Menhaden

APPENDIX TO IMPACT REPORT 2016

Menhaden Capital PLC (the "Company" or "Menhaden") aims to generate long-term shareholder returns, predominantly in the form of capital growth, by investing in businesses and opportunities that deliver or benefit from the efficient use of energy and resources.

The Menhaden 2016 Impact Report included quantitative measurement of the positive impacts of Menhaden's portfolio companies. To calculate this impact the Menhaden Team asked sustainability consultancy Carbon Smart to calculate the resource consumption (electricity, fuel, water and waste) and carbon avoided for each company in the investment portfolio (as it stood on 30 December 2016) - with the exception of the privately held companies managed by Alpina Partners which were analysed by the manager's team.

This appendix outlines the detailed methodology and assumptions on which these calculations were based.

Overall approach

Carbon Smart reviewed each company in Menhaden's investment portfolio to calculate the resource consumption (electricity, fuel, water and waste) and carbon avoided. All calculations are based on publicly available information shared by the individual companies. To arrive at an environment benefit calculation, one of two approaches were followed (in order of preference):

1. Product/services - Resource savings and carbon avoided due to the products and services offered by the business.

In cases where either;
- Insufficient information was publicly available to calculate the savings through the business's offerings or
- The products or services of the business did not have a specific environmental benefit (e.g. Wabtec) the following alternative approach was applied:

2. Internal savings – resource savings and carbon avoided through internal, company-wide initiatives helping the organisation to produce or deliver their products and services in a more resource efficient way.

To note it is to expected that the savings from the product/services will significantly outweigh the benefits of the internal savings.

All environmental benefit figures have been calculated for the 2016 reporting year. Menhaden's report follows the DEFRA Environmental Reporting Guidelines and the GHG

reporting protocol to calculate the emissions saved. The most recent available carbon conversion factors were used to calculate the carbon savings: For international electricity generated the 2014 EIA grid average factors were applied and for all other resources the 2016 DEFRA carbon conversion factors were used.

Menhaden's share of avoided resource consumption and emissions production

The following table provides a breakdown of Menhaden's share of avoided resource consumption and emissions production for each organisation by investment theme.

Theme	Company	% ownership	Electricity (kWh)	Fuel (litres)	Waste (tonnes avoided to landfill)	Water (cubic meters)	Carbon (tCO_2e)
Clean energy	X-Elio	8.00%	30,052,822	-	-	39,519	12,874
	Abengoa	0.18%	12,696,000	-	156	16,695	877
	Atlantic Yield	0.16%	4,032,240	-	-	5,302	1,523
	Terraform Global	0.43%	4,004,815	-	-	5,266	2,256
	Terraform Power	0.36%	16,686,004	-	-	21,942	7,858
	Brookfield Renewable Energy	0.03%	436,872	-	-	574	2,258
Sustainable transport	Airbus	0.01%	-	88,863	3	-	201
	Borgwarner	0.014%	-	-	-	21	<1
	FirstGroup	0.135%	-	3,505,452	18	-	9,158
	Shimano[1]	0.007%	-	-	-	-	-
	Volkswagen[2]	0.006%	-	-	-	-	-
	Wabtec[3]	0.022%	-	-	-	-	-
Resource and energy	Air Products & Chemicals	0.009%	-	-	-	1,125	79
	Johnson Matthey	0.013%	-	-	<1	-	11,676
	Rockwell Automation	0.007%	-	-	1	-	<1
	Roper Technologies	0.008%	-	-	-	279	<1

[1] There are no environment benefit figures for Shimano due to insufficient publicly available information on the sustainability benefits of their products or their company emissions and reduction activities

[2] Due to the recent VW emissions scandal and its consequent impact on the credibility of VW's sustainability data, no environmental benefit has been calculated

[3] There are no environment benefit figures for Wabtec due to insufficient publicly available information on the sustainability benefits of their products or their company emissions and reduction activities

	Safran	0.012%	-	-	1	-	4
Water and waste	Stericycle	0.042%	-	-	97	-	19
	Total		**67,908,754**	**3,801,874**	**275**	**90,725**	**48,784**

Calculation approach and assumptions

The following section details the calculations carried out (whether they are based on the product/service offered or internal company savings), the approach taken and the assumptions made for each company.

CLEAN ENERGY THEME

X-Elio

Calculation: product/service
Annual energy generated and total carbon emissions avoided using renewable energy rather than energy from a local grid and water use avoided when compared to coal fired generation.
Approach
X-Elio disclose the total energy generated figure in 2015. This figure was used to calculate the total carbon and water avoided through renewable rather than non-renewable generation.
Key assumptions
- 2015 generation figure is the same in 2016 (as 2016 generation not yet published)
- The PV solar array replaced energy purchased from a coal fired station

Abengoa

Calculation: product/service
Annual energy generated and total carbon emissions avoided using renewable energy rather than energy from a local grid and water use avoided when compared to coal fired generation.
Approach
Abengoa disclose the total energy generated figure in 2015. This figure was used to calculate the total carbon and water avoided through renewable rather than non-renewable generation.
Key assumptions
- 2015 generation figure is the same in 2016 (as 2016 generation not yet published)
- The PV solar array replaced energy purchased from a coal fired station.

Atlantica Yield

Calculation: product/service

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Annual energy generated and total carbon emissions avoided using renewable energy rather than energy from a local grid and water use avoided when compared to coal fired generation.

Approach

Atlantica Yield disclose the total energy generated figure in 2015. This figure was used to calculated the total carbon and water avoided figure if this energy was purchased from the national grid instead.

Key assumptions

- 2015 generation figure is the same in 2016 (as 2016 generation not yet published)
- The PV solar array replaced energy purchased from a coal fired station

Terraform Global and Terraform Power

Calculation: product/service

Annual energy generated and total carbon emissions avoided using renewable energy rather than energy from a local grid and water use avoided when compared to coal fired generation.

Approach

Terraform Global and Terraform Power do not disclose the total energy generated for the year, but they do state their generation capacity. Using industry standard renewable energy calculation tools we have calculated annual consumption estimates based on the type of facility, the generation capacity and the location of the system.

Key assumptions

- Solar: Standard fixed open rack array with 14% system losses, operating at 100% efficiency (i.e. new)
- Wind: Location of the wind farms is state - or country central
- Water avoided calculations: Calculation has been based on the assumption that the energy produced by Terraform has replaced energy generated by a coal fired station

Brookfield Renewable Energy

Calculation: product/service

Annual energy generated and total carbon emissions avoided using renewable energy rather than energy from a local grid and water use avoided when compared to coal fired generation.

Approach

Brookfield Renewable Energy does not disclose the total energy generated for the year, but they do state their generation capacity. Using industry standard renewable energy calculation tools, annual consumption estimates were calculated based on the type of facility, the generation capacity and the location of the system.

Key assumptions

- Solar: Standard fixed open rack array with 14% system losses, operating at 100% efficiency (i.e. new)
- Wind: Location of the wind farms is state - or country central
- Hydroelectricity: Assumes an average efficiency rating between 40 -60% depending on

location of the hydro plant
- Water avoided calculations: Calculation has been based on the assumption that the energy produced by Brookfield has replaced energy generated by a coal fired station

SUSTAINABLE TRANSPORT THEME

Airbus

Calculation: product/service
Annual carbon avoided using Airbus compared to Boeing airplanes.
Approach
Fuel and carbon saved by using Airbus airplanes rather than Boeing airplanes flying for one year. These calculations have been based on all Airbus aircraft delivered in 2016.
Key assumptions
- Carbon saved is the difference in CO2 emissions caused by flights made by Airbus aircraft and by comparable Boeing aircraft
- Flight distance: Weighted average annual distance flown in the US by aircraft of each type is a reasonable proxy for the average distance flown world wide[4]
- Aircraft numbers: The delivered volume of aircraft for 2016 is a reasonable representation of the new aircraft in operation in 2016
- Comparable aircrafts: We have selected comparable aircrafts between Airbus and Boeing

Borg Warner

Calculation: Internal
Annual carbon savings of the company-wide carbon reduction initiatives implemented in the previous reporting year.
Approach
Sum of all carbon savings of the carbon initiatives publicly reported in Borg Warner's Carbon Disclosure Project (CDP) response.
Key assumptions
- List of initiatives stated in the CDP response is accurate and complete

First Group

Calculation: Product/service
Carbon avoided from First Group public transportation as alternative to private passenger cars.
Approach
It was assumed that 1 in 4 of First Group customers have switched from using their private passenger cars to using their transportation facilities. As such, the calculations compare the avoided fuel and carbon from ¼ of First Group passengers. The calculations were carried out separately for the five business divisions (First Bus, First Rail, First Student, First Transit &

[4] https://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=254&DB_Short_Name=Air%20Carrier%20Summary

Greyhound) to take into account the different transport modes (bus, rail), efficiency of the average vehicle (published online by First Group) and the location (UK, US).

Key assumptions
- 1 in 4 passengers have switched from private passenger cars to First Group transportation due to the service that they provide
- Average UK car efficiency: 205 grams of CO_2e per passenger km[5]
- Average US car efficiency: 661 grams of CO_2e per passenger km[6]
- All cars are diesel
- Average occupancy of buses is 70-80%
- Average UK bus journey: 6.24 km[7]

RESOURCES AND ENERGY THEME

Air Products & Chemicals

Calculation: Internal
Annual water and carbon saved through company-wide initiatives.
Approach
Air Products & Chemical publicly state their avoided water consumption and carbon emitted from 2007 to 2015. An annual water and carbon avoided figure was calculated based on the stated figures.
Key assumptions
- Avoided water and carbon figures are the same year on year

Johnson Matthey

Calculation: Product/service
Carbon avoided using Johnson Matthey catalytic converters in new cars.
Approach
Carbon Smart calculated the NOx emissions avoided in one's years travel by new cars/light commercial vehicles sold in 2016 that have been fitted with a Johnson Matthey converter. The NOx emissions were then converted to CO_2e emissions.
Key assumption
- 1/3 of all new cars are fitted with Johnson Matthey converters[8]
- 20% of all new cars are diesel[9]
- Catalytic converters save 5g/km of pollutants[10]
- NOx removal accounts for 14% of the 5g/km claimed by Johnson Matthey[11]

[5] http://www.futuretravel.org.uk/statistics/
[6] https://www.epa.gov/sites/production/files/2016-02/documents/420f14040a.pdf
[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/489894/tsgb-2015.pdf
[8] http://www.technology.matthey.com/resources/view-questions-answers/much-pollution-saved-autocatalysts/
[9] https://www.nytimes.com/2015/12/09/business/energy-environment/the-dimming-of-diesel-fuels-future-in-cars.html
[10] http://www.technology.matthey.com/resources/view-questions-answers/much-pollution-saved-autocatalysts/

- 14,541 km distance travelled per year per car (based on a weighted average of a regional review by US Department of Transportation)[12]

Rockwell Automation

Calculation: Internal
Sum of annual carbon savings of the company-wide carbon reduction initiatives implemented in the previous reporting year.
Approach
Sum of all carbon savings of the carbon initiatives publicly reported in Rockwell Automation's Carbon Disclosure Project (CDP) response.
Key assumptions
- List of initiatives stated in the CDP response is accurate and complete

Roper Technologies

Calculation: Internal
2015 – 2016 water savings and associated emissions due to an internal resource efficiency project carried out.
Approach
Roper Technologies disclose the water savings of their most recent resource efficiency project. This figure has been used to calculated the carbon avoided figure for Roper Technologies.
Key assumptions
n/a

Safran

Calculation: Internal
Sum of annual carbon savings of the company-wide carbon reduction initiatives implemented in the previous reporting year.

Approach
Sum of all carbon savings of the carbon initiatives publicly reported in Safran's Carbon Disclosure Project (CDP) response.
Assumptions
- List of initiatives stated in the CDP response is accurate and complete

WATER AND WASTE THEME

[11] https://www3.epa.gov/air/nitrogenoxides/health.html
https://en.wikipedia.org/wiki/Exhaust_gas#Main_motor_vehicle_emissions
[12] https://www.fhwa.dot.gov/policyinformation/statistics/2008/in5.cfm

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Stericycle

Calculation: product / service
Total waste to landfill avoided figure and associated emissions avoided calculated.
Approach
Stericycle state the annual tonnage of waste removed figure and their diversion away from landfill rate. This information was used to calculate the total tonnage and avoided associated emissions.
Assumptions
n/a

PORTFOLIO CARBON FOOTPRINT

The following table details for each company the total market cap (in £), the total annual carbon footprint for scope 1 (direct emissions) and 2 (electricity generated) and the total revenue in sterling.

	Company	Total market cap (£)	Revenue millions (£)[13]	Total scope 1 and 2 emissions (tCO_2e) 2016[14]
Clean energy	X-Elio	127,450,088	36	-
	Abengoa	286,399,737	4,704	2,773,618
	Atlantic Yield	1,809,635,220	706	25,633
	Terraform Global	571,810,763	156	10,223
	Terraform Power	1,429,634,731	509	33,285
	Brookfield Renewable Energy	6,847,837,327	1,782	83,567
Sustainable transport	Airbus	45,788,760,766	51,981	925,357
	Borgwarner	7,166,556,205	1,210	321,499
	FirstGroup	1,259,440,820	5,186	2,386,176
	Shimano	12,571,145,163	2,042	184,454
	Volkswagen - Preference		-	-
	Wabtec	6,306,047,423	2,404	168,245
Resource and energy	Air Products & Chemicals	31,293,786,897	6,921	30,210,000
	Johnson Matthey	6,044,496,825	10,716	456,000
	Rockwell Automation			

[13] The revenue for each business was sourced from annual reports
[14] This data was sourced from annual reports, sustainability reports or the CDP. Where 2016 was not yet available 2015 was used instead.

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		15,081,921,181	4,584	137,300
	Roper Technologies	15,754,464,636	2,611	182,740
	Safran	23,150,321,466	140,560	525,990
Water and waste	Stericycle	5,689,742,186	2,169	151,817
	Total	**181,179,451,432**	**238,277**	**38,575,904**

About Carbon Smart

Carbon Smart, founded in 2007, is a well-established, independent sustainability consultancy working across the environmental and social agenda with private and public sector organisations across the globe. Carbon Smart has previously worked with distinguished clients such as the UK Home Office, BNP Paribas and RBS to help them track their environmental performance.