HERA Corporate Carbon Footprint

On behalf of HERA

V1.0, 30 April 2020

Client:	**New Zealand Heavy Engineering Research Association Incorporated**
Title:	**HERA Carbon Footprint**
Report version:	V1.0
Report date:	30 April 2020

Cover photo © HERA

Document prepared by:

Christin Schaller
Sustainability Consultant
+64 4 8892 590
christin.schaller@thinkstep-anz.com

Quality assurance by:

Katharina Bauch
Team Lead - Sustainability
+64 4 889 2584
katharina.bauch@thinkstep.com

Contact

thinkstep Ltd

11 Rawhiti Road
Pukerua Bay
Wellington 5026
New Zealand

Certified B Corporation

Web www.thinkstep-anz.com

Email anz@thinkstep-anz.com

Phone +64 4 889 2520

Table of Contents

Executive Summary

New Zealand Heavy Engineering Research Association Incorporated (HERA) and its member organisations are mindful of the impact of carbon intensive products and services on climate change. HERA wants to walk the talk and seeks to understand its own emissions profile as well as to determine the investment required for carbon offsetting and certification.

In this project, a carbon footprint has been calculated for HERA for the 2019 financial year (1 July 18 – 30 June19). The carbon footprint covers all relevant direct (scope 1), indirect (scope 2) and supply chain (scope 3) emissions and has been calculated in line with the following standards:

- ISO 14064-1:2019 - Greenhouse gases Part 1
- Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard
- Greenhouse Gas Protocol - Corporate Value Chain (Scope 3) Accounting and Reporting Standard

The Greenhouse Gas Protocol (GHG Protocol) definitions of the different scopes of a corporate carbon footprint are provided in Table 1. Furthermore, the GHG Protocol divides scope 3 emissions into 15 distinct categories, of which 6 categories are applicable to HERA and included in this study. Further details on the categories and the relevance for HERA can be found in section 'Scope 3 Emissions'.

Table 1: Definition of scope 1, 2 and 3 emissions, based on the Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard

Emission Type	Definition
Scope 1	Direct emissions from sources owned or controlled by the company
Scope 2	Indirect emissions from purchased electricity
Scope 3	Indirect emissions from other sources

HERA operates one office (HERA house) and has a 100% subsidiary, the HERA Certification Ltd. Both are covered in the corporate carbon footprint, which is summarised in Table 2 and presented in Figure 1.The carbon footprint is presented in kilograms of CO_2 equivalent (kg CO_2e), grouped by scope with a category breakdown for scope 3. Excluded categories are marked as n/a.

Table 2: HERA Corporate Carbon Footprint

Scope and Source	GHG Emissions ($kg\ CO_2e$)	Contribution (%)
Scope 1	**11,708**	**6.5%**
Scope 2	**5,516**	**3.1%**
Scope 3	**163,379**	**90.5%**
Category 1 – Purchased goods & services	53,452	29.6%
Category 2 – Capital goods	n/a	n/a
Category 3 – Fuel- & energy- related activities	4,264	2.4%
Category 4 – Upstream transportation & distribution	n/a	n/a
Category 5 – Waste generated in operations	13,179	7.3%
Category 6 – Business travel	59,214	32.8%
Category 7 – Employee commuting	24,223	13.4%
Category 8 – Upstream leased assets	n/a	n/a
Category 9 – Downstream transport & distribution	n/a	n/a
Category 10 – Processing of sold products	n/a	n/a
Category 11 – Use of sold products	n/a	n/a
Category 12 – End-of-life treatment of sold products	n/a	n/a
Category 13 – Downstream leased assets	9,046	5.0%
Category 14 – Franchises	n/a	n/a
Category 15 – Investments	n/a	n/a
Total scope 1, 2 and 3	**180,603**	

The total carbon footprint across all emission sources is 180,603 kg CO_2e, with 11,708 kg CO_2e coming from direct emissions, 5,516 kg CO_2e from purchased electricity, and 163,379 kg CO_2e from supply chain emissions. It shows that over 90% of the carbon emissions arise from scope 3 activities, with roughly one third arising each from business travel and purchased goods and services. Significant scope 3 emissions (>7%) also arise from employee commuting and waste generation.

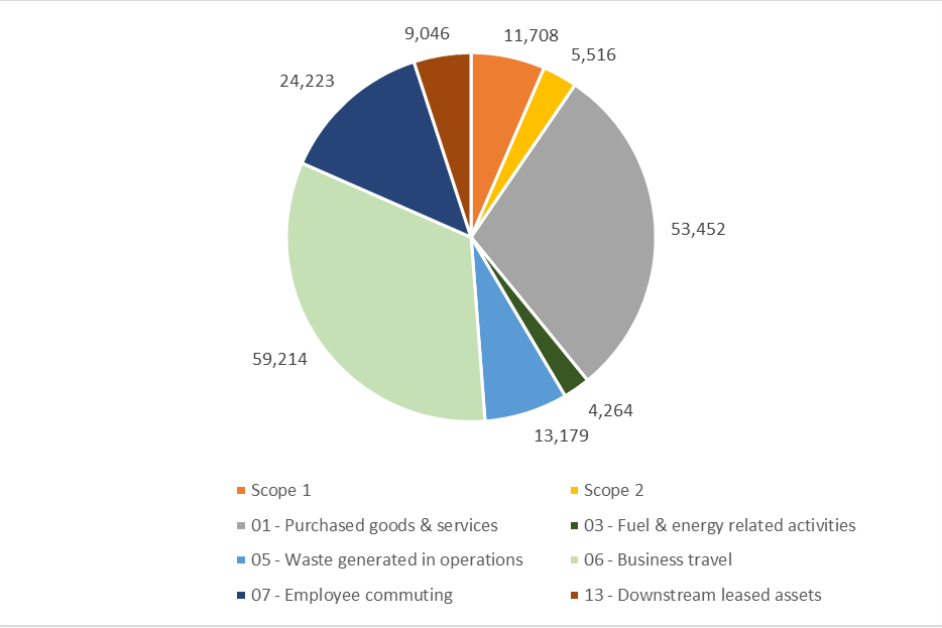

Figure 1: HERA Corporate Carbon Footprint (kg CO_2e)

Consumption and other activity data was provided by HERA or estimated based on the best information currently available. Emission factors were sourced from reports published by the New Zealand Ministry for the Environment (MfE, 2019), the UK Government's Department of Business, Energy and Industry Strategy and the Department for Environment, Food and Rural Affairs (BEIS/DEFRA, 2019) and the Motu Economic and Public Policy Research (Motu, 2014).

Further detail for each scope including methodology, assumptions and emission sources used for calculations are provided in the following sections and the MS Excel Inventory "HERA_Inventory_FY19".

Glossary and Abbreviations

Term	Definition
EF	Emission factor
FY19	HERA's Financial Year 2019 (1st July 2018 to 30th June 2019)
GHG Protocol	Greenhouse Gas Protocol
MfE	New Zealand Ministry for the Environment
WTT	Well-to-tank emissions, which are produced in the production and distribution of fuels/electricity

Scope 1 and 2 Emissions

Scope 1 Emissions

Emissions: 11,708 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 6.5%

The major contributor to scope 1 emissions is fuel consumption from company cars (99.5 %). Other contributions are from gases used for welding trainings (0.5%).

Definition

Direct greenhouse gas emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion of stationary or mobile fuel in owned or controlled machinery/vehicles; fugitive emissions or physical and chemical processing.

Methodology and Assumptions

Emissions included in scope 1 for HERA arise from fuel consumption of company cars and gases used in welding trainings. The welding gases only contain a small percentage of carbon dioxide (CO_2) and no other greenhouse gases. Therefore, the contribution for the carbon footprint is relatively low. HERA provided the volume for each gas and the density of carbon dioxide was applied to convert volumes into kg of gas. It was assumed that all the CO_2 will be released to air during the welding process.

Emissions from premium petrol consumption of the four company cars have been estimated based on fuel costs for the financial year 2019 (FY19). For the three company cars that are part of salary packages it is assumed that the private use is limited to the weekends with equivalent daily travel distances on all weekdays. Based on this assumption 71 % of the emissions from salary package cars are allocated to HERA's direct emissions. The emission factor used was derived from the New Zealand Ministry for the Environment's publication 'Measuring Emissions: A Guide for Organisations' which is based on data for the calendar year 2016 (MfE, 2019).

Scope 2 Emissions

Emissions: 5,516 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 3.1%

All emissions arise from purchased electricity.

Methodology and Assumptions

All electricity purchased by HERA was used in the HERA house. In FY19 HERA leased 31.7% of the HERA house to third parties, 68.3% was used by HERA. It was assumed that the electricity consumption in leased and non-leased areas of the HERA house are the same per square meter. Based on this assumption and in accordance with the GHG Protocol, 68.3 % of the electricity emissions of the HERA house were allocated to HERA's scope 2 emissions. The electricity emissions from the leased floor areas of the HERA house are included in category 13. thinkstep calculated electricity emissions using the relevant emission factor provided by the MfE (MfE, 2019).

Definition

Scope 2 emissions are indirect emissions from the generation of purchased electricity that is consumed in its owned or controlled equipment or operations.

Scope 3 Emissions

The GHG Protocol divides scope 3 emissions into 15 distinct categories, but not all of these categories are applicable to Hera. Six categories have been identified as applicable to HERA. Further details on the categories and the relevance for HERA are provided in Table 3 and in the following sections.

Table 3: Scope 3 categories, GHG Protocol - Corporate Value Chain (Scope 3) Accounting and Reporting Standard

Category	Description	Relevance for HERA
Category 1	Purchased goods and services	Relevant for HERA
Category 2	Capital Goods	Not relevant, since HERA has not purchased any capital goods in FY19
Category 3	Fuel & Energy Related Activities	Relevant for HERA
Category 4	Upstream transportation & distribution	Not relevant, since HERA does not produce any products
Category 5	Waste generated in operations	Relevant for HERA
Category 6	Business Travel	Relevant for HERA
Category 7	Employee Commuting	Relevant for HERA
Category 8	Upstream Leased assets	Not relevant for HERA, emissions from leased assets are deemed to be insignificant (e.g. coffee machine, water filter) or are included in category 1 (e.g. printer)
Category 9	Downstream transportation & distribution	Not relevant, since HERA does not produce any products
Category 10	Processing of sold products	Not relevant, since HERA does not produce any products
Category 11	Use of sold products	Not relevant, since HERA does not produce any products
Category 12	End-of-life treatment of sold products	Not relevant, since HERA does not produce any products
Category 13	Downstream leased assets	Relevant for HERA
Category 14	Franchises	Not relevant, since HERA did not own any franchises in FY19
Category 15	Investments	Not relevant, since HERA had no relevant investments in FY19

Category 1 – Purchased Goods and Services

Emissions: 53,452 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 29.6%

The major contributors to HERA's category 1 emissions are: Laptops, Monitor and other electronic material (12.5%), Printers (10.8%) Publications (9.4%) and consulting services (8.5%).

Definition

Category 1 includes the upstream (cradle-to-gate) emissions from all purchased goods and services not included in the other categories of upstream scope 3 emissions (i.e., category 2 through category 8).

Methodology and Assumptions

The carbon emissions for purchased goods and services were calculated using the spend-based method. This means the economic value of goods and services are multiplied with relevant secondary emission factors. Any expenditures for activities that are covered by a different GHG scope 3 category (e.g. flights under 'Category 6 – Business Travel'), was excluded from category 1 calculations to avoid double counting.

Based on HERA's procurement data, all goods and services purchased in FY19 have been split into 31 sub-categories with each sub-category assigned an emission factor per dollar spent (CO_2e/$). Through this method, 95% of HERA's expenditures for purchased goods and services could be assigned an emission factor, with the remaining 5% (city rates) being calculated by scaling up the modelled emissions, to cover 100%.

Since HERA operates in New Zealand, it is assumed purchased goods and services are mainly from New Zealand sources. Therefore, the database from 'Motu Economic and Public Policy Research' was used as the source for the emission factors (Motu, 2014). For some of HERA's sub-categories no exact emission factor match was available in the Motu source, in that case a more conservative emission factor was applied e.g. the Motu paper emission factor was used for stationary.

Category 3 – Fuel- and energy- related activities (not included in scope 1 or 2)

Emissions: 4,264 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 2.4%

Definition

Category 3 emissions are related to the production of fuels and energy purchased and consumed by the reporting company in the reporting year that are not included in scope 1 or scope 2. Typically referred to as cradle-to-gate or well-to-tank (WTT) emissions.

Methodology and Assumptions

Category 3 emissions include:

a) emissions generated by the extraction, refining and transportation of purchased fuels (cradle-to-gate or well-to-tank (WTT) emissions),
b) emissions generated by the extraction, production, and transportation of fuels consumed in the generation of purchased electricity, and
c) transmission and distribution losses of purchased energy (electricity or natural gas) that is consumed (i.e., lost) in a transmission and distribution system.

Transmission and Distribution losses for electricity consumed by HERA were calculated using the appropriate MfE emission factor (MfE, 2019). MfE does not include emission factors for the production emissions of purchased electricity or fuels.

Therefore, these emissions have been calculated using emission factors from the UK Government's Department of Business, Energy and Industry Strategy and the Department for Environment, Food and Rural Affairs (BEIS/DEFRA, 2019). This source provides a New Zealand specific emission factor for electricity generation and an UK factor for WWT emission factors for transport fuels.

WWT emissions from business travel and employee commuting are included in category 6 and category 7.

Category 5 – Waste generated in operations

Emissions: 13,179 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 7.3%

The major contributor to category 5 emissions is general waste (94.8%). Minor contributions arise from paper waste and wastewater (5.2%).

Definition

Category 5 includes emissions from third-party disposal and treatment of waste generated in the reporting company's owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater.

Methodology and Assumptions

Category 5 emissions were calculated by multiplying the amount of waste (in kg) generated with the respective emission factor. Paper and general waste were the waste types generated by HERA in FY19. Waste amounts were estimated based on the size of the waste container, pickup cycles and average filling level of waste containers. A density factor from MfE was applied to convert paper and waste volumes into mass (kgs).

As for scope 2, it was assumed that same waste amounts per square meter were generated in leased and non-leased areas of the HERA house. Based on this assumption and in accordance with the GHG Protocol, 68.3 % of the emissions from waste generated in the HERA house were allocated to HERA's category 5 emissions. The remaining 31.7% of waste emissions from leased assets are included in category 13.

It is assumed that general was sent to a landfill without gas recovery, as a conservative approach, so emissions were calculated by using the adequate MfE emission factor (MfE, 2019). For paper waste a recycling emission factor from BEIS/DEFRA was used (BEIS/DEFRA, 2019). Wastewater emissions were considered by applying the MfE emission factor for annual domestic wastewater per capita to the 13 HERA employees (MfE, 2019).

In addition to waste treatment emissions, waste transport emissions were calculated for general and paper waste based on an estimated transport distance of 10km.

No data was available to calculate emissions from garden and food waste sent to composting and therefore no composting emission were not included in this category. Due to HERA's nature of business, the number of employees and the MfE emission factor for composting it can be assumed that emissions from garden and food waste sources are minor.

Category 6 – Business Travel

Emissions: 59,214 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 32.8%

The major contributor to category 6 emissions is air travel (82.2%). Other contributions arise from private cars (11.9%), accommodation (5.0%) and 'other business travel' (1.0%).

Definition

Category 6 includes emissions from the transportation of employees for business related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and passenger cars.

Methodology and Assumptions

Category 6 emissions for HERA can be split into four sub-categories: air travel, private car travel (e.g. employee owned), accommodation and other business travel. Other business travel include travel with taxis/ Uber, rental cars, ferries and motorbikes. In addition, business travel from board members have been separately estimated by HERA and account for 13% of total category 6 emissions.

Emissions for business travel (except accommodation) can be split into a) combustion emissions from the consumption of fuel and b) WTT emissions related to the extraction, refining and transportation of the fuel.

a) Air travel emissions are based on kilometre travelled. Flight distances were calculated from origin and destination cities provided by HERA for all flights in FY19, by using Air New Zealand's FlyNeutral Calculator (Air New Zealand, 2020). MfE emission factors for domestic and international flights without radiative forcing multiplier were used to calculate the emissions. The radiative forcing multiplier account for the wider climate effects of aviation including water vapour and indirect GHGs. According to MfE this is an area of active research which is yet to be agreed. HERA provided an estimation of distance travelled in private cars, ferries and motorbikes as well as the dollar spend values for taxis/ Uber and rental cars. Appropriate conversion and emission factors were sourced from MfE (MfE, 2019).
b) Emissions related to the extraction, refining and transportation of the fuel used in each transport mode are based on the same activity data as described under a). The appropriate emission factor sourced from BEIS/DEFRA has been applied (BEIS/DEFRA, 2019).

Accommodation emissions are calculated by multiplying the number of nights stayed in a hotel by an emission factor based on the location of the hotel from MfE.

Category 7 – Employee Commuting

Emissions: 24,223 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 13.4%

The major contributor to category 7 emissions is commuting with a single-occupancy car (80.4%). Followed by public transport (16.0%) and motorbike (3.6%).

Definition

Category 7 includes emissions from the transportation of employees between their homes and their worksites, including telecommuting.

Methodology and Assumptions

As for category 6, emissions from employee commuting can be split into a) combustion emissions from the consumption of fuel and b) WTT emissions related to the extraction, refining and transportation of the fuel.

a) Employee commuting data was derived from a survey conducted by HERA for FY19. The answers included the distance travelled and mode of travel used by each of the ten relevant employees. Commuting emissions from employees with a salary package car were not considered in this category since corresponding emissions are covered under scope 1.
   Commuting travel modes considered in category 7 are single-occupancy car, public transport (bus) and motorbike. Commuting emissions were calculated by multiplying the distance travelled with the relevant emission factors from MfE.
b) Emissions related to the extraction, refining and transportation of the fuel used in each transport mode are based on the km travelled and the relevant WTT emission factors derived from BEIS/DEFRA (BEIS/DEFRA, 2019).

Category 13 – Downstream leased assets

Emissions: 9,046 kg CO_2e

Percentage of total (scope 1, 2 and 3) emissions: 5.0%

The major contributor to category 13 emissions is general waste (64.1%). Followed by purchased electricity (35.6%) and paper waste (0.3%).

Definition

Category 13 includes emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in scope 1 or scope 2. This category is applicable to lessors (i.e., companies that receive payments from lessees). Companies that operate leased assets (i.e., lessees) should refer to category 8 – Upstream leased assets.

Methodology and Assumptions

In FY19 HERA leased 31.7% of the HERA house to third parties. It was assumed that the electricity consumption as well as the waste generated in leased and non-leased areas of the HERA house are the same per square meter. In accordance with the GHG Protocol, 31.7 % of the electricity and waste emissions of the HERA house were therefore included in this category.

The electricity emissions calculated include emissions related to the consumption of purchased electricity (scope 2) as well transmission and distribution losses and production emissions of the purchased electricity (as described in category 5 - Methodology and Assumptions).

Therefore, these emissions have been calculated using emission factors from the UK Government's Department of Business, Energy and Industry Strategy and the Department for Environment, Food and Rural Affairs (BEIS/DEFRA, 2019). This source provides a New Zealand specific emission factor for electricity generation and an UK factor for WWT emission factors for transport fuels.

In addition, emissions from general and paper waste treatment and transport are included in category 13. The emissions were calculated, as described in category 5 - Methodology and Assumptions. It is assumed that general was sent to a landfill without gas recovery, as a conservative approach, so emissions were calculated by using the adequate MfE emission factor (MfE, 2019). For paper waste a recycling emission factor from BEIS/DEFRA was used (BEIS/DEFRA, 2019). Waste transport emissions were calculated based on an estimated transport distance of 10km.

Conclusions and Recommendations

HERA's carbon inventory is dominated by scope 3 emissions, which account for over 90% of all emissions. Roughly one third arising each from business travel and purchased goods and services. Other significant contributors to scope 3 emissions are employee commuting and waste generation.

Scope 1 and 2 emissions from fuels, welding gases and electricity use are relatively certain for Hera, and the emission factors are widely understood. Scope 3 emissions have considerably more uncertainty than those in scopes 1 and 2, and for some categories the necessary data was not available in the preferred form or completeness, and estimations and assumptions were applied. To improve the accuracy of the carbon footprint and the availability of data for future years emissions calculations we recommend the following:

Scope 1

- Assess fuel used in company cars (preferred) or distance travelled (e.g. from odometer)
- Improve the assumptions of private care use for salary package cars

Scope 3

- Category 5 – Waste generated in operations
    - Obtain more information about the landfill type (with gas recovery or not) and location
    - Estimate filling levels of containers or bins
    - Identify the HERA specific density of waste types e.g. through a waste audit
- Category 6 – Business travel
    - Commence data collection for business travel, incl. distance travelled and travel mode, where possible fuel type and quantity e.g. from airlines
- Category 7 – Employee commuting
    - Sense check results of employee commuting survey
- Category 13 – Downstream leased assets
    - Confirm assumption that electricity consumed and waste generated in leased areas of the HERA house is similar to the area used by HERA

References

Air New Zealand, 2020. *FlyNeutral Calculator.* [Online]
Available at: https://www.airnewzealand.co.nz/loyaltymodule/form/carbon-emissions-offset
[Accessed 06 March 2020].

BEIS/DEFRA, 2019. *Greenhouse gas reporting: conversion factors 2019,* s.l.: Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs.

ISO, n.d. *ISO 14064-1:2019 Greenhouse gases - Part 1 ,* s.l.: s.n.

MfE, 2019. *Measuring Emissions: A Guide for Organisations,* s.l.: New Zealand Government – Ministry for the Environment.

Motu, 2014. *Consumption-based greenhouse gas emissions input-output model,* s.l.: Motu Economic and Public Policy Research.

World Business Council for Sustainable Development/ World Resources Institute, 2011. *Greenhouse Gas Protocol - Corporate Value Chain (Scope 3) Standard,* s.l.: s.n.

World Business Council for Sustainable Development/ World Resources Institute, 2015. *Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard,* s.l.: s.n.