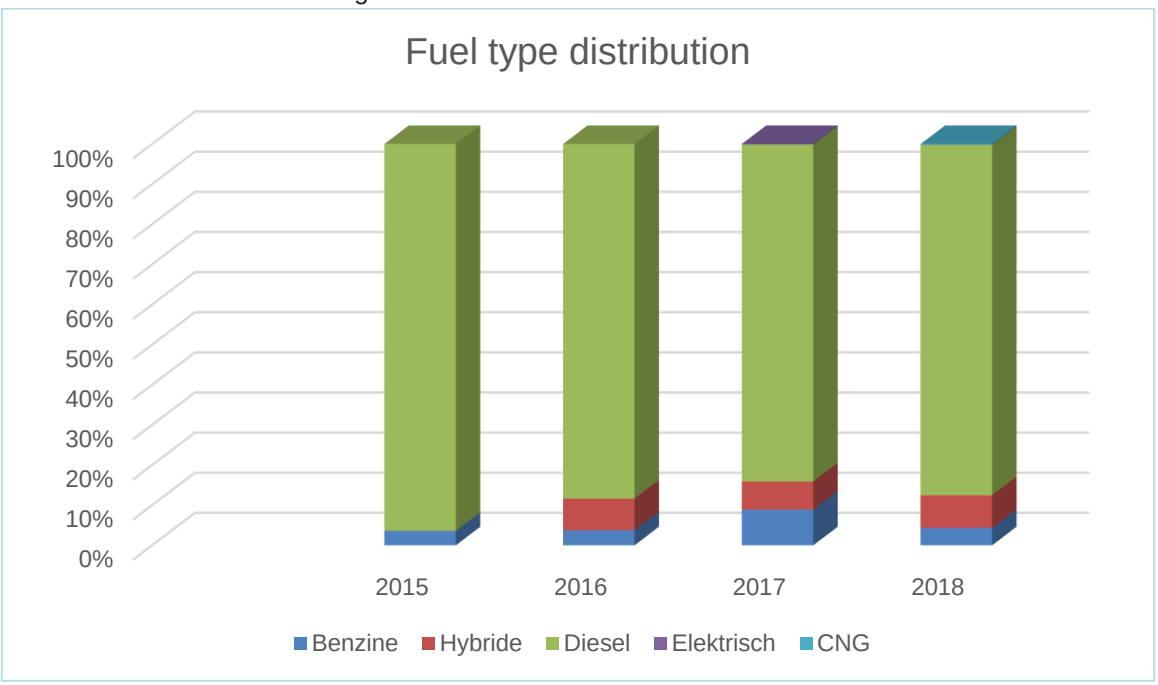

Figure 5: Distribution by fuel type

4.2.2 Scope 2

Electricity use Head office

DEME is aiming for CO_2 neutrality for its electricity use at the DEME head office by 2025 (year-on-year). The current electricity consumption is already 100% renewable in origin (contractually regulated), but a master plan is being built in order to provide for the local electricity needs and to become electricity self-sufficient.
The evolution of the electricity consumption on the DEME HQ site is shown below. In 2018 only 11,1% of the total electricity consumption was self produced energy (by solar panels and wind turbine).

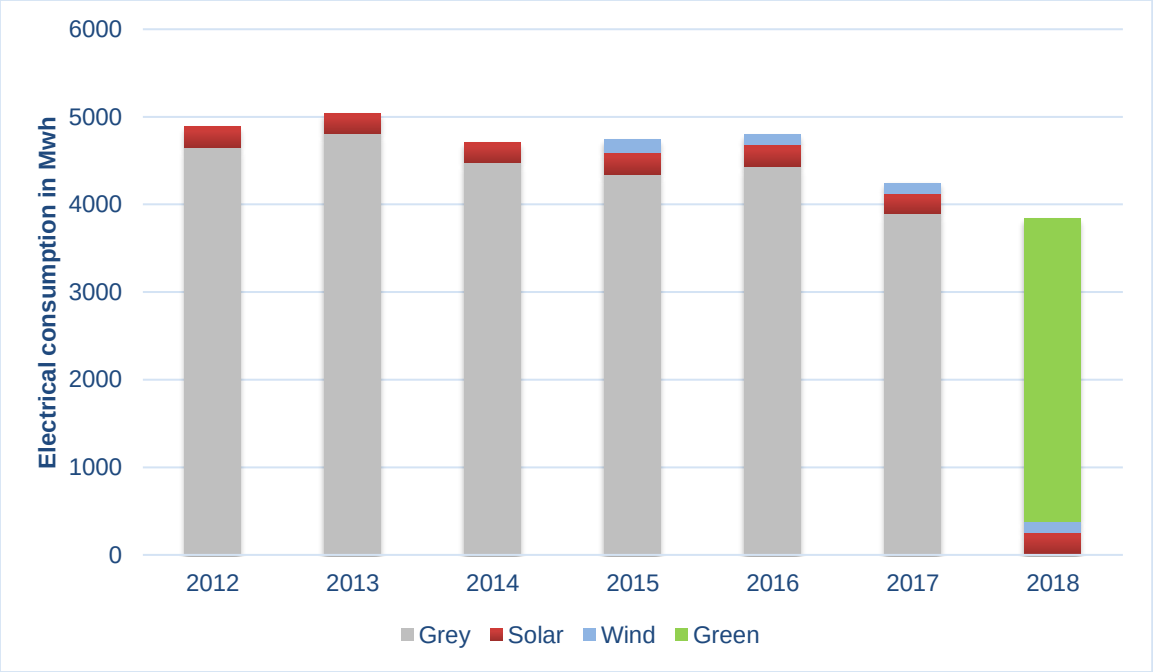

Figure 6: Share renewable electricity in DEME Head Office

Electricity use on sites in Belgium & the Netherlands

The aim is to fulfill the energy needs on sites with renewable energy. Objective for the project sites is to increase the total share of green power to 15% by 2022. The share of renewable energy on project sites for 2018: 14 %.

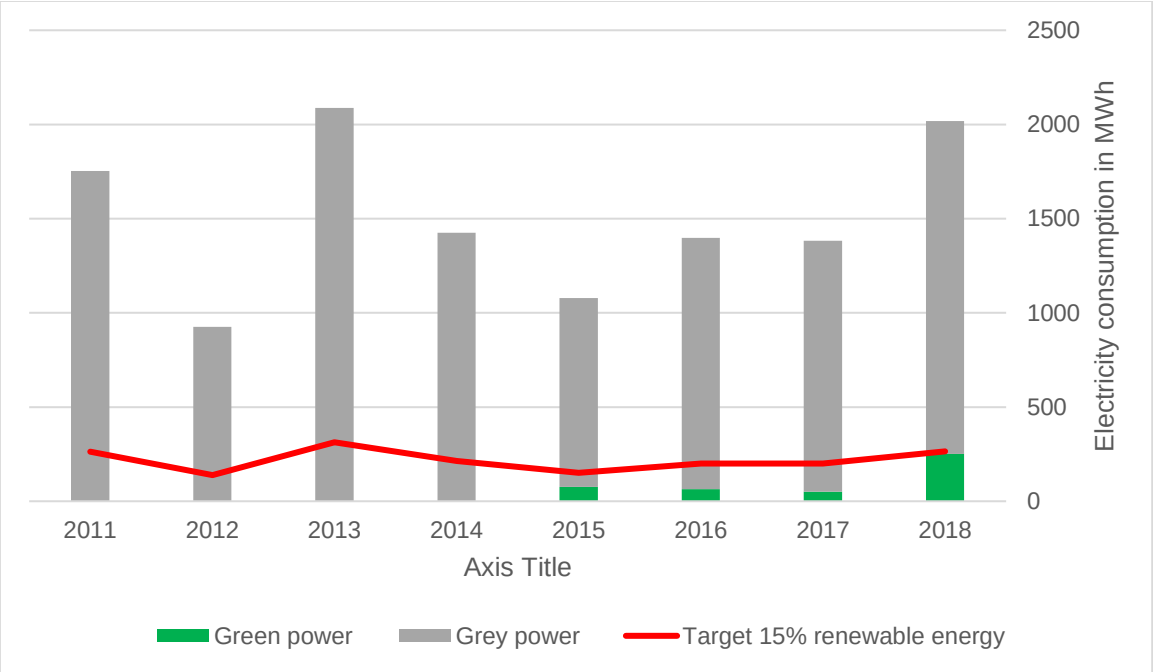

Figure 7:Ratio green versus grey electricity and 15% target line

4.2.3 Scope 3

DEME has analysed its scope 3 emissions and decided to monitor only 4 emission categories (see table 5.1 GHG Protocol Scope 3 Standard in the 'Handreiking Aanbesteden Versie 3.0) for which the amounts are measurable and reducible; e.g:

- Cat 1: purchase of goods & services (concrete, steel, fuel consumption of hired equipment);
- Cat 4& 9: transport;
- Cat 5: generated waste;
- Cat 7: commuter travel.

The scope 3 emissions for 2018 are shown in the graph below.

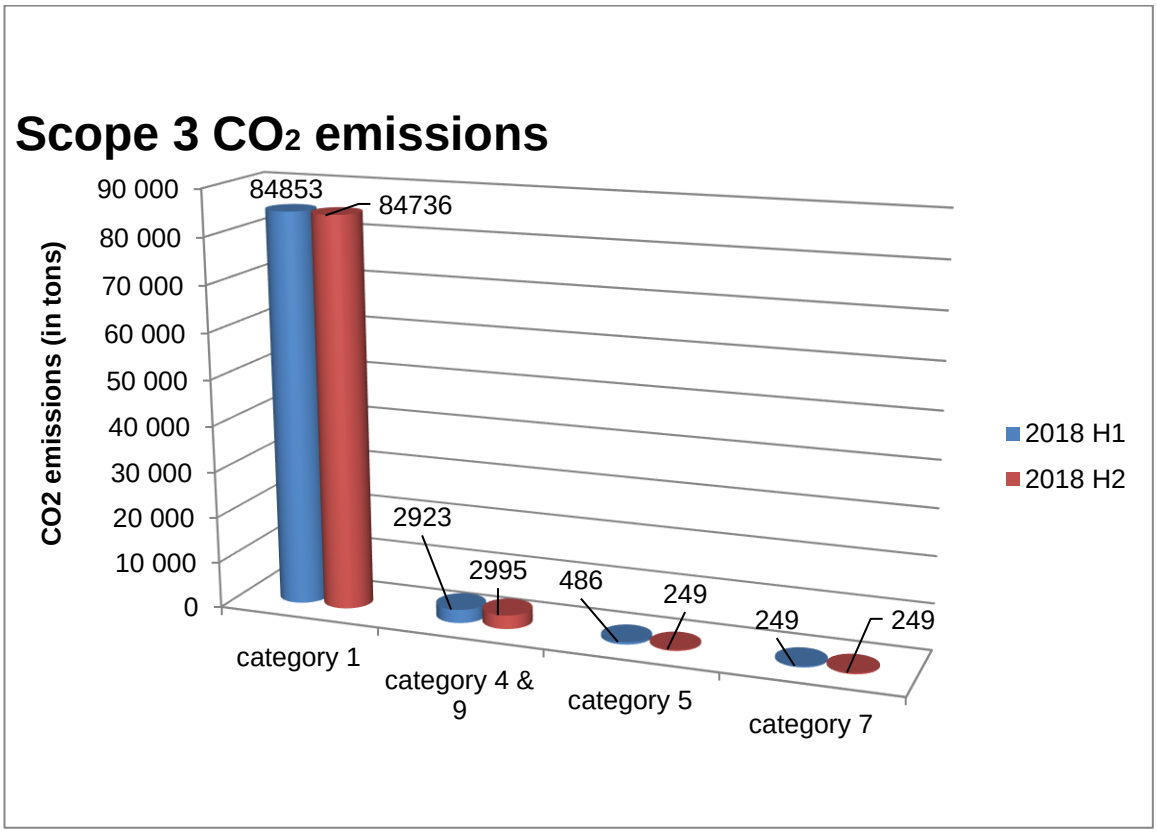

Figure 8: Scope 3 standard CO_2 emission categories for the year 2018

Not all the scope 3 emissions are calculated on the basis of real data, some emissions are calculated by CO_2 conversion factors retrieved from literature. The reliability of the scope 3 emissions is indicated in the table below.

Table 5: scope 3 emissions

Emission category	% based on product carbon footprints or real data
Category 1	97%
Category 4&9	51%
Category 5	0%
Category 7	0%

The category 1 scope 3 emissions consist of several subcategories: concrete, steel & fuel consumption for hired equipment. The CO_2 amounts for 2018 are shown in the graph below.

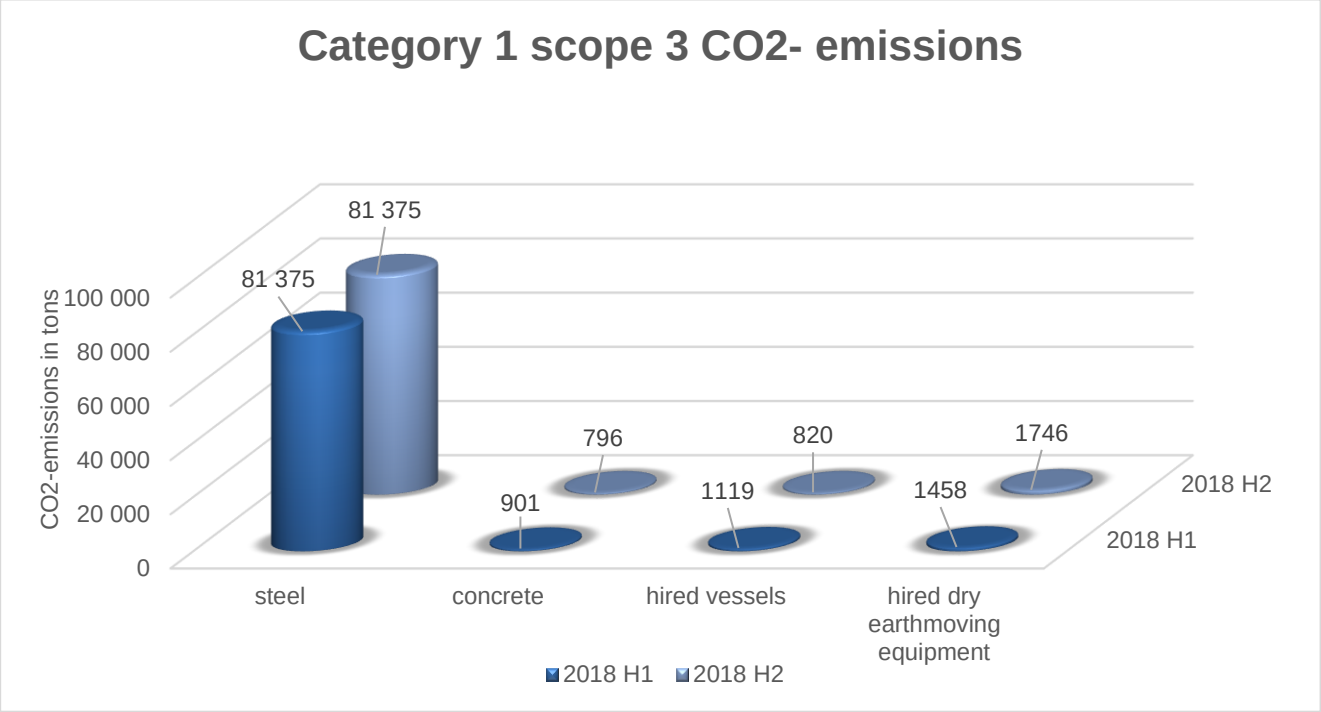

Figure 9: category 1 CO_2 emissions for the year 2018

Chain emissions

To get more insight in its chain emissions, 2 chain analysis were conducted, i.e. 1 for the installation of offshore wind farms and another for maritime &fluvial sand/gravel transport.

Installation of offshore windfarms

In 2018 we started a new chain study on the Rentel Wind Turbine project. Depending on this outcome of this study and the review by an independent recognized consultancy, we will be able to formulate new objectives.

Maritime & fluvial marine aggregates transport

DBM analysed its activities for processing and supplying marine aggregates. The major contribution of its scope 3 emissions is due to external transport activities. Therefore DBM established a reduction policy for its maritime & fluvial transport. The policy aims for a 6 % reduction in CO_2 emissions per tonne km, starting from 2015 till 2022.

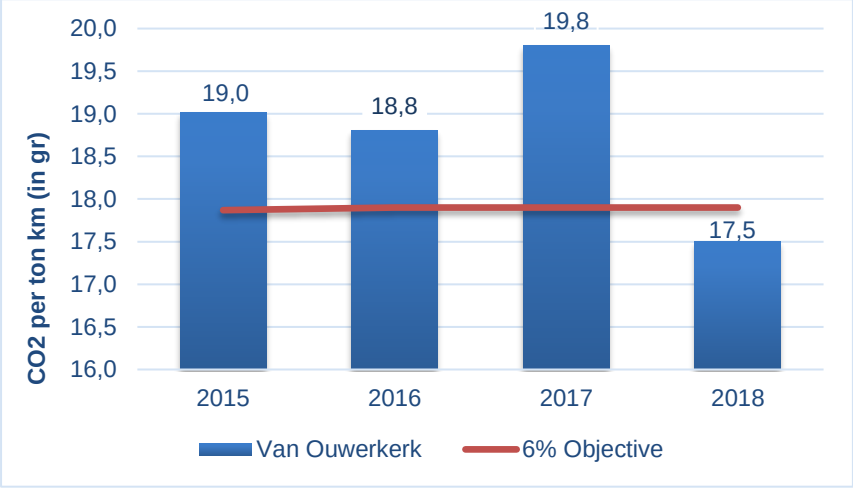

Figure 9: CO_2 emission maritime & fluvial transport organised by DBM

The average emissions per ton * km has dropped by 11,6%. From 0.01976kg / ton* km in 2017 to 0.01754 kg / ton*km 2018. The avarage tonnage per cargo is increased with 3,1% since 2017. bigger loads are more eco friendly.

4.3 DEME'S ENERGY ACTION PLAN

DEME's energy reduction programme is evaluated and assessed by means of an energy management action plan. Ref. document DEME-QHSES-DOC-031.

Actions accomplished on 31th December of 2018

SCOPE 1

Description	Scope	CO_2 Reduction	Status	Responsible
Two speed propulsion gearboxes	1	Can save up to 8% of the fuel consumption	Head of Technical Department	2016-2018
Tuning exercise on engines	1	Monitor the exercise and see what reduction occurs	Head of Technical Department	2016-Q1/Q2 2018
Testing ultrasonic antifouling	1	Reduce growth of barnacles, efficiency increase	Head of Technical Department	2016-2018
Build and use of electrical cutter (Blanew)	1	Use of electrical power instead of fuel	Head of new build	2016-2018
New drivetrain research,hybrid, continuation with IHC	1	8-15% CO_2-reduction shown in tests	Head of new build Department	2017-2018
Monitoring emissions from LNG dual fuel ships	1	Methane slip, CO_2, SOx, NOx, Particulate matter	Head of New building Department	2017-Q1 2018

SCOPE 2

Description	Scope	CO_2 Reduction	Status	Responsible
energy audit for office in The Netherlands (2018) HIT Energy Solution	2	unknown	Facility manager office	**2017-2018** 2018-2022

SCOPE 3

Commuter travel

Description	Scope	CO_2 Reduction	Status	Responsible
Home office, satellite offices	3	HRD Dept.	2018	Sustainable manager
Flex offices	3	HRD/ QHSE-S	2018	Sustainable manager

Waste management

Description	Scope	CO_2 Reduction	Status	Responsible
Monitoring of waste quantities	3	QHSE-S	2018	Environmental manager

5 EMISSIONS & REDUCTIONS - PROJECT LEVEL

5.1 Projects with CO_2-related award advantage

Emissions and reductions related to projects with a specific award advantage on the CO_2 Performance Ladder are separately reported.

An overview of these projects is given in the table below.
Further information about the projects can be found at DEME's corporate website.

Project budget nb.	Project description	Status project
5589	Land make middle island Ijburg	New project since last reporting
5264	Maintenance dredging of rivers NL	On-going
5311	Renovation of weir and lock complex in Nederrijn /Lek	On-going
5547 5548	Blankenburgverbinding	New project since last reporting,
5447 5453	Rijnlandroute	On-going
5509 5512 5513	Lock Terneuzen	On-going

Table 5: overview of projects with CO_2 award advantage

5.2 Assessing and reducing uncertainties

The qualitative influences of uncertainty on the DEME GHG emission inventory (or in this case CO_2 - carbon footprint) are the following:

(1) Source data consists of invoices and delivery records. If the source data on purchased quantities is not available, actual or estimated energy consumption data is used. Estimations are always conservative. It may occur that fuel supply to third (non-DEME) equipment is not separately registered when the fuel is included in the invoice/delivery record of the DEME equipment or DEME project reported figure.

(2) Vessels in co-ownership are considered as subcontracted, however accounted for in scope 1 when their consumption could not be separately identified.

(3) Energy supplied to third equipment is not registered separately when shared fuel tanks are used on site.

(4) The quantity of gas consumed is reported in GCV (higher or gross calorific value), not NCV (lower or net calorific value).

(5) For each flight, the total of air miles is provided by the travel agency.

(6) The fuel consumption of cars is based on the data provided by the fuel supplier (invoices). Here, all invoices from the fuel supplier are taken into account (i.e. including use of the car for private purposes).

(7) The use of private cars for business purposes is compiled from the reimbursed expenses for employees.

(8) The fuel consumption for the ships of DEME Building Materials includes the total energy consumption of all their activities throughout Europe.

(9) Except for the emissions for maritime & fluvial transport and chartered vessels all the scope 3 emissions are calculated based on the total cost of sales and by applying average CO_2 emission conversion factors [DEME- QHSES-DOC-002].

6 ISO 14064-1 CROSS REFERENCE

Aspect in ISO 14064-1 § 7.3	Description	Section in this document
a	Description organisation	1
b	Persons responsible	4
c	Period covered	4.1
d	Organisational boundaries	2.1
e	Scope 1 emissions	4.1
f	Combustion of biomass	3
g	GHG removal	3
h	Exclusion of GHG sources	3.2
i	Scope 2 emissions	4.1
j	Base year	3
k	Base year changes	3.1
l	Quantification methodology	3
m	Changes in quantification methodology	3.1
n	GHG emission factors used	3.3
o	Uncertainties in accuracy	6
p	ISO 14064 statement	4
q	Verification statement	3.4

Table 6: ISO 14064-1 cross reference

7 DOCUMENT REFERENCES

DEME-QHSES-DOC-002	Scope 3 CO_2 emission analysis
DEME-QHSES-DOC-031	Energy Management Action Plan