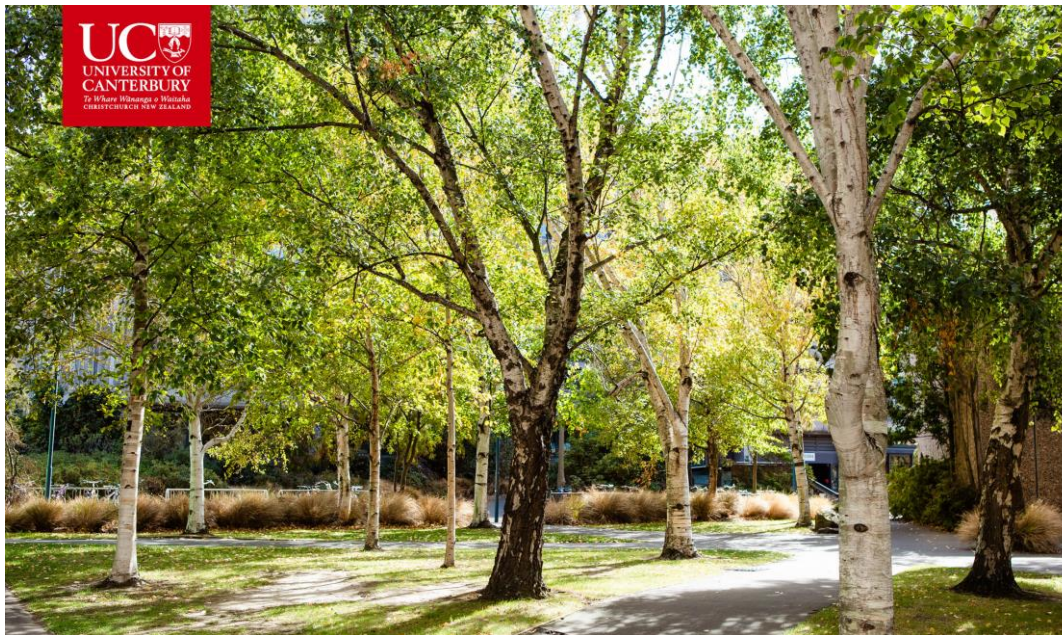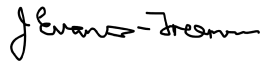# Emissions Management and Reduction Plan

Emissions Management and Reduction Plan

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Prepared by	Tony Sellin, Energy & Carbon Manager	
Version approved by	Professor Jan Evans-Freeman Pro Vice Chancellor Sustainability	
	Paul O'Flaherty Executive Director – People, Culture & Campus Life	
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	n/a	15 Feb 2021	n/a
	1.0 (this version)	18 Oct 2023	Alignment with UC template and formatting, updated roles, and general UC context.

Contents

Introduction

This report is the greenhouse gas (GHG) Emissions Management and Reduction Plan prepared for University of Canterbury and forms the managed step part of the organisation's application for CarbonZero Programme certification.[1] [2]

Rationale

The University recognises the potential challenges posed by climate change and, through its own teaching, research and operational environment, seeks to promote and encourage sustainable best-practice, both from the campus collective and the individual student or staff member.

In order to 'measure and manage' the impact of the business and its practices on the environment, optimise and improve efficiency of the built environment plant and equipment, the University's Energy & Carbon Manager undertakes emissions measurement. The Carbon and Utilities Report (Contains: Electricity; Coal; Vehicle Fuel; Air Travel - also contains Campus domestic and irrigation water consumption) is presented to the Vice-Chancellor and the University's Senior Leadership Team in order to provide on-going comparison consumption; carbon performance and cost metrics and graphs/charts. An annual sustainability report is presented to the Senior Leadership Team and the University Council.

The University has a Pro-Vice-Chancellor Sustainability, who heads a Sustainability Hub with two staff. The Hub is responsible for leading the Sustainability chapter of the University Strategy. In addition, a Sustainability Office exists within Facilities Management with 3.8 FTE led by the Sustainability Manager. Its responsibilities include the coordination of sustainable practice and policy on campus. UC is committed to pursuing equitable environmental sustainability in all its activities. Information about Sustainability on campus can be viewed at: http://www.sustain.canterbury.ac.nz/aboutoffice.html

For the last 10 years UC has measured, verified and managed its GHG emissions. In the past few years TEFMA (Tertiary Education Facilities Management Association) had broadened the annual benchmark survey Environmental Performance Report to incorporate carbon data. Equally, with the increasing global concern and focus on climate issues and use of Emissions Trading Schemes, national carbon reduction commitments and targets becoming more widely adopted, it is imperative to adopt a more formalised and structured approach to GHG emissions measurement at UC.

Senior Leadership commitment

Senior Leadership commitment and buy-in to the CEMARS (now Carbon Reduce) process was originally agreed and secured in 2010 by the then Vice-Chancellor Dr Rod Carr, championed by Professor Sue McKnight, Pro Vice-Chancellor Learning Resources; Tony Sellin, Energy and Carbon Manager; and Dr Matt Morris, Sustainability Manager. The Landcare Research CarboNZero Team (now Toitū Envirocare) presented to the group also including the then DVC – Professor Ian Town; PVC College of Science – Professor Paul Fleming; College of Engineering, and School of Forestry - Associate Professor Euan Mason. It was agreed that the UC Energy and Carbon Manager would manage the annual process to coordinate data, calculate and submit the Emissions Inventory Return and host the external auditors to satisfy verification scope and criteria and achieve conformance.

The Senior Leadership commitment has continued, supported and bolstered by Professor Cheryl de le Rey, Vice-Chancellor, Professor Jan Evans-Freeman, Pro-Vice-Chancellor Sustainability, and Paul O'Flaherty, Executive Director People, Culture and Campus, the University having committed to a Low Carbon Energy Roadmap Strategy and a target of Net Zero Carbon by 2030.

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[1] Throughout this document 'emissions' means 'GHG emissions'.

[2] Programme means the Toitū carbonreduce and Toitū carbonzero certification programme.

Person responsible

The person with the overall responsibility for emission reductions by the University is the Pro-Vice-Chancellor Sustainability, with operational responsibility held by Tony Sellin, Energy and Carbon Manager. All Asset Operations services matters are agreed and delivered through Keith Lilley, Director of Facilities Management, reporting to the Senior Leadership Team through Paul O'Flaherty. In addition, a Carbon Sequestration Steering Group within Facilities Management meets to ensure all options are canvassed and provides recommendations to the Pro-Vice-Chancellor Sustainability through the Sustainability Programme Board.

Awareness raising and training

Awareness raising and training are undertaken by the Energy and Carbon Manager and Dr. Matt Morris, Sustainability Manager, assisted by the Chloe Sutton, Sustainability Engagement Coordinator.

Emissions reduction, among a number of sustainability goals/targets, is identified and driven by the UC Sustainability Policy and the Sustainability Plan. The policy identifies the principal sustainability goal that the UC will strive to improve its own environmental impact and contribute toward the national target under the Paris Agreement to reduce greenhouse gas emissions to 30% below 2005 levels by 2030. Equally, the policy articulates actions to:

1. ensure that UC research contributes to resolving global sustainability challenges;

2. weave opportunities for students to learn and contribute to resolving the Sustainable Development Goals through UC teaching;

3. measurably and substantially improve the environmental sustainability of UC;

4. establish a Carbon Neutrality Initiative that will ensure that UC will be carbon net neutral by 2030; and

5. grow and leverage our local, national, and global sustainability networks to bring new thinking to our challenges and to share our practice.

The University's Facilities Management team undertake capital and operational projects with low energy and sustainable practices as key elements of our philosophy for design of the built-environment. These best practice and ESD (Environmentally Sustainable Design) principles are detailed in UCS Design Standard Guidelines and have been communicated to architectural and engineering services consultants engaged by UC to provide their professional services. In the past 10 years there has been an unprecedented level of construction work undertaken in terms of earthquake remediation and major new building projects. This project work is designed to provide optimum and optimised facilities for teaching, research, and staff accommodation, considering and combining holistic life cycle costing and asset management practices.
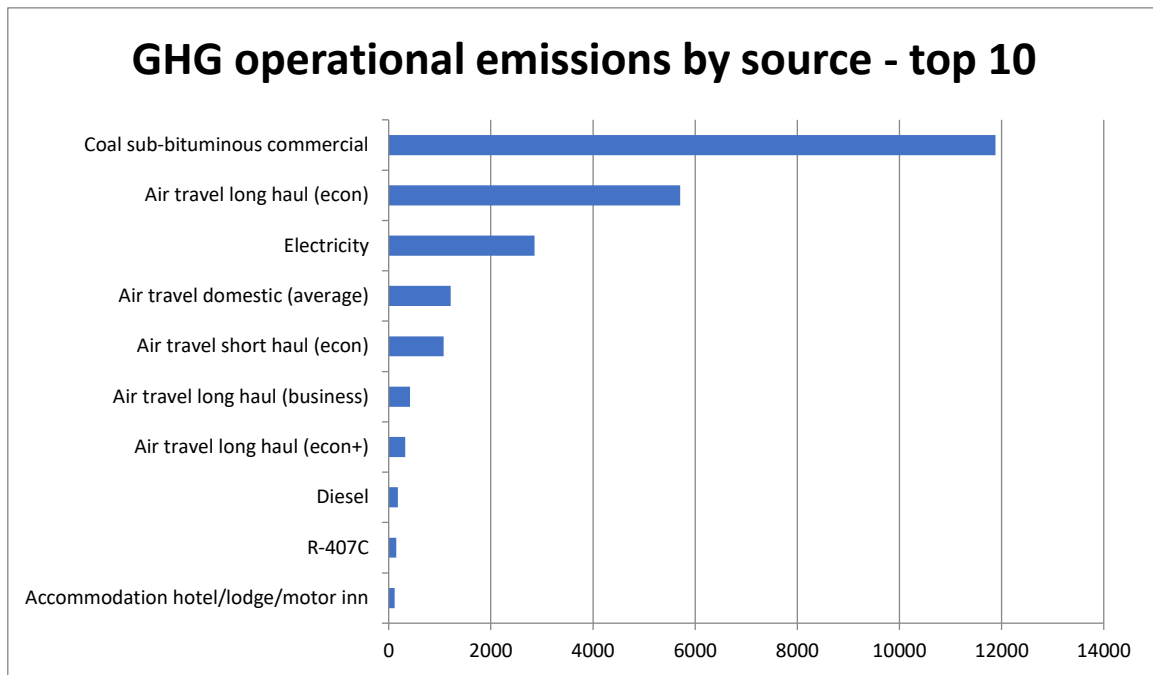
Significant emissions sources

Figure 1: GHG emissions by source.

The University's main Sources of carbon emissions are:

- **Coal** – Scope 1 Direct Emission – combustion of coal for space heating and domestic hot water, controlled by the University and can be influenced by better control and more efficient built environment space design. Baseline controlled performance is compared with 'Heating Degree Days'.

- **Public Transport Air Travel** (Domestic and long haul) Scope 3 Indirect Emission – as a consequence of a university function: research, teaching, study and conference research activity. Demand controlled by the University and can be influenced by increased awareness and provision of increased facilities providing alternative methods to connect communicate and conference in collaborative digital workspaces.

- **Electricity** – Scope 2 Indirect Emission - Purchased electricity for lighting and power - demand controlled by UC. Baseline against targets will be set, 'Baselined and Benchmarked buildings' with prioritised targeting of the lesser performers.

- **Diesel and Petrol** – Scope 1 Direct Emission – as a consequence of university function: Vehicle fuel for research and teaching study trips, grounds maintenance machinery and emergency electricity generation. Demand controlled by UC and can be influenced, with the exception of the latter operational fuel demands.

- ***Refrigerant leakage** – Scope 1 Direct Emission - Improved Asset Register records accumulating, identifying specific quantities of refrigerant gases and top-ups that may be required when maintained. Installation and demand for use controlled by UC.

From *Figure 1* it can be seen that coal and air travel are the largest components of the University's total GHG emissions inventory, respectively providing space-heating to the built-environment on campus or enabling domestic, short-haul and long-haul travel for teaching and research. The University has a Low Carbon Energy Roadmap Strategy which has two major projects underway: the Ilam Boiler Project (which will remove two coal fired boilers replaced by a Biomass boiler and new controls), and the Ilam Campus Building Ground Source Heat Pump (GSHP) Conversion project. The boiler replacement will remove around 9,000 tonnes CO_2-e from UC's emissions inventory. The GSHP conversion project initially requires improvement to the thermal envelopes of 32 buildings, boosting performance and efficiency, also reducing load on the boiler-plant. Eventually UC will completely remove combustion heat-plant, replacing entirely with renewable technology in the form of electricity and GSHP's. Both projects will similarly improve energy efficiency and carbon reduction.

Projects for emissions reduction

The organisation is committed to managing and reducing its emissions in accordance with the Programme requirements. The University's emissions reduction targets have been informed by the 'CEMARS/Carbon Reduce' inventories since the 2010 base year. The Low Carbon Energy feasibility study and Roadmap strategy specifically identified in collaboration between general/academic staff and developed using consultants, along with support and input from the student cohort. The VC has also provided specific direction out of the Academic Strategic Framework to develop UC Sustainability Strategic Goals. The strategic goals objectives and outcomes identify a holistic approach with 'specific actions' to enhance sustainability and sustainable development in teaching and research, alongside the establishment of a net carbon neutrality initiative by 2030 using the Low Carbon Roadmap Strategy projects combined with emissions reduction objectives associated with organisational operations (air travel, UC vehicles, and electricity consumption). Equally, recognising of the relative contributory aspects of UCs School of Forestry Academic expertise, high country forestry, and GHG Inventory, the University is investigating carbon offsetting and insetting, and sequestration options to meet needs approaching 2030, along with promotion of real-world teaching and research opportunities.

Specific projects have been evaluated to achieve our targets. These are detailed below.

The first two projects are implementation projects identified initially in the LCES Feasibility Study and subsequently confirmed by the LCES Roadmap Strategy. The particular focus of the study and strategy was to identify and analyse the Life-cycle costs and benefits of decarbonising the campuses, considering:

- both legacy buildings and new building teaching and research facility projects (post-earthquake Campus Masterplan); and
- the capacity and age of plant/equipment and alternative fuels along with relative security of supply.

The projects identified will firstly remove coal from the campus and eventually then remove combustion as major source of heat, replacing the proposed biomass boilers with electrically generated heat using ground source heat pumps.

The third project will address air travel and encourage reduction. UC will research impacts of air travel to inform choice, provide easy to use communication in the form of collaborative digital workspaces and 'no travel' conference alternatives.

The remaining projects, more 'business as usual' objectives resulting in replacement of fossil fuel with renewable electricity/ biofuel, areoptimising asset maintenance or replacement and more effective benchmarking to aid applied energy and carbon management incrementally through 'continuous commissioning'.

Table1: Projects to reduce emissions

Objective	Actions	Responsibility	Completion date
Reduce Coal combustion	Install Biomass boiler at Ilam to replace Coal boilers. Implementation project identified by Low Carbon Energy Scheme (LCES) Roadmap Strategy and detailed in UC Sustainability Strategic Goal 3.	Facilities Management (FM)	20/12/2023
	Install Biomass boiler at Dovedale to replace Coal boilers. Implementation project identified by Low Carbon Energy Scheme (LCES) Roadmap Strategy and detailed in UC Sustainability Strategic Goal 3.	Facilities Management (FM)	31/12/2025

Objective	Actions	Responsibility	Completion date
Ilam Campus Ground Source Heat Pump Project	Assess and improve thermal performance of 32 buildings. Group buildings into hubs and replace Medium Temperature Hot Water (MTHW) heating with Ground source Heat Pumps.	Facilities Management	31/12/2035
Reduce Air Travel	Reduce Air travel emissions by reducing long haul air travel Identified in UC Sustainability Strategic Goal 3.	PVC Sustainability	Ongoing
Reduce use of Diesel and Petrol	Replace fossil fuelled Fleet vehicles with EV's. Use or increase Biofuel in diesel vehicles, plant, and equipment.	FM Support Services Manager; Energy & Carbon Manager, and Sustainability Manager	Ongoing / Dec-24
Reduce Refrigerant liability	Reduce holdings and losses associated with Refrigerant by a combination of: Specifying new or replacement refrigeration plant & equipment replacement with lower GWP gases and optimising maintenance.	Energy & Carbon Manager; Maintenance Manager; and Asset Maintenance Supervisor	Ongoing / Dec-24
Monitoring and Targeting	Baseline, benchmark, and reduce energy use in buildings.	Energy & Carbon Manager and Building Controls Specialist	Ongoing / Dec-24

Table 2 highlights emission sources that contributed to poor data quality and describes the actions that will be taken to improve the data quality in future inventories.

Table 2: Projects to improve data quality

Emissions source	Actions to improve data quality	Responsibility	Completion date
Refrigerants	Liaise with contractors to identify ensure continued improvement of Asset Record - data accuracy on variety and mass of gas replaced in refrigeration plant and equipment.	Asset Maintenance Supervisor	Dec-24
Carbon excluded from Carbon Reduce Inventory for Electricity consumed by Contractors in large capital work projects.	Identify process to ensure metering available to identify electricity consumed by capital work projects.	Energy & Cabon Manager and Building Controls Specialist	Dec-24

The emissions inventory identified various emissions liabilities. Table 3details the actions that will be taken to prevent GHG emissions from these potential emissions sources.

Table 3: Projects to prevent emissions and reduce liabilities

Emissions source	Actions to reduce liabilities	Responsibility	Completion date
Refrigerants	Continue with scheduled contract maintenance of air conditioning and refrigeration plant and equipment to minimise the risk of refrigerant loss	Asset Maintenance Supervisor	On-going

Unintended environmental impacts

The University accepts and abides by its statutory, regional, professional, and moral obligations ensuring that works or operations on and off campus are planned and undertaken with forethought and provision of coordinated guidelines and specification documentation to eliminate or suitably limit potential environmental impact. Therefore, it is considered that there should not be any relevant unintended environmental impacts.

Key performance indicators

Table 44: GHG emissions per KPI

KPI	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total gross GHG emissions per Turnover/revenue ($Millions)	122.86	95.12	91.83	84.70	88.54	84.56	75.23	77.34	82.08	64.45
Total mandatory GHG emissions per Turnover/revenue ($Millions)	122.86	95.10	91.80	84.66	88.46	84.47	75.14	77.25	81.78	64.14

In order to meaningfully present data to UC's internal and external stakeholders and other interested parties, particularly bearing in mind how extreme events (eg GFC, earthquakes, pandemic) on the global scene can rapidly and significantly influence the UC's customer base and potential income stream, there are a number of KPI metrics which are used to render fair opportunities for objective comparison.

Monitoring and reporting

The GHG emissions will be monitored by the Energy and Carbon Manager and reported through the Pro-Vice-Chancellor Sustainability to SLT The reductions will be reported in terms of absolute emissions and also expressed in KPI metrics of: UC Revenue; EFTS (Equivalent Full Time Students), and GFA (Gross Floor Area) to provide flexibility in objective review.

Emissions reduction calculations

Table 5: GHG inventory results

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Scope 1	16,917.85	13,417.71	12,381.71	11,107.32	11,839.00	11,163.54	10,861.62	11,321.53	13,433.15	12,502.58
Scope 2	3,744.00	3,041.67	4,461.37	3,688.64	3,522.29	3,821.07	3,072.24	3,465.66	3,059.47	2,854.95
Scope 3 Mandatory	10,970.37	7,722.06	6,803.90	6,681.26	7,406.41	7,722.38	7,477.79	8,286.69	9,720.07	8,930.41
Scope 3 Additional	0.00	6.42	6.78	9.58	19.54	23.12	24.86	25.76	97.27	114.88
Scope 3 One time	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total gross emissions	31,632.21	24,187.87	23,653.76	21,486.80	22,787.25	22,730.10	21,436.52	23,099.64	26,309.97	24,402.83
Reporting reductions										
5-year average (tCO$_2$e)	31,632.21	27,910.04	26,491.28	25,240.16	24,749.58	22,969.16	22,418.89	22,308.06	23,272.70	23,595.81
5-year average (tCO$_2$e) (scope 1 & 2)	20,661.84	18,560.61	17,988.10	17,190.07	16,824.31	15,688.87	15,183.76	14,772.58	15,111.92	15,111.16
Emissions intensity reductions										
Turnover/revenue ($Millions)	257.46	254.28	257.59	253.68	257.37	268.81	284.96	298.69	320.53	378.65
GDP deflator values Yr1 prices (assumed)										
Adjusted turnover ($M)										
Emissions intensity (tCO$_2$e/$M)	122.86	95.12	91.83	84.70	88.54	84.56	75.23	77.34	82.08	64.45
5-year average emissions intensity (tCO$_2$e/$M)	122.86	108.99	103.27	98.63	96.61	88.95	84.97	82.07	81.55	76.73
Percentage change in absolute emissions	(no data)	-23.53	-2.21	-9.16	6.05	-0.25	-5.69	7.76	13.90	-7.25
Percentage change in emissions intensity	(no data)	-22.58	-3.46	-7.76	4.53	-4.50	-11.04	2.80	6.14	-21.49

Performance against plan

The University originally set 2010 base year targets in accordance with the then government target under the Kyoto Accord reducing GHG emissions by between 10-20% by 2020. UC achieved 23% reduction in absolute emissions by the end of reporting year 2019, which has exceeded the higher end of the original target reduction.

UC's future focus has sustainability woven throughout its strategic goals for teaching and research, the Campus Built environment and general operation which will result in measurable improvement across the board over the decade resulting in Net Carbon Neutral by 2030.

KPI measure	Base Year 2010 Quantity	Base Year 2010 tCO_2e/KPI measure	Year 3 2013 Quantity	Year 3 2013 tCO_2e/KPI measure	Year 6 2016 Quantity	Year 6 2016 tCO_2e/KPI measure	Year 9 2019 Quantity	Year 9 2019 tCO_2e/KPI measure
Number of Equivalent Full Time Student (EFTS)	15,674.00	2.02	12,180.00	1.76	12,492.00	1.72	14,891.00	1.64
Number of Full-time Equivalent Academic Staff (FTE)	784.00	40.35	740.00	29.04	715.00	29.98	826.00	29.49
Number of m^2 in Campus Occupied Space GFA	271152.00	0.1167	223758.00	0.0960	221366.00	0.0968	253,973.00	0.0959
Number of Full-time Equivalent General Staff (FTE)	1309.00	24.17	1,166.00	18.43	1,162.00	18.45	1,162.00	20.97
Government grant	117,236.00	0.27	126,996.00	0.17	132,665.00	0.16	165,126.00	0.15
Tuition fees	90,406.00	0.35	75,849.00	0.28	92,520.00	0.23	137,579.00	0.18
Research funding	49,820.00	0.63	50,848.00	0.42	59,775.00	0.36	68,100.00	0.36
Revenue / Turnover (000's)	257,462.00	0.12	253,693.00	0.08	284,960.00	0.075	370,805.00	0.066
Revenue / Turnover ($million)	257.46	122.86	253.69	84.70	284.96	75.23	370.81	65.69