"It is not enough to do your best; you must know what to do, and then do your best"
W. Edward Deming

2023

Axosomatic | Organizational Sustainable Intelligence

GHG Inventory Report
2020 - 2021 and 2021 - 2022

Calculated and Prepared by
Axosomatic

For
Ajman University

www.axosomatic.com

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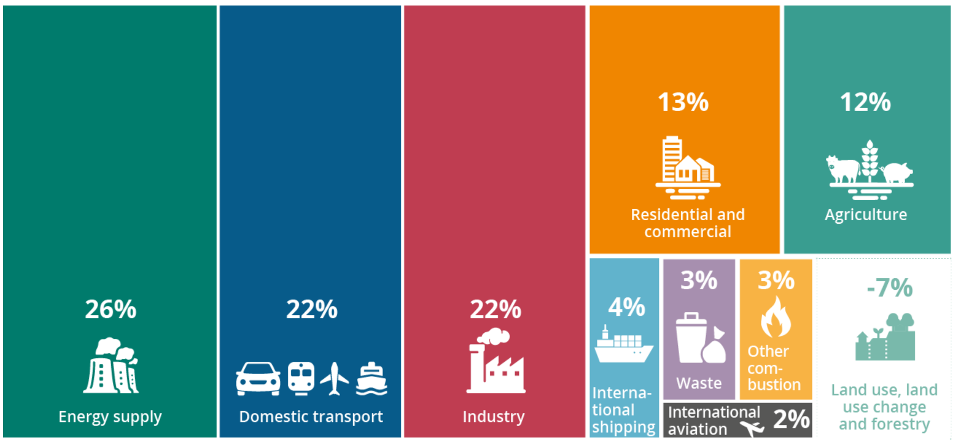

Sources of Greenhouse Gases (GHG) Emissions

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BEIS	Department for Business, Energy, and Industrial Strategy
BSI	British Standards Institute
CDP	Carbon Disclosure Project
CO_2e	carbon dioxide equivalent
EPA	Environmental Protection Agency
EV	electric vehicles
GHG	greenhouse gases
GJ	gigajoule
GRI	Global Reporting Initiative
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kg	kilogram
km	kilometer
LPG	liquefied petroleum gas
m^2	square meters
m^3	cubic meters
MW	megawatt
MWh	megawatt-hour
PKM	passenger-kilometer
SBT	science-based target
SBTi	Science-Based Target initiative
t	metric ton
tCO_2e	metric ton carbon dioxide equivalent
T&D	transmission and distribution
UAE	United Arab Emirates
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

1. OVERVIEW OF GHG EMISSIONS[1]

The GHG emissions consist of gases that trap heat in the atmosphere and contribute to the warming of the Earth's surface, causing climate change. The most common gases monitored are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (HFCs, OFCs, and SF_6).

Carbon dioxide enters the atmosphere through burning fossil fuels, solid waste, trees, and other biological materials and certain chemical reactions, and is removed from the atmosphere when it is absorbed by plants as part of the biological carbon cycle.

Methane is emitted during the production and transport of coal, natural gas, and oil, as a result from livestock and other agricultural practices, land use, and by the decay of organic waste in municipal solid waste landfills.

Nitrous oxide is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.

Fluorinated gases are synthetic greenhouse gases that are emitted from a variety of household, commercial, and industrial applications, and processes. The sources of fluorinated gases are:

1. HFCs gas is used in refrigeration and air conditioning systems, foam insulation, aerosols, fire protection, and solvents.
2. PFCs gas is used in semiconductor manufacturing, aluminium production; production of certain consumer products such as non-stick cookware, stain-resistant textiles, and fire-fighting foam; refrigeration and air-conditioning system.
3. SF_6 is used in magnesium and aluminium production.

1.1 Scope 1: Direct GHG Emissions

Scope 1 emissions are direct GHG emissions that occur from sources controlled or owned by an organization, such as emissions associated with fuel combustion in boilers, furnaces, vehicles, chemical production, or during research processes.

1.2 Scope 2: Indirect GHG Emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary. Scope 2 emissions physically occur at the facility where electricity is generated. In another words, the consumption of electricity and water by an organization constitutes scope 2 indirect GHG emission.

1.3 Scope 3: Indirect GHG Emissions

Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. It is the consequence of the activities of the company but occurs from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services, business travel, and employee commuting to and from the organization's premises.

[1] Overview of Greenhouse Gases | US EPA

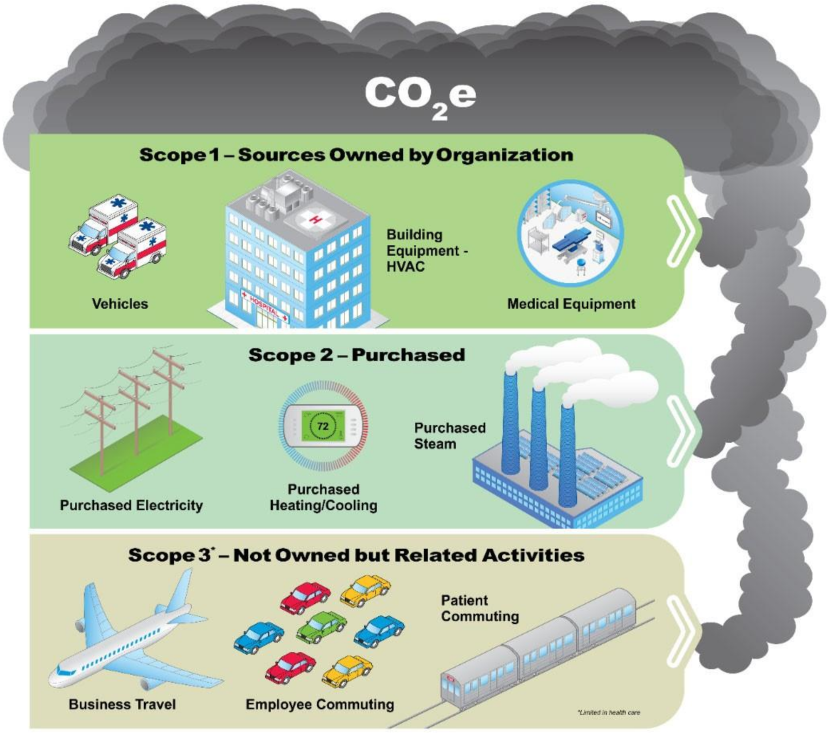

Figure 2.Illustration of CO_2e sources. Source US EPA.

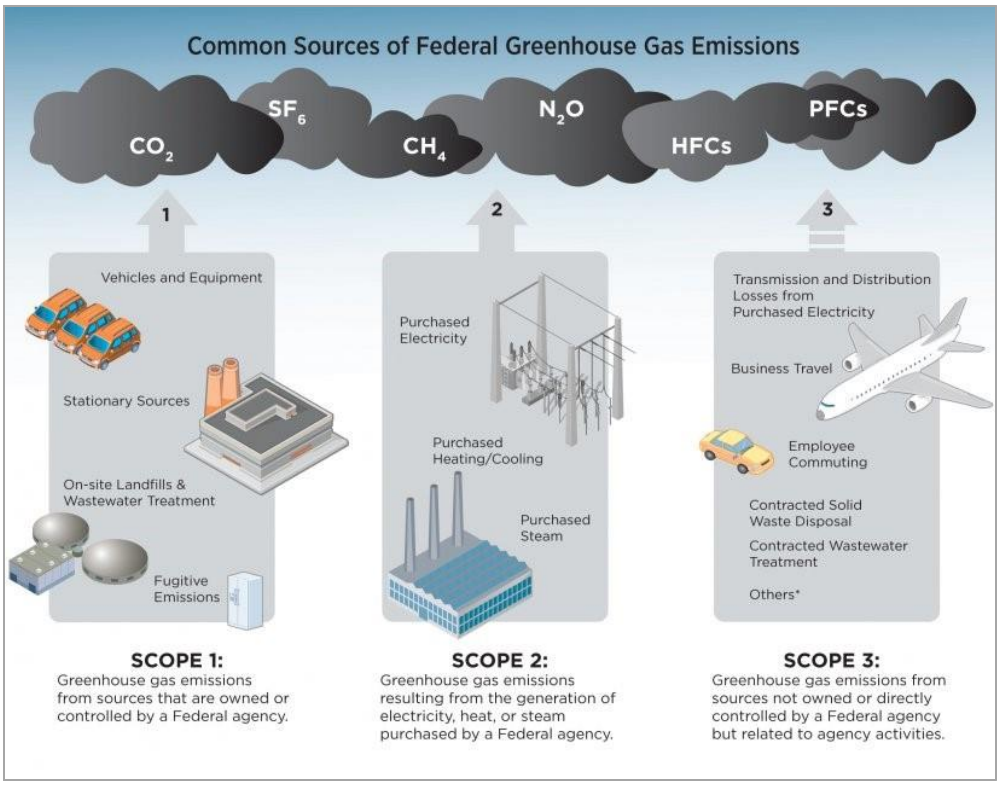

Figure 1. Illustration of sources of GHG gases. Source US EP.

1.4 Global Warming Potentials[2]

Global warming potential (GWP) is a measure used to compare the impact of different greenhouse gases on global warming over a specific period of time, typically 20, 100, or 500 years. It quantifies how much a particular greenhouse gas can contribute to the greenhouse effect and global warming compared to carbon dioxide (CO2), which is often used as a reference gas with a GWP of 1.

The concept of GWP is important for understanding and addressing climate change because it allows us to assess the relative contributions of various greenhouse gases to the warming of the Earth's atmosphere. Different greenhouse gases have varying abilities to trap heat, and their lifetimes in the atmosphere also influence their warming potential.

Carbon dioxide (CO2) is considered as the reference gas with a GWP of 1. Other greenhouse gases are compared to CO2 in terms of their warming potential. For example, methane (CH4) has a GWP of about 25 over 100 years, which means it is estimated to have 25 times the warming effect of CO2 over that period.

GWP values can be calculated over different time horizons, such as 20, 100, or 500 years. Shorter time horizons emphasize the short-term impact of gases that might have higher warming potential but dissipate more quickly, while longer time horizons consider the longer-term effects of gases with longer atmospheric lifetimes.

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The following table shows the GWP – 100 years for the most common gasses:

GHG	GWP (100 years)
Carbon dioxide (CO_2)	**1**
Methane (CH_4)	**27 - 30**
Nitrous oxide (N_2O)	**298**
Hydrofluorocarbons (HFCs)	See Annex I
Perfluorocarbons (PFCs)	See Annex I
Sulphur hexafluoride (SF_6)	**22,800**

Table 1. List of common gasses and their GWP 100 years.

[2] https://www.epa.gov

2. EXECUTIVE SUMMARY

This Greenhouse Gases (GHG) inventory report is the outcome of the assessment phase of Axosomatic Net-Zero Carbon Intelligence solutions framework conducted to Ajman University (AU). It presents annual GHG emissions for AU for the periods of Sep 2020 – Aug 2021 (2020 – 2021) and Sep 2021 – Aug 2022 (2021 – 2022). The data presented in the report is the quantification of the amount of GHG emissions that is directly attributed to AU operations within the declared boundary and scope for the specified reporting periods.

The purpose of the report is to fulfil the need to:

1. Develop an accurate and rigorous approach to carbon accounting and reporting, based on the GHG Protocol Standards.
2. Include all GHG emissions from AU, including those upstream and from employee commuting.
3. Bring validity to AU performance in relation to GHG emissions.
4. Provide a quantified approach on how to optimize resources and operations.
5. Encourage internal learning and awareness in line with AU strategic goals and serve as best practice for other organizations.
6. Improve AU ranking.

For the purpose of reporting, GHG emissions are split into three scopes, Scope 1, Scope 2, and cope 3 in accordance with the requirements of the GHG Protocol Standard, and as defined by the World Resources Institute (WRI). The GHG Protocol represents the most rigorous approach to emissions accounting and has been adopted by many private and public sectors.

Calculation of GHG emissions was based on GHG protocol, BEIS, BSI, CEDA, CDP, EPA, GRI, GWP, IPCC, ISO, SBT, SBTi, WBCSD, WRI, and local energy data.

The report is divided in 7 sections. This section presents a summary of the GHG emissions attributed to AU. Sections 2.7 and 2.8 presents, respectively, the SBTi and Axosomatic reductions plan and targets to reduce the AU GHG emissions by 2030 and 2050. Sections 3 to 6 describe the calculated scope 1,2, and 3 emissions based on the provided data. Section 7 summarizes data assumption and estimation.

2.1 Institutional Description

Established in 1988 as the first private university in the GCC, Ajman University (AU) was also the first university in the UAE to admit expatriate students. AU continues to be a pioneer for inclusion, innovation, and social impact. In 2020, Ajman University became one of the first six higher education institutions in the world to receive global accreditation from the Quality Assurance Agency (QAA), UK's independent body and a global leader in quality assurance for higher education.

The University strives to fulfil the needs of students, alumni, employers, and society through a learner-centric development journey, quality education, hands-on experience, research as well as community engagement. AU develops well-rounded, career-ready graduates who are professionally competent, socially responsible, innovative and active contributors to the sustainable development of the UAE and beyond.

Ajman University is proactive in maintaining a green campus and raising sustainability awareness among its students, faculty, and staff, details of which is available at this link: Energy Conservation | CAMPUS (ajman.ac.ae).

To further support its mission, AU established a Sustainable Investment Policy to guide its investment and in line with United Nations Sustainable Development Goals (SDGs 11,12,13) and the Global 2050 CO_2 Net Zero. Details of the AU Sustainable Investment Policy is available at this link: Sustainable Investment Policy | CAMPUS (ajman.ac.ae). The Green House Inventory Report is a further to the AU mission to maintain an Organizational Sustainable Intelligence.

2. 2 Institutional Boundary

Descriptive information	Company response
Company name	Ajman University
Description of the company	Higher Education Institution
Chosen consolidation approach (equity share, operational control or financial control)	Operational Control
Description of the businesses and operations included in the company's organizational boundary	Providing undergraduate and graduate programs in Art, Humanities, Engineering, and Medical Sciences in one campus. Provides in-campus cafes and restaurant, transportation, and housing for students.
The reporting period covered	Sep 2020 – Aug 2021, and Sep 2021 – Aug 2022
A list of scope 3 activities included in the report	Upstream
A list of scope 1, scope 2 and scope 3 activities excluded from the report with justification for their exclusion	All scope 1 and scope 2 are included. Upstream scope 3 activities are included, excluding Upstream leased assets. All Downstream are excluded. Reason for exclusion: activities are not applicable to Ajman University.
The year chosen as base year and rationale for choosing the base year	2020 - 2021
Carbon reduction plan and target by at least 2050.	Ajman University is in the process of implementing a solution framework to optimize its operations and reduce GHG emissions by 50%, by 2030. The plan will take into account the growth of Ajman during the coming 7 years.

Table 2. Institutional Boundary.

2.3 Institutional Parameters[3]

Organizational Metrics			
Item	**Descriptions**	**2020 - 2021**	**2021 - 2021**
1	Number of campuses owned	1	1
2	Number of campuses rented	0	0
3	Number of buildings owned	13	13
5	Total FT Faculty	254	259
6	Total PT Faculty	71	74
7	Total FT Staff	519	525
8	Total PT Staff	19	15
	Total Employees (TE)[4]	**863**	**873**
	Employee FTE[3]	**803**	**813**
9	Total FT Students	5,848	5,048
10	Total PT Students	1,045	1,467
	Total Students (TS)	**6,893**	**6,515**
	Student FTE	**6,196**	**5,537**
11	Total Students in dormitories	624	1085
12	Total campus area (m2)	215,000	
13	Total area occupied by buildings	125,680	
14	Total green area (m2)	8,600	
15	Number of trees	4,237	
16	Total grass area (m2)	6,500	

Table 3. Institutional parameters.

[3]Source: Ajman University.
[4] Based on CHEDS formula.

2.4 Summary of GHG Emissions Attributed to AU

The following tables list, respectively, the summary of Scope 1, Scope 2, and Scope 3 GHG emissions attributed to Ajman University during the periods 2020 – 2021 and 2021 – 2022, expressed in tCO_2e (Metric Ton of CO_2 equivalent).

2020 – 2021 (Base Year)		
Description	GHG Emission (tCO_2e)	% of Total
Scope 1: Direct GHG Emission	871.469	4.4%
Scope 2: Indirect GHG Emission	12,100.645	60.9%
Scope 3: Indirect GHG Emission	6,902.975	34.7%
Certified green electricity	0	0
Purchased emission reductions	0	0
Total	19,875.089	100.0%

Table 4. Summary of GHG emissions 2020 – 2021.

2021 – 2022 (Performance Year)		
Description	GHG Emission (tCO_2e)	% of Total
Scope 1: Direct GHG Emission	946.113	4.6%
Scope 2: Indirect GHG Emission	12,576.450	61.2%
Scope 3: Indirect GHG Emission	7,034.360	34.2%
Certified green electricity	0	0
Purchased emission reductions	0	0
Total	**20,556.923**	**100.0%**

Table 5. Summary of GHG emissions 2021 – 2022.

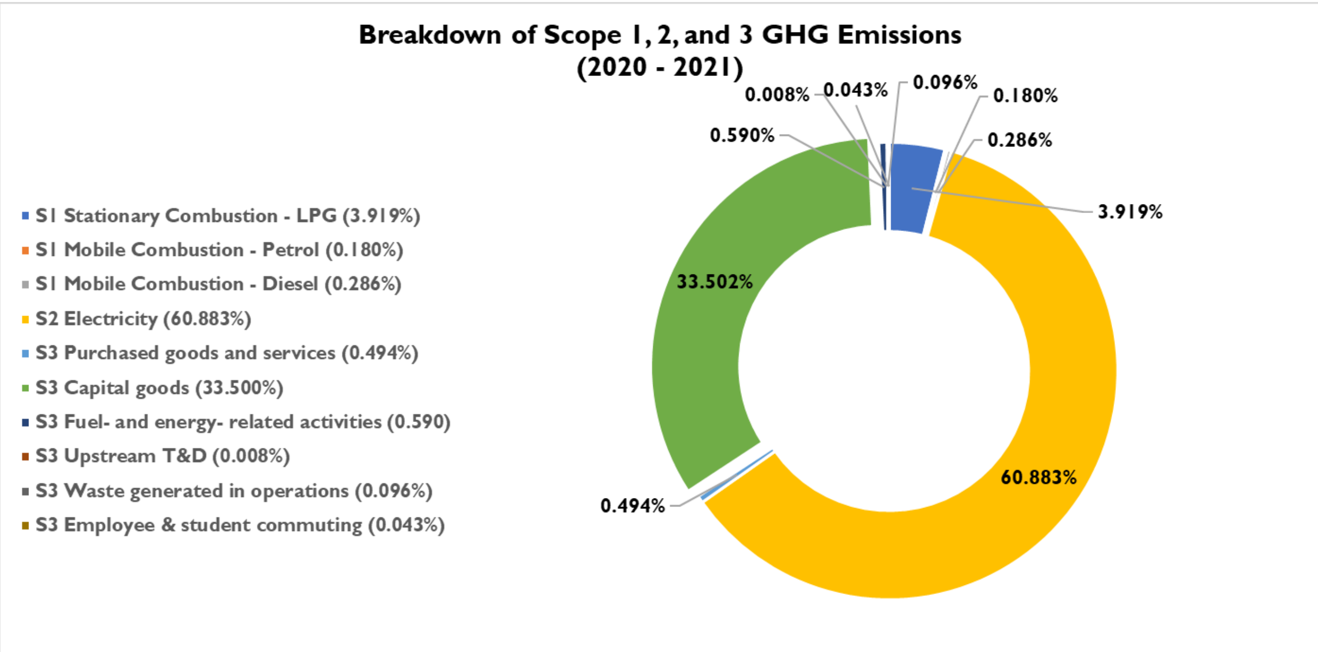

Figure 3. Scope 1, 2,3 Breakdown (2020 – 2021).

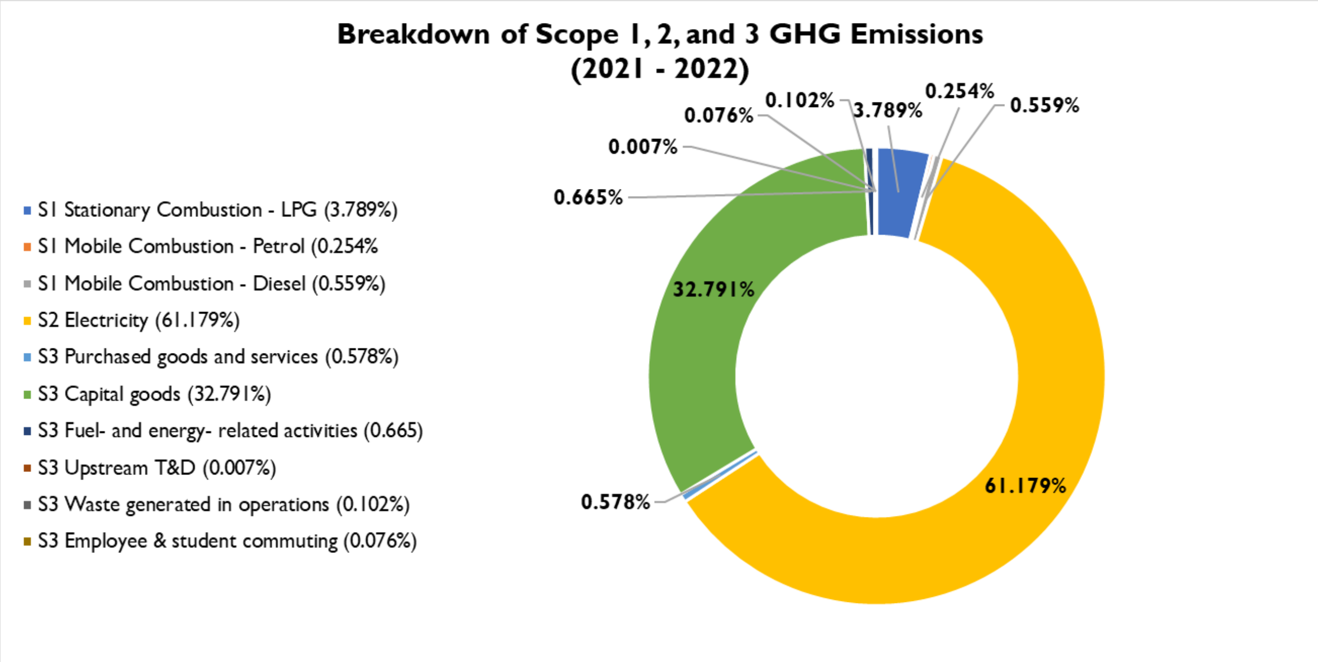

Figure 4. Scope 1, 2,3 Breakdown (2021 – 2022)

2.4.1 Axosomatic Comments

1. Scope 1 GHG emissions is high, compared to similar institutions, because of the diesel and petrol consumptions associated with AU owned cars and buses. This emission can be reduced by replacing a percentage of AU's existing petrol and/or diesel operated care with hybrid and/or EVs and optimizing the driving distance using well-known existing optimization algorithms.
2. Scope 1 emissions did not include Refrigerant Leakage, because it was not recorded by the maintenance personnel.
3. Scope 2 GHG emission constitutes about 60% of the total GHG emissions attributed to AU, which is similar to most organizations and is the highest compared to Scope 1 and Scope 3.
4. Scope 2 emissions attributed to AU can be reduced by installing renewable energy sources, such as solar panels, raising awareness of employees and students, and installing light switch motion sensors in the offices to turn lights on and off based on the presence in the room.
5. Scope 3 GHG emissions is low compared to similar institutions because business travel and T&D of purchased good and capital assets were not provided.
6. The consumption of printing papers is 8.3 ton during 2021 – 2022. This is about 10 kg/employee (9.34KgCO_2e). On average, it is estimated that 1 kilogram of non-recycled printing paper requires around 2 to 3 small trees, and from 10 to 20 litres of water.
7. AU may need to consider the period 2021 – 2022 as the base year, instead of 2020 – 2021, because this period was a lockdown period and most of the academic and administrative activities were conducted from home.
8. The GHG emissions associated with the use of AU's diesel-operated vehicles are twice as much as the petrol-operated vehicles.
9. Building 4083 J2 has the highest GHG emissions among all building, followed by the 4092 - Female Hostel.

2.5 GHG Emissions (tCO_2e) and Metrics

The following table summarizes the GHG emissions (Scope 1 and Scope 2) attributed to AU, during the periods 2020 – 2021 and 2021 – 2022. Details of Scope 1 and Scope 2 GHG emissions are described in sections 3 and 4, respectively.

Description	Year 2020 - 2021	Year 2021 - 2022	% Increase
Scope 1: Direct GHG Emission[5] (tCO_2e)	871.469	946.113	8.57%
Scope 2: Indirect GHG Emission[1] (tCO_2e)	12,100.645	12576.450	3.93%
Scope 3: Indirect GHG Emission[1] (tCO_2e)	6,902.975	7,034.360	1.90%
Total (tCO_2e)	19,875.089	20,556.923	3.43%
Base Year (2020 2021)	19,875.089	-----	-----
FTEF[2]	803	813	-----
FTSE[2]	6,196	5,537	-----
GHG/FTEE and FTSE[6]	2.840	3.237	-----
Weighted Campus Users	5,405.25	7,231.75	-----
GHG/Weighted Campus Users[7]	2.400	1.870	-----
GHG/Campus Area	0.092	0.096	-----

Table 6. GHG Emissions and Metrics.

2.5.1 Axosomatic Comments

The Weighted Campus Users (WCU) is a metric developed by the Association for the Advancement of Sustainability in Higher Education. It is used to measure how intensively certain institution's population, those who lives in campus, use the campus resources.

For example, an institution where a high percentage of students live on campus would witness higher GHG emissions, electricity and water consumptions, wastewater, and waste generation figures than otherwise comparable non-residential institution.

The metric (GHG/Weighted Campus Users) is a function of Scope 1 and 2 emissions, total full-time employee equivalent, total full-time student equivalent, and total number of students resides at the in-campus housing owned by the institution.

The percentage reduction of (GHG/Weighted Campus Users) in a performance year with respect to a base year, indicates the effectiveness of the institution's plan to reduce Scope 1 and 2 emissions.

A percentage reduction above 30% would indicate effective reduction of scope 1 and 2 GHG emissions. The benchmarking data in the next page compares the (GHG/Weighted Campus Users) of a sample of national and international HEIs, including AU.

[5] Source: Axosomatic (www.axosomatic.com)
[6] FTEE (Full-Time Employe Equivalent) and FTSE (Full-Time Student Equivalent), based on CHEDS formula.
[7] Scope 1 and Scope 2 only.

2. 6 GHG Emissions Benchmarking[8]

The following table compares GHG Emissions (Scope and Scope 2) and other metrics, of Ajman University to selected international and national universities. The metrics (GHG/WCU and % Decrease) are used to indicate the effectiveness of the institution's plan to reduce its GHG emissions, during its path to Net-Zero Carbon. The (% Decrease) indicates the percentage reduction of total GHG emissions (Scope 1 and Scope 2) per weighted campus users for the performance year, with respect to the base years. The higher the (% Decrease), the more effective the plan.

								Performance Year		Base Year	
	Scope 1	Scope 2	TFS[9]	TE[10]	WCU[11]	GHG/WCU[12]	% Reduction[13]	Start	End	Start	End
Loyola U Chicago	9,275.00	3,234.00	15,818.00	2,835.00	13,573.25	0.92	79.0%	01-Jul-21	30-Jun-22	01-Jul-07	30-Jun-08
Florida State U	17,627.00	90,606.00	39,829.00	7,079.00	35,538.75	3.05	23.4%	01-Jul-22	30-Jun-22	01-Jul-17	30-Jun-18
University of NC	19,457.00	37,673.00	27,599.00	3,658.00	23,973.00	2.38	38.6%	01-Jul-21	30-Jun-22	01-Jul-02	30-Jun-03
Ohio University	42,775.00	32,257.00	22,632.00	3,823.00	19,027.00	3.93	46.8%	01-Jul-18	30-Jun-19	01-Jul-11	30-Jun-12
U Tennessee, Knoxville	80,464.00	82,493.00	28,329.00	7,089.00	26,565.75	6.13	24.0%	01-Jul-20	30-Jun-21	01-Jul-14	30-Jun-15
AUS, UAE	302.27	57,791.87	5,230.00	536.00	5,814.75	9.99	0.0%	01-Jul-18	30-Jun-19	01-Jan-15	31-Dec-15
HCT, UAE	254.40	27,595.00	24,766.00	2,105.00	20,153.25	1.38	18.2%	01-Jan-21	31-Dec-21	01-Jan-18	31-Dec-19
Ajman University, UAE	**12,972.114**	**13,522.56**	**5,537**	**813**	**7,231.75**	**1.870**	**22.1%**	**01-Sep-21**	**31-Aug-22**	**01-Sep-20**	**31-Aug-21**

Table 7. Benchmarking of GHG emissions of national and international HEIs.

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8 Data compiled by Axosomatic (www.axosomatic.com). There are no official data published by other institutions in the UAE.
9 Total Full Time Students.
10 Total Employees.
11 Weighted Campus Users.
12 GHG Emissions per Weighted Campus Users.
13 All values above 30%, indicate reductions in the GHG emissions with respect to the base year. This is because the AU base year is the lockdown year, which will challenge the plan to reduce the total Scope 1 and Scope 2 GHG emissions. However, it should be noted that it took the listed US universities an average of 10 years to bring down the GHG emissions by an average of 42%.

2.6 Emissions by Scope and Greenhouse Gases

The following tables provide the approximate emissions of greenhouse gasses associated with Scope 1, 2, and 3 activities at AU, during the periods 2020 – 2021 and 2021 – 2022. It should be noted that, because of the rounding of digits, the figures may not add up exactly to the total tCO_2e in table 6.

It should also be noted from the tables, the emissions associated to Scope 2 are higher because of the consumption of purchased electricity.

As mentioned in section 1.2, these gases have stronger warming effect on the environment, compared to CO_2. Their effects can be reduced by using renewable energy, increasing environmental awareness among employees and students, and replacing existing vehicles by EVs and/or hybrid cars.

2020 - 2021			
	Scope 1	Scope 2	Scope 3
Carbon dioxide (CO2)	869.378	11,976.542	6901.7585
Methane (CH4)	0.722	45.590	0
Nitrous oxide (N2O)	1.370	78.073	0.016
Hydrofluorocarbons (HFCs)	0	0	1.222
Perfluorocarbons (PFCs)	0	0	0
Sulphur hexafluoride (SF6)	0	0	0
Total (tCO_2e)	871.470	12,100.204	6902.9965

Table 8. Emissions by scope and greenhouse gases (2020 – 2021).

2021 - 2022			
	Scope 1	Scope 2	Scope 3
Carbon dioxide (CO2)	946.113	12,576.37	7,034.360
Methane (CH4)	943.12	12448.622	7,033.144
Nitrous oxide (N2O)	0.78	47.387	0
Hydrofluorocarbons (HFCs)	2.22	81.151	0.016
Perfluorocarbons (PFCs)	0	0	1.222
Sulphur hexafluoride (SF6)	0	0	0
Total (tCO_2e)	946.113	12,577.16	7,034.382

Table 9. Emissions by scope and greenhouse gases (2021 – 2022)

2.7 GHG Emissions Reduction Schemes

Ajman University has developed an ambitious plan to reduce the GHG emissions attributed to its activities, by 2030 and 2050. The common GHG emissions reduction schemes adopted by most organizations, which AU does not use at the present time, are listed below:

GHG Emissions Reduction Schemes		
Mobile and stationary combustion of biomass	Mass	tCO_2e
No Activity	n/a	n/a
Deforestation of two hectares or more	Mass	tCO_2e
No Activity	n/a	n/a
GHG stock liability	Mass	tCO_2e
No Activity	n/a	n/a
Renewable electricity generation & use	kWh generated	tCO_2e avoided
No Activity	n/a	n/a
Types of emission reductions purchased	Amount	tCO_2e
Certified green electricity (tCO2-e)	n/a	n/a
Purchased emission reductions (tCO2-e)	n/a	n/a
Total	n/a	n/a

Table 10. GHG Emissions Reduction Schemes.

2.7 AU Reduction Plan and Targets

A carbon reduction target covering Scope 1 and 2 emissions by at least 2050 refers to Ajman University's commitment to reduce greenhouse gas (GHG) emissions that are directly produced by its own activities (Scope 1 emissions) and the emissions associated with the energy it consumes (Scope 2 emissions) by the year 2050.

Ajman University is committed to setting ambitious carbon reduction targets covering Scope 1 and 2 emissions in alignment with the urgency to combat climate change. These targets vary in terms of their specific emission reduction goals, timelines, and strategies, but they all share a common aim of transitioning to a low-carbon economy and reducing dependence on fossil fuels.

The targets set are as follows:

1. Net Zero Emissions by 2050: where Ajman University aims to balance its emissions with equivalent carbon removal or offsetting activities.
2. Percentage Reduction Targets: to reduce emissions by 50% by 2030 and 100% by 2050 compared to the baseline year of 2020-2021.
3. Renewable Energy Transition: Ajman University plans to transition to 100% renewable energy sources for electricity consumption (Scope 2) by 2040.
4. Energy Efficiency Improvement: to improve energy efficiency of buildings by aiming for a 25% reduction in energy consumption over the next 2 years.
5. Fleet Electrification Targets: to transition to electric vehicles (EVs) or other low-carbon alternatives, by aiming for a 50% of fleet to be electric by 2030.

2.7.1 Science Base Target Initiative

Axosomatic proposes an effective and structured reduction plan for AU, based on the Science Based Target Initiative (SBTi). This is a universal approach followed by many organizations.

The reduction targets for Scope 1, 2, and 3 are shown in the table and chart in the next page. The selected base year is 2021 – 2022, and the target year is 2030.

It is noted that the average annual reduction till 2030 is 6.6%, and 11.3% from 2030 till 2035, for scope 1, 2, and 3.

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Scope 1 (tCO2e)	946	896	847	797	747	698	648	598	549	499	449	400	350	300
Scope 2 (tCO2e)	12,577	11,916	11,256	10,596	9,935	9,275	8,615	7,955	7,294	6,634	5,974	5,314	4,653	3,993
Scope 1 & 2 (tCO2e)	13,523	12,813	12,103	11,393	10,683	9,973	9,263	8,553	7,843	7,133	6,423	5,713	5,003	4,293
Scope 3 (tCO2e	7,034	6,665	6,296	5,926	5,557	5,188	4,819	4,449	4,080	3,711	3,341	2,972	2,603	2,233
Annual Reduction		5.3%	5.5%	5.9%	6.2%	6.6%	7.1%	7.7%	8.3%	9.0%	10.0%	11.1%	12.4%	14.2%

Table 11. Proposed reduction based GHG emissions targets.

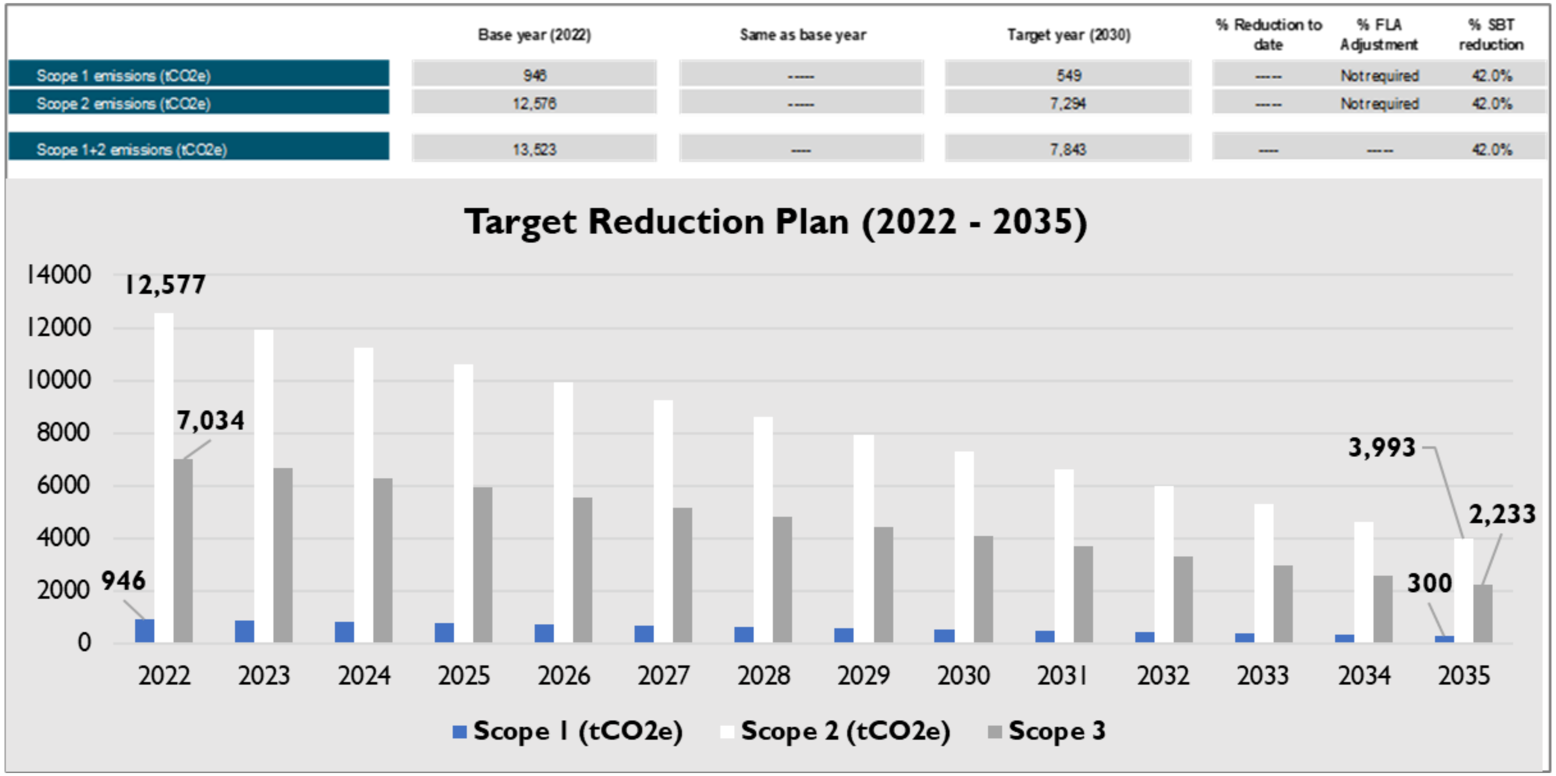


Figure 5. Proposed reduction target for AU.

2.8 The Next Step

Axosomatic Net-Zero Carbon Intelligence (NZCI) framework helps organizations define their path to NetZero carbon, based on the outcome of the GHG emissions report. The framework (Fig. 6) operates online and provides real-time monitoring of GHG emissions.

Axosomatic will work AU towards its path to Net-Zero carbon, by offering the following:

1. Online and continuous monitoring of GHG emissions.
2. Develop, implement, and monitor a Net-Zero strategic plan to reach the 2030 and 2050 targets with the following objectives and actions:
3. Structure the procurement procedures to provide accurate and comprehensive data for scope 3.
4. Define the required load of renewable energy to reduce the purchase of electricity.
5. Define the required hybrid and/or EV vehicles to replace the existing ones.
6. Define and implement a Life-Cycle Assessment (LCA) of key-products and equipment used by AU, and processes to improve Scope 3 emissions.

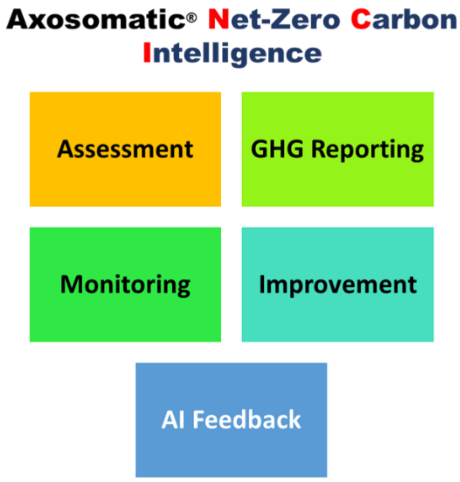


Figure 6. Axosomatic NZCI.

Return On Investment

The implementation of Axosomatic NZCI real-time assessment, monitoring and improvement of GHG emissions reduction will lead to:

- substantial cost savings;
- national and international compliance (**QS Ranking**);
- enhanced reputation;
- process improvement; and
- effective and efficient GHG emissions management and reduction.

3. SCOPE 1: DIRECT GHG EMISSIONS

Scope 1 direct GHG emissions attributed to Ajman University, occurred from the stationary combustion of LPG, and the mobile combustion of petrol and diesel operated cars, buses, pickups, truck, and mobile dental clinic owned by AU.

3.1 Scope 1 Data Provided by AU

Summary of Scope 1 Data Provided by AU			
Source	**Year 2020 - 2021**	**Year 2021 - 2022**	**% Increase**
Consumption of Stationary Combustion			
Diesel	Not Applicable	Not Applicable	------
Heating Oil	Not Applicable	Not Applicable	------
Propane/LPG (m^3)	504	504	0%
Refrigerant Leakage[14]	Not Provided	Not Provided	------
Consumption of Mobile Combustion[15]			
Petrol (litres)	15,264.48	22,339.20	46%
Diesel (litters)	20,383.20	41,203.20	102%

Table 12. Summary of Scope 1 Data provided by AU.

3.2 Scope 1 GHG Emissions

Summary of Scope 1: Direct GHG Emissions (tCO_2e)			
Source	**Year 2020 - 2021**	**Year 2021 - 2022**	**% Difference**
GHG Emissions due to Stationary Combustion[16]			
Diesel	Not Applicable	Not Applicable	------
Heating Oil	Not Applicable	Not Applicable	------
Propane/LPG	778.882	778.882	0%
Refrigerant Leakage[17]	Not Included	Not Included	-----
Sub-Total	**778.882**	**778.882**	**0%**
GHG Emissions due to Mobile Combustion[18]			
Petrol	35.718	52.274	46%
Diesel	56.869	114.957	102%
Sub-Total	**92.587**	**167.231**	**82%**
Total Scope 1 GHG Emissions	**871.469**	**946.113**	**8.6%**

Table 13. Scope 1 GHG Emission from stationary and mobile combustions (2020 – 202, 2021 – 202).

3.2.1 Axosomatic Comments

Scope 2 GHG emissions from mobile combustions of petrol and diesel vehicles are higher in 2021-2022, compared to 2020-2021, because the latter was a lockdown period. These emissions could be reduced by replacing the existing vehicles with EVs and/or hybrid cars. Research by the European Energy Agency found that the carbon emissions of an electric car are around 17 – 30% lower than driving a petrol or diesel car[19]. This could mean that the GHG emissions of 167.231 tCO_2e (table 8 above), could be reduced to 39.318 tCO_2e. The subsequent subsections present the Scope 1 GHG emissions by source.

[14] Refrigerant leakage from air-conditioning system.
[15] Ajman University owns cars, buses, pickup and truck vehicles, some petrol operated, and some diesel operated.
[16] GHG emissions from the consumption of LPG, and leakage of refrigerant in the air-conditioning system.
[17] Refrigerant leakage was not recorded by Ajman University during the reporting periods.
[18] GHG emissions from transportation vehicles owned by AU.
[19] https://www.eea.europa.eu.

3.3 Scop 1 GHG Emissions by Mobile Combustion Source (2020 – 2021)

Source (Petrol)	Units	tCO2e
Cars	6	9.839
Buses	9	23.970
Pickup	2	1.909
Total GHG Emission		35.718

Table 14. Scope 1 GHG emissions from mobile petrol combustion (2020 – 2021).

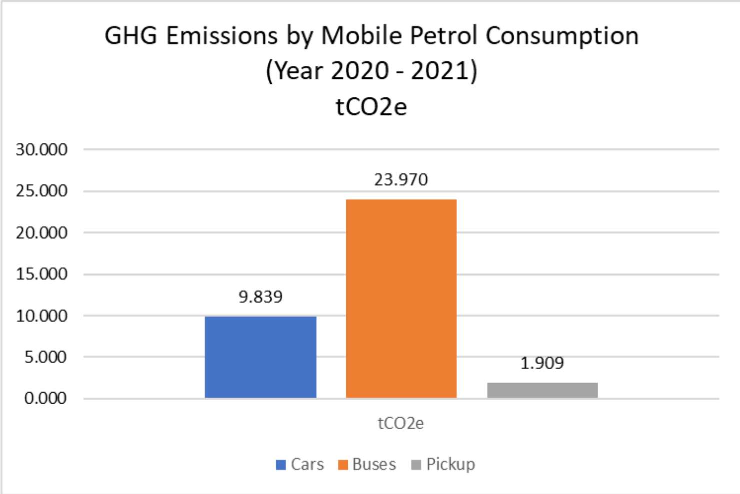


Figure 7. GHG emissions from mobile petrol combustion (2020 – 2021)

Source (Diesel)	Units	tCO2e
Truck	1	1.694
Buses	25	52.577
Pickup	2	2.036
Dental Clinic	1	0.562
Total GHG Emission		**56.869**

Table 15. Scope 1 GHG emissions from mobile diesel combustion (2020 – 202).

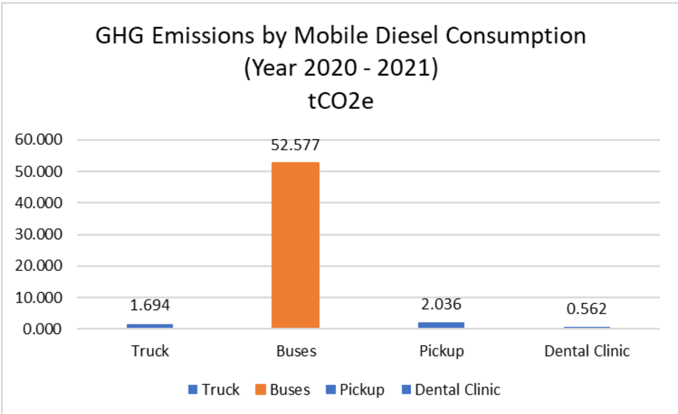


Figure 8. GHG emissions from mobile diesel combustion (2020 – 2021).

Source (Petrol and Diesel)	tCO2e
Cars	9.839
Pickup	3.945
Busses	76.547
Dental Clinic	0.562
Truck	1.694
Total GHG Emission	**92.587**

Table 16. Scope 1 GHG emissions from mobile petrol and diesel combustion (2020 – 202)..

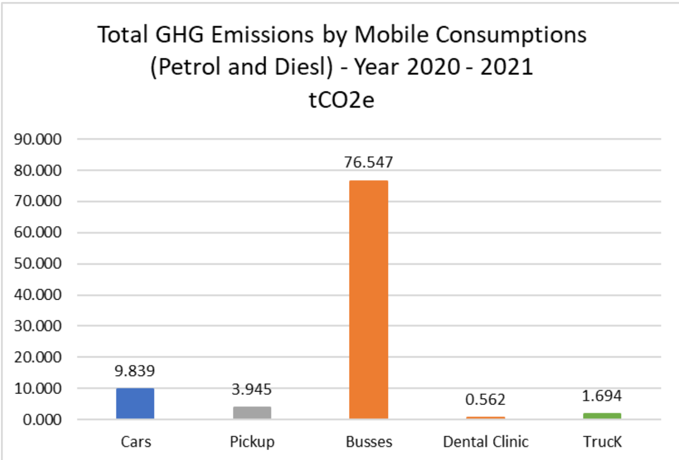


Figure 9. GHG emissions from mobile petrol and diesel combustion (2020 – 2021).

3.4 Scop 1 GHG Emissions by Mobile Combustion Source (2021 – 2022)

Source (Petrol)	Units	tCO2e
Cars	6	11.805
Buses	9	37.504
Pickup	2	2.965
Total GHG Emission		52.274

Table 17. Scope 1 GHG emissions from mobile petrol combustion (2021 – 2022).

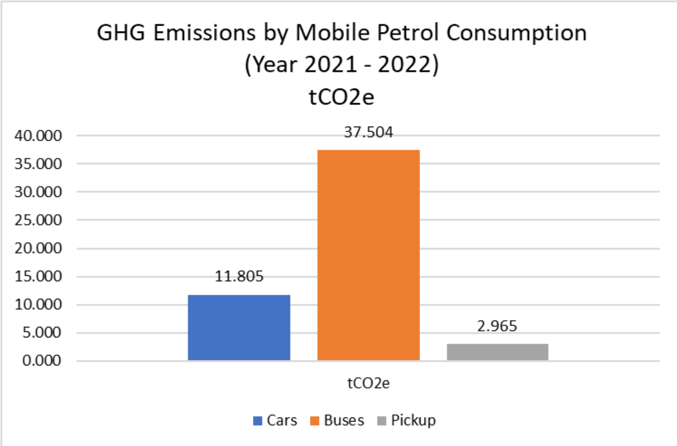
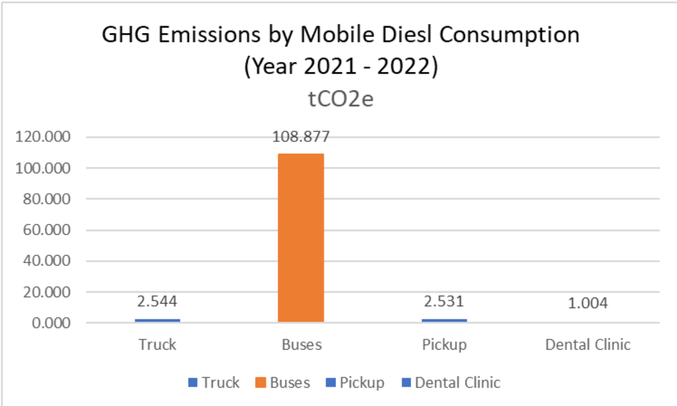


Figure 10. GHG emissions from mobile petrol combustion (2021 – 2022)

Source (Diesel)	Units	tCO2e
Truck	1	2.544
Buses	25	108.877
Pickup	2	2.531
Dental Clinic	1	1.004
Total GHG Emission		114.957

Table 18. Scope 1 GHG emissions from mobile diesel combustion (2021 – 2022).



Source (Petrol and Diesel)	tCO2e
Cars	11.805
Pickup	5.496
Busses	146.381
Dental Clinic	1.004
Truck	2.544
Total GHG Emission	167.231

Table 19. Scope 1 GHG emissions from mobile petrol and diesel combustions (2021 – 2020).

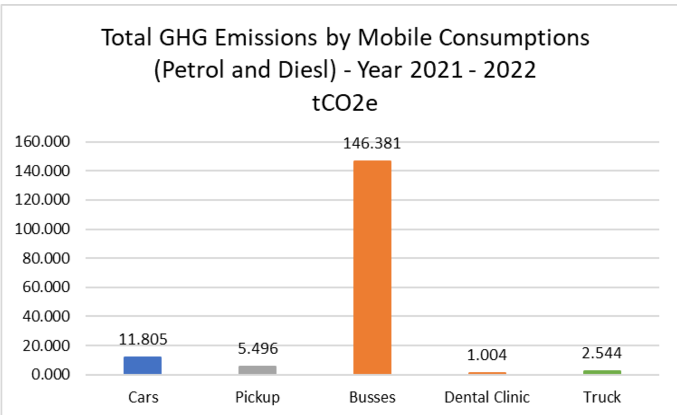


Figure 11. GHG emissions from mobile petrol and diesel combustion (2021 – 2022)

3. 5 Discussion of Scop 1 Direct GHG Emissions

The following table and chart present the summary of Scope 1 Direct GHG Emissions by the sources at Ajman University. The following are observed from the table:

1. The GHG emissions from all sources, stationary and mobile, during the year 2020 – 2021 is lower than those during 2021 – 2022. This could be attributed to the fact that the period 2020 2021 was the lock down period in the UAE. Teaching and administrative works were conducted online.
2. However, the GHG emissions from the consumption of LPG is the same in both periods. The reason is that the College of Dentistry, who consumes the LPG, was operational during the lockdown years.
3. The carbon emissions from the mobile combustion of diesel, in both years, are higher than the carbon emissions from the combustion of petrol. This may be attributed to the number of buses used for transportation.
4. The carbon emission from the consumption of LPG is the highest, compared to the mobile of combustion of petrol and diesel.

Table 20. Summary of Scope 1: Direct GHG emissions by source - Year 1 and Year 2.

Source	2020 - 2021	2021 - 2022	% Increase
LPG	778.882	778.882	0.0%
Petrol	35.719	52.274	46.3%
Diesel	56.869	114.957	102.1%
Total	**871.470**	**946.113**	**8.6%**

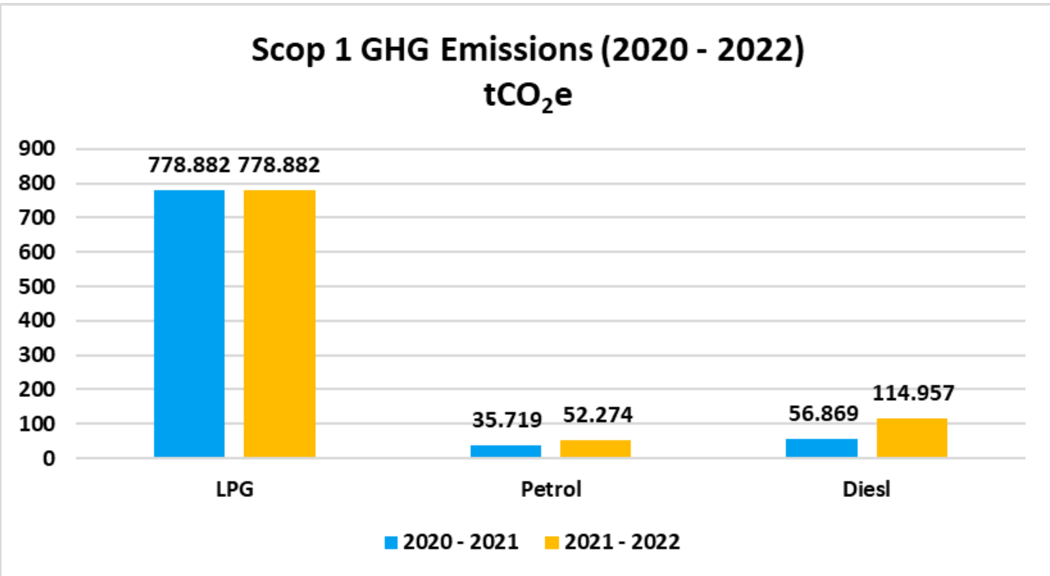


Figure 13. Summary of Scope 1: Direct GHG emissions by source during Year 1 and Year 2.

4. SCOPE 2: INDIRECT GHG EMISSIONS

Scope 2 indirect GHG emissions attributed to Ajman University, occurred from the consumptions of purchased electricity.

4.1 Electricity Consumption

There are 13 buildings at AU, the electricity consumptions of 12 were completely provided and used to calculate the GHG emissions. The data used for calculation consisted of all buildings, excluding the building: 210000070508 F.HOSTEL

4.2 Water Consumption

The provided data for water consumption was incomplete. The following table illustrates the number of buildings whose data were provided. GHG emissions from water consumption is include in Scope 3.

Source	2020 - 2021	2021 - 2022
	Data Provided	
Electricity	12 buildings	12 buildings
Water	6 buildings	5 buildings

Table 21. Electricity and water consumptions data provided by AU.

4.3 Summary of Scope 2 GHG Emissions

The following table summarizes the electricity and water consumptions at AU during the periods of 2020 – 2021 and 2021 – 2022, with the associated carbon emission expressed in metric ton of CO_2 equivalent.

Source	2020 - 2021		2021 - 2022		
	Consumption	tCO_2e	Consumption	tCO_2e	% Increase
Electricity (MWH)	20,930	12,100	21,755	12,576	3.9%

Table 22. Scope 2 GHG Emissions associated with electricity (2020 – 202, 2021 – 2022).

Building	2020 - 2021		Building	2021 - 2022	
	MWH	tCO_2e		MWH	tCO_2e
S.COMPLEX	490.03	283.29	S. COMPLEX	603.459	348.86
4091 F.HOSTEL	821.383	474.84	4091- F. HOSTEL	817.126	472.38
4088 J2	1,210.835	699.98	4088 J2	1197.156	692.08
4089 J2	1,332.750	770.46	J1+LABOR CAMP	1,347.001	778.70
4086 J1	1,363.999	788.53	4089 J2	1,403.478	811.35
J1+LABOR CAMP	1,411.126	815.77	4086 J1	1,764.416	1,020.01
J2+S.FIELD	2,005.192	1,159.20	4085 J1	1,972.746	1,140.44
4085 J1	2,038.198	1,178.28	SZC	2,254.182	1,303.14
5614 S.HUB	2,105.318	1,217.08	J2+S.FIELD	2,311.149	1,336.08
SZC	2,273.508	1,314.31	5614 S.HUB	2,393.905	1,383.92
4092 F.HOSTEL	2,865.607	1,656.61	4092 F. HOSTEL	2,716.910	1,570.65
4083 J2	3,013.044	1,741.84	4083 J2	2,973.141	1,718.77
Total AU	**20,930.99**	**12,100.21**	**Total (AU)**	**21,754.669**	**12,576.37**

Table 23. Scope 2 GHG Emissions by builiding associated with electricty consumption(2020 – 2021, 2021 – 2022).

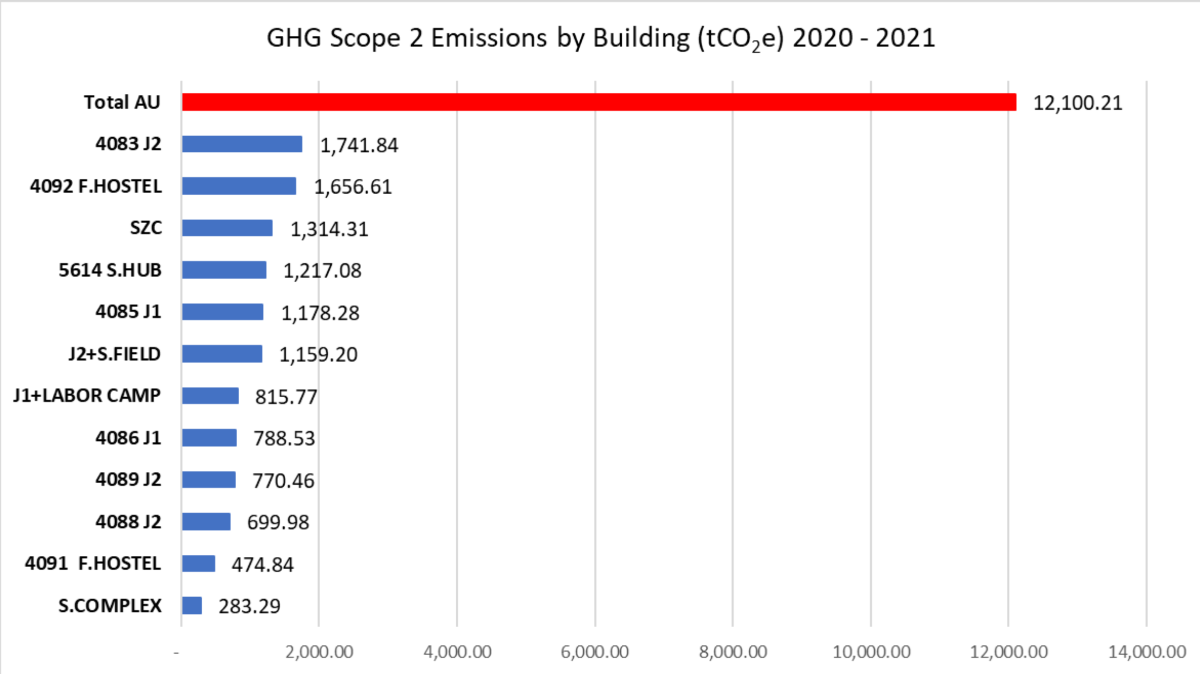


Figure 14. Scope 2 GHG emissions by building during 2020 – 2021, associated with electricity consumption only,

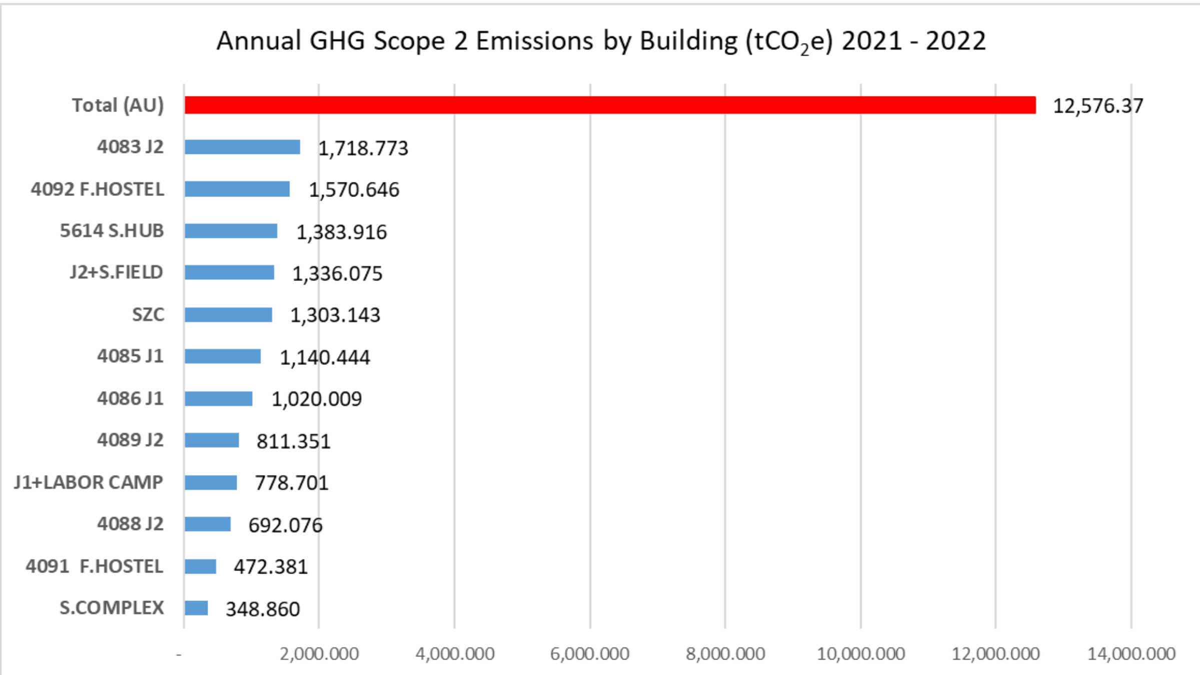


Figure 15. Scope 2 GHG emissions by building during 2021 – 2022, associated with electricity consumption only.

Table 24. Scope 2 GHG emission by byulding associated with electiricty consubmption (2020 – 2021).

	SZC	4088 J2	4089 J2	4083 J2	J2+S.FIELD	J1+LABOR CAMP	4085 J1	4086 J1	S.COMPLEX	4092 F.HOSTEL	4091 F.HOSTEL	5614 S.HUB
Sep-20	149.11	61.54	71.48	170.93	211.08	97.22	161.33	61.54	26.13	192.00	43.76	137.14
Oct-20	131.41	80.98	90.29	203.14	142.15	80.58	135.48	106.98	21.40	148.30	41.15	123.65
Nov-20	113.79	74.54	78.56	168.35	86.76	78.57	108.75	83.88	19.68	144.41	42.09	108.47
Dec-20	95.32	55.63	58.53	129.67	60.32	65.51	80.08	62.06	39.67	129.35	40.03	83.58
Jan-21	87.64	49.94	57.44	124.23	37.95	56.30	63.18	44.74	28.98	103.08	38.66	71.03
Feb-21	77.98	41.71	50.52	89.00	26.60	51.26	47.37	32.15	6.86	103.71	38.93	64.85
Mar-21	75.44	45.14	51.95	95.12	36.87	40.00	44.88	26.75	7.37	99.58	36.48	63.27
Apr-21	96.01	48.41	53.15	121.33	45.54	57.66	71.18	43.10	11.02	122.42	40.43	92.59
May-21	102.09	48.49	50.85	127.16	69.89	54.57	80.68	51.94	17.01	128.90	37.69	88.56
Jun-21	120.14	62.15	67.45	158.90	115.85	72.70	109.95	86.06	52.85	154.10	39.23	118.16
Jul-21	126.16	68.96	72.74	179.80	144.93	83.02	135.98	87.07	37.39	164.80	38.30	131.73
Aug-21	139.20	62.49	67.51	174.23	181.28	78.39	139.42	102.27	14.92	165.96	38.11	134.06
Total	**1314.31**	**699.98**	**770.46**	**1741.84**	**1159.20**	**815.77**	**1178.28**	**788.53**	**283.29**	**1656.61**	**474.84**	**1217.08**

Total AU	12,100.21
Average	1008.35
Median	987.49
STDV	427.64

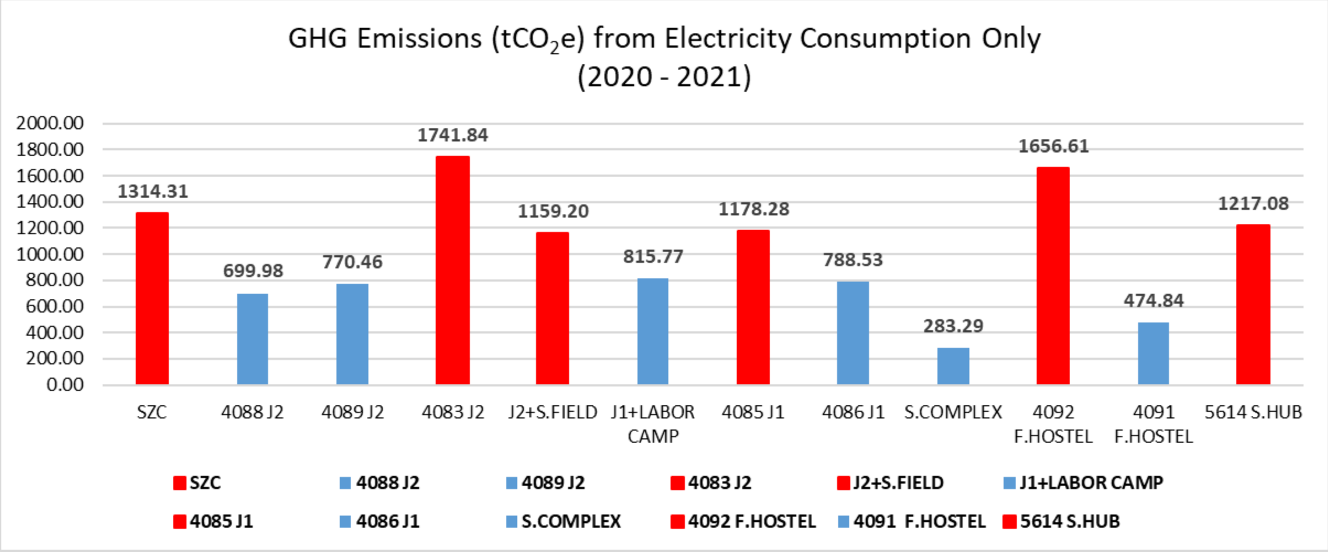


Figure 16. Scope 2 GHG emissions by building associated with electricity consumption (2020 – 2021).

Table 25. Scope 2 GHG emission associated with electricity consumption 2021 – 2022..

	SZC	4088 J2	4089 J2	4083 J2	J2+S.FIELD	J1+LABOR CAMP	4085 J1	4086 J1	S.COMPLEX	4092 F.HOSTEL	4091 F.HOSTEL	5614 S.HUB
Sep-21	145.49	66.48	76.01	181.84	216.05	92.72	150.18	123.12	63.86	171.44	38.29	147.98
Oct-21	137.34	69.13	77.73	191.14	177.74	99.28	137.68	128.46	53.94	164.61	41.13	143.31
Nov-21	130.78	72.88	76.19	161.93	146.75	90.24	120.47	108.47	47.32	149.09	43.65	124.62
Dec-21	106.49	56.30	62.98	97.41	100.37	69.42	81.33	62.74	22.26	123.91	40.74	98.00
Jan-22	87.39	49.94	54.68	92.93	54.59	43.46	54.64	35.54	17.32	107.33	40.13	84.06
Feb-22	60.93	41.71	48.49	62.95	44.12	38.78	45.71	27.97	9.50	102.20	38.65	69.35
Mar-22	58.84	45.14	59.85	87.41	62.11	46.45	55.91	36.35	7.13	97.71	37.84	79.74
Apr-22	97.89	48.41	65.05	131.70	67.71	56.57	75.16	54.71	11.63	114.75	40.41	107.89
May-22	92.78	48.49	60.61	171.00	61.27	57.05	84.13	77.58	16.27	114.91	36.87	95.20
Jun-22	110.13	62.15	74.77	186.98	102.12	59.97	99.51	101.40	32.72	131.12	40.49	121.43
Jul-22	144.31	68.96	84.00	189.93	142.77	59.92	115.53	128.42	32.46	143.69	38.09	155.87
Aug-22	130.79	62.49	70.99	163.55	160.46	64.84	120.20	135.25	34.46	149.88	36.09	156.45
Total	**1303.14**	**692.08**	**811.35**	**1718.77**	**1336.08**	**778.70**	**1140.44**	**1020.01**	**348.86**	**1570.65**	**472.38**	**1383.92**

Total AU	12,576.37
Average	967.41
Median	1020.01
STDV	486.95

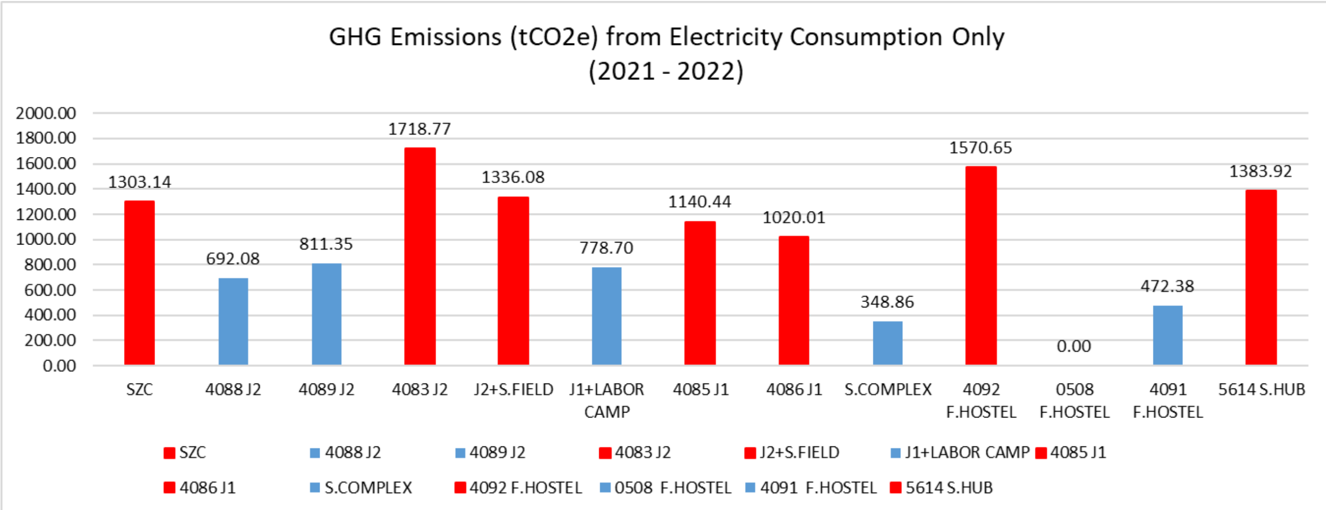


Figure 17. Scope 2 GHG emissions by building due to electricity consumption only (2021 – 2022).

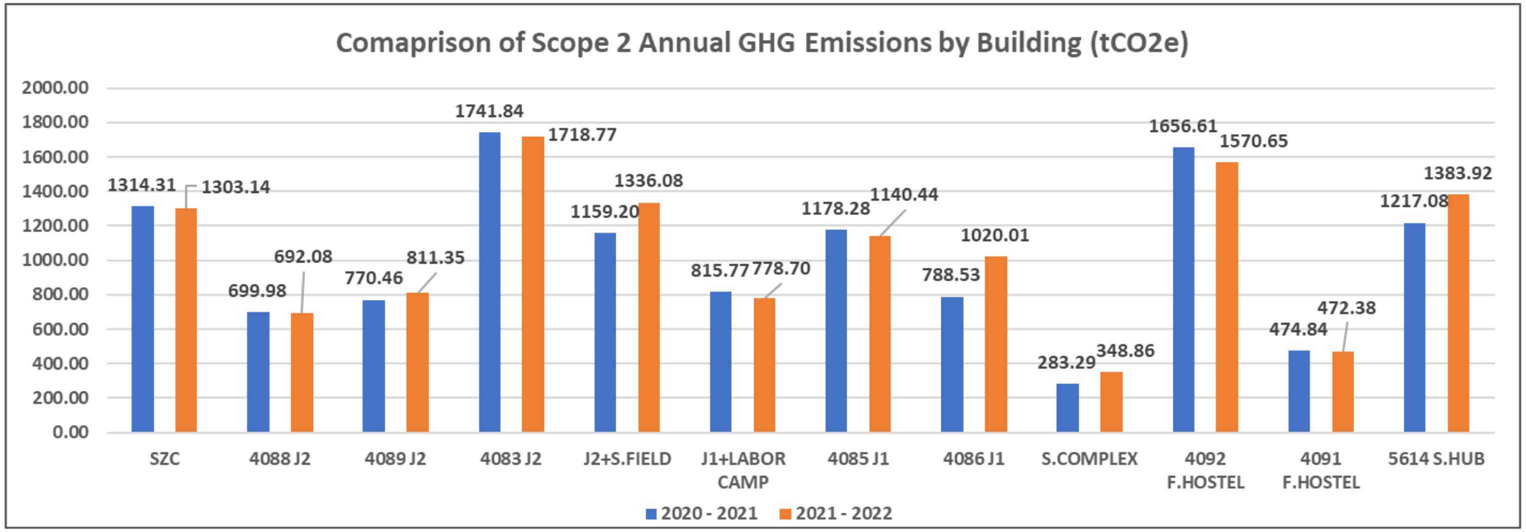


Figure 18. Comparison of Annual Scope 2 GHG emission, assoiciated with electricity consumption only, in each building.

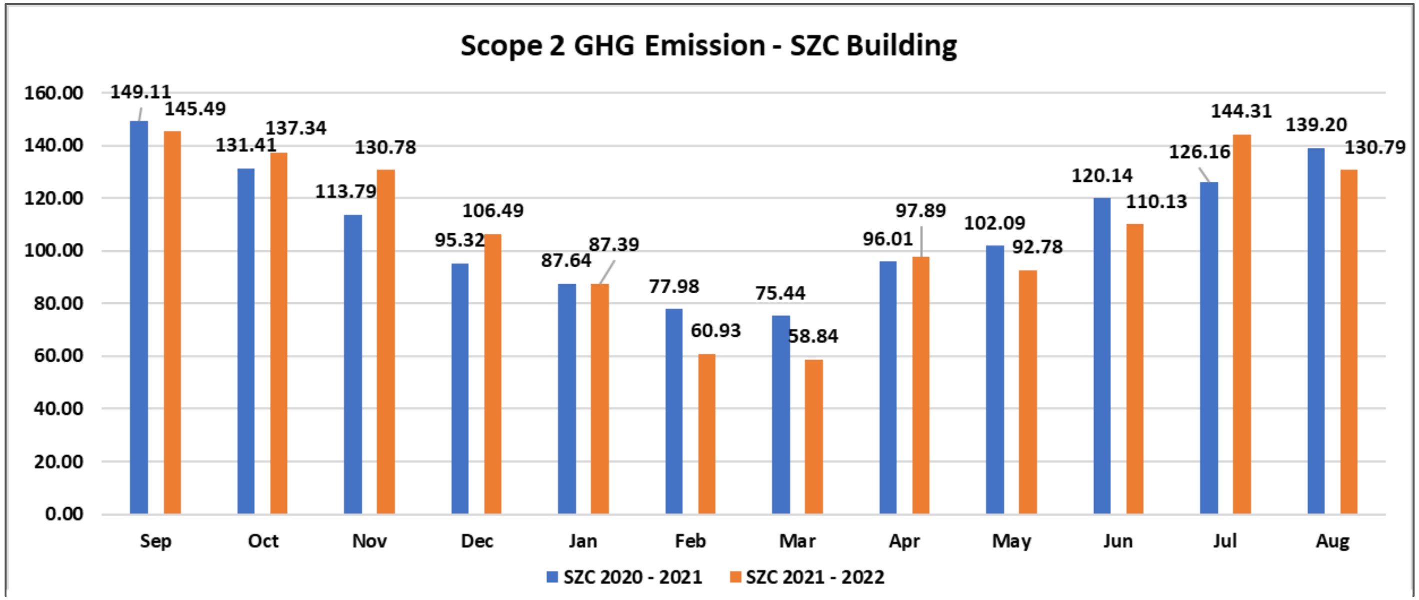


Figure 19. Scope 2 GHG emission associated with electricity consumption only, in building SZC.

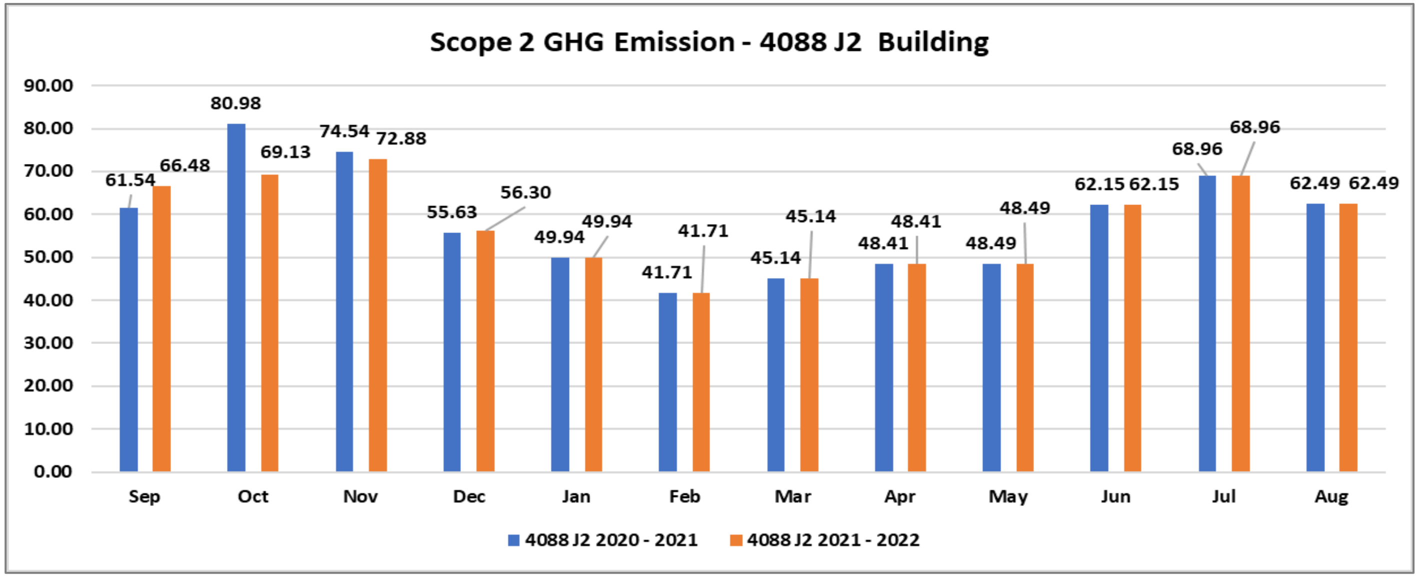


Figure 20. Scope 2 GHG emission associated with electricity consumption only, in building 4088 J2

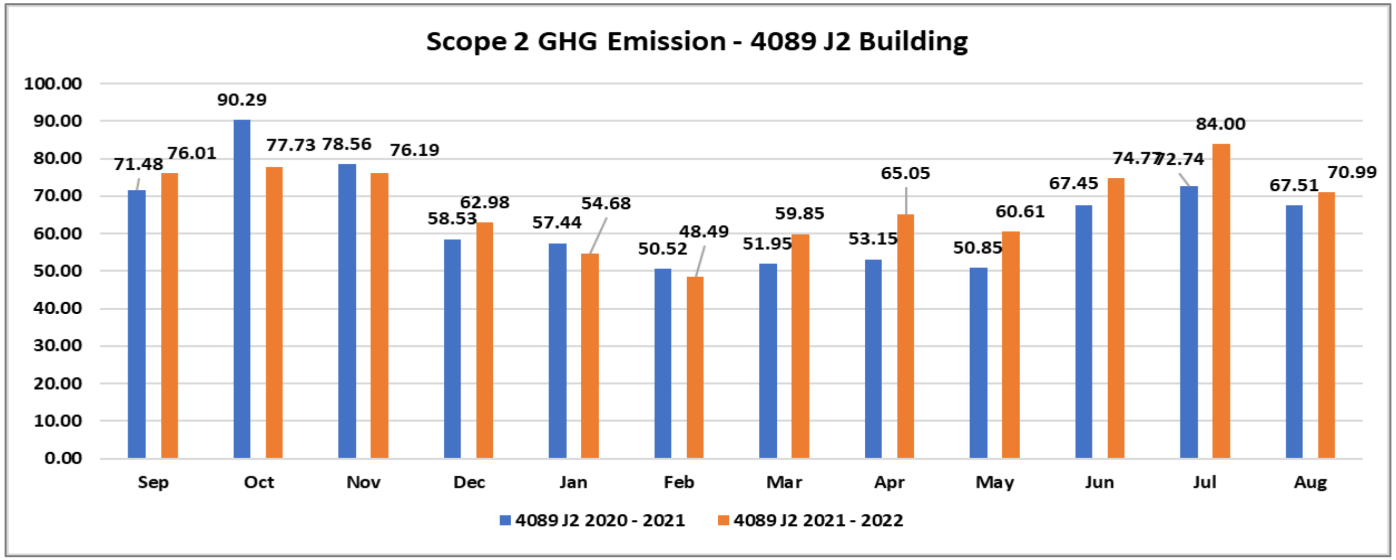


Figure 21. Scope 2 GHG emission associated with electricity consumption only, in 4089 J2.

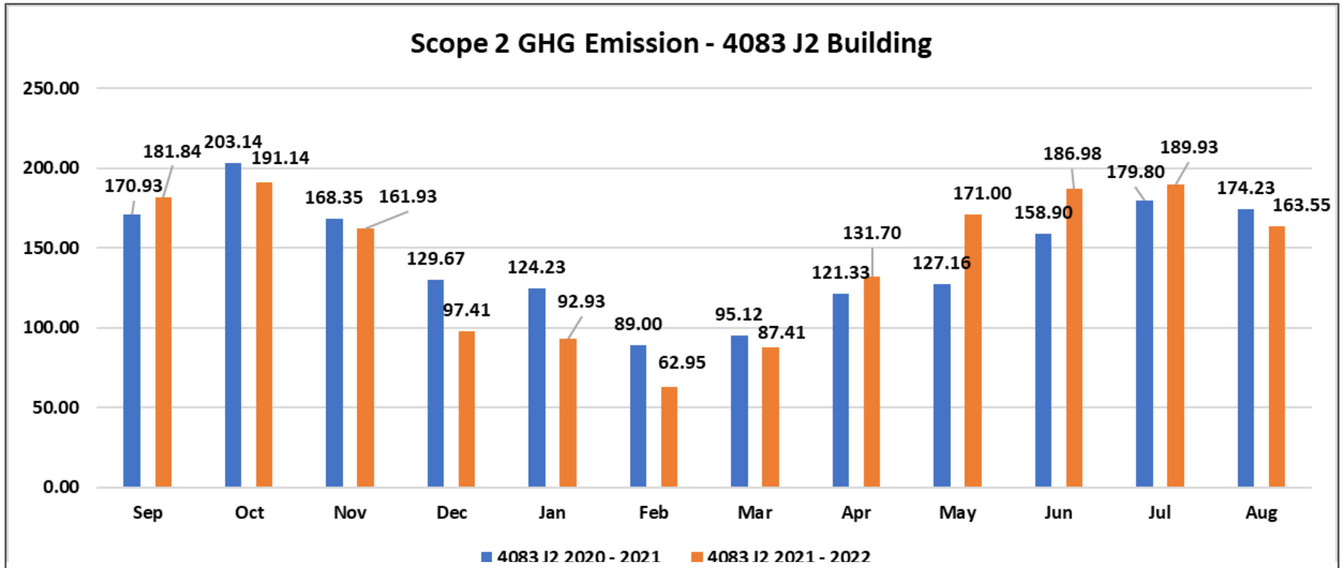


Figure 23. Scope 2 GHG emission associated with electricity consumption only, in building 4083 J2.

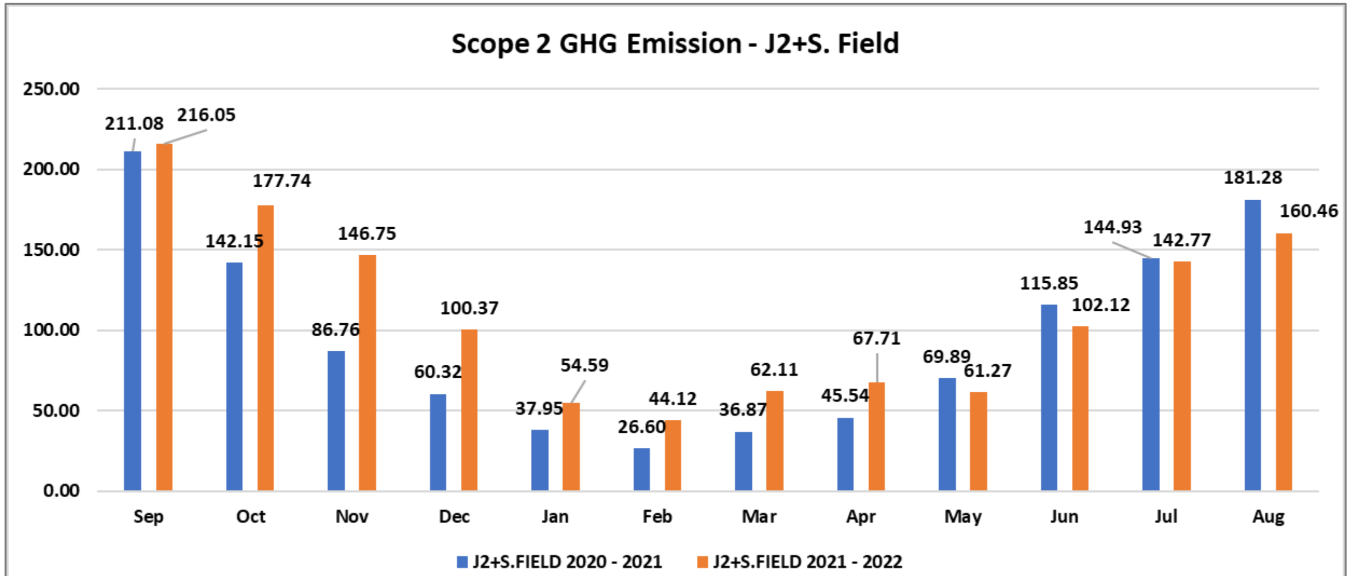


Figure 22. Scope 2 GHG emission associated with electricity consumption only, in J2+S. Field.

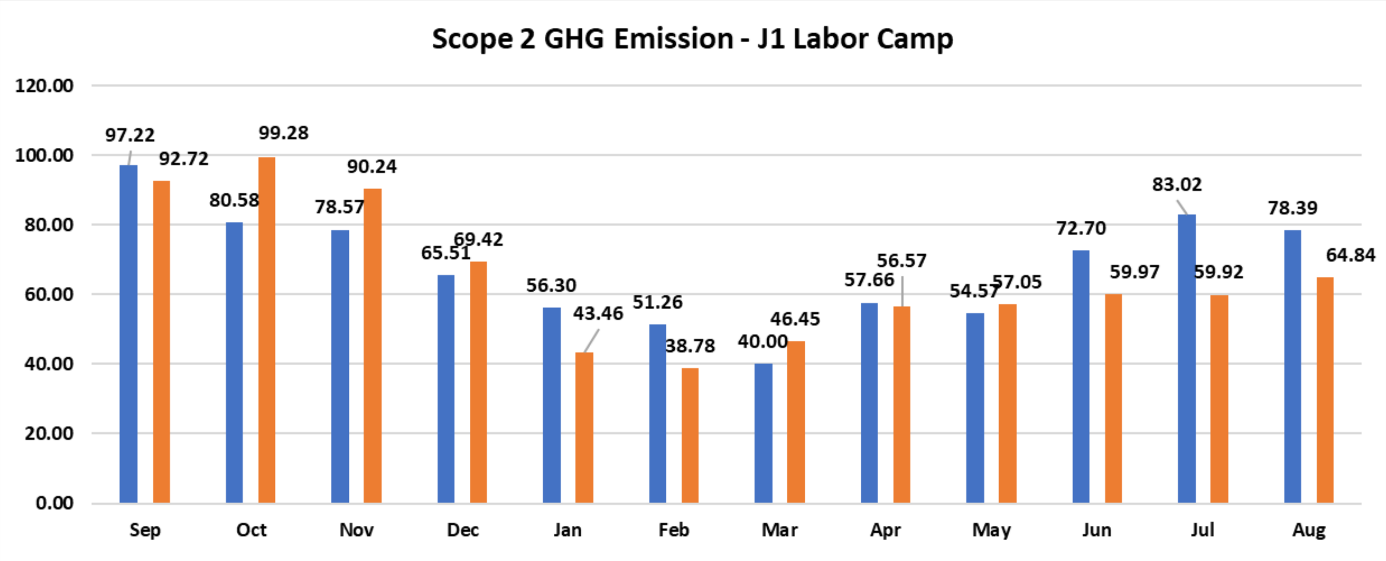


Figure 24. Scope 2 GHG emission associated with electricity consumption only, in J1 Labor Camp.

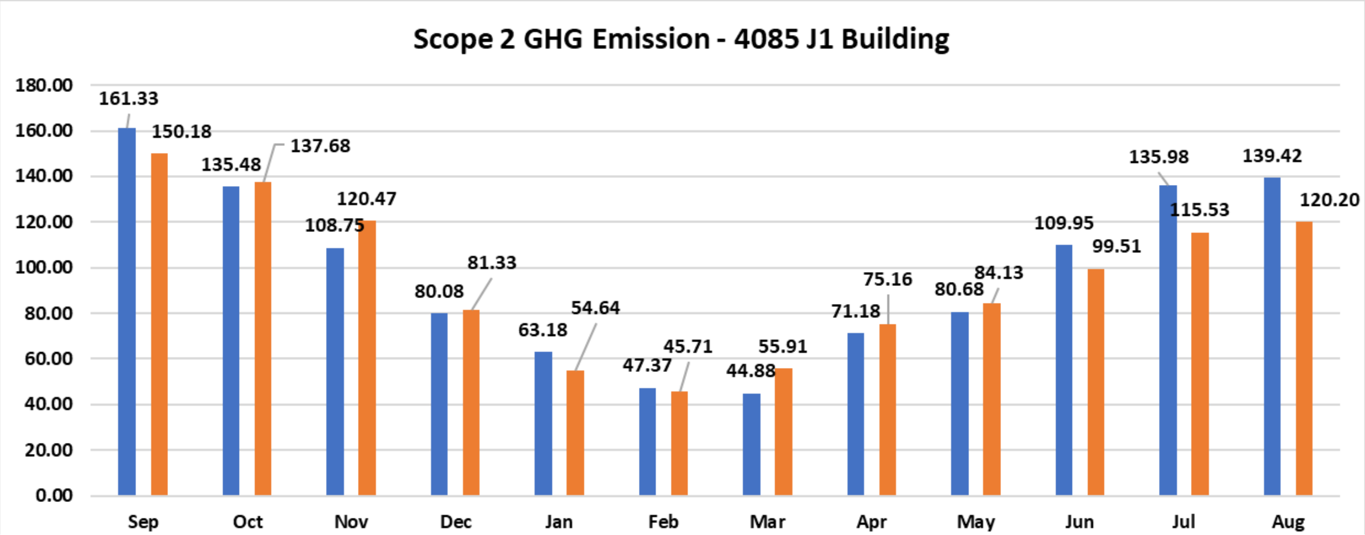


Figure 25. Scope 2 GHG emission associated with electricity consumption only, in building 4085 J1.

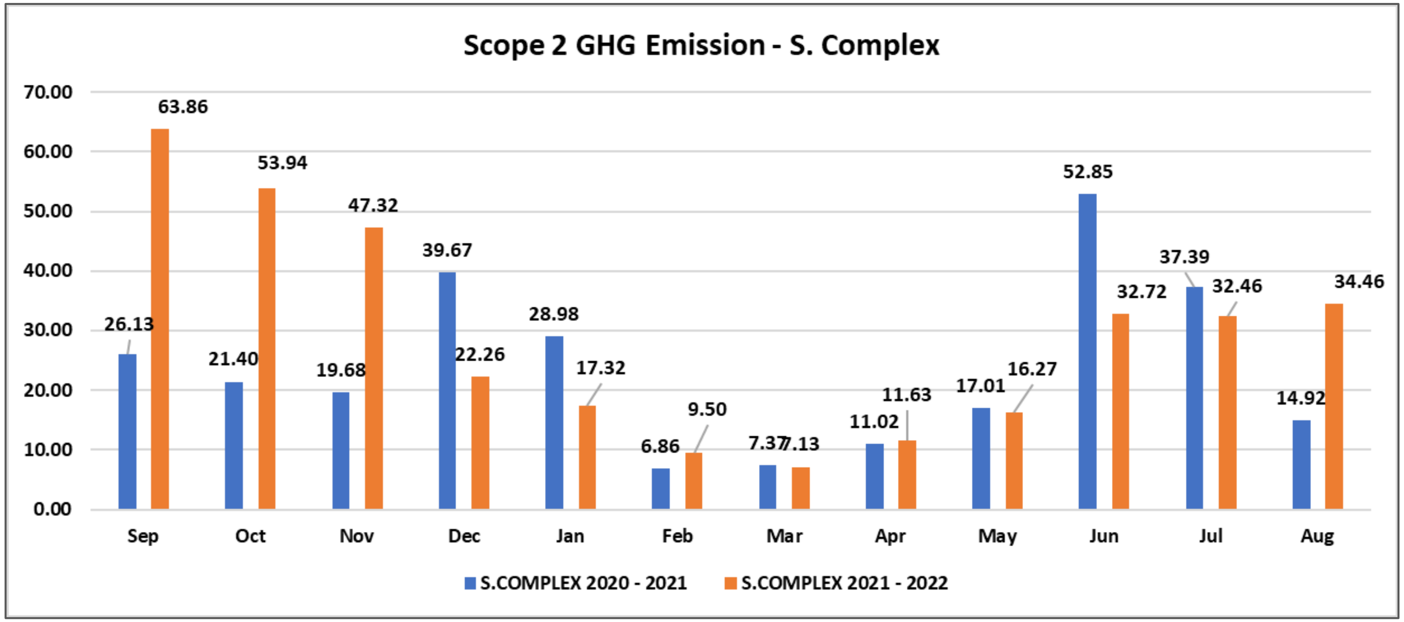
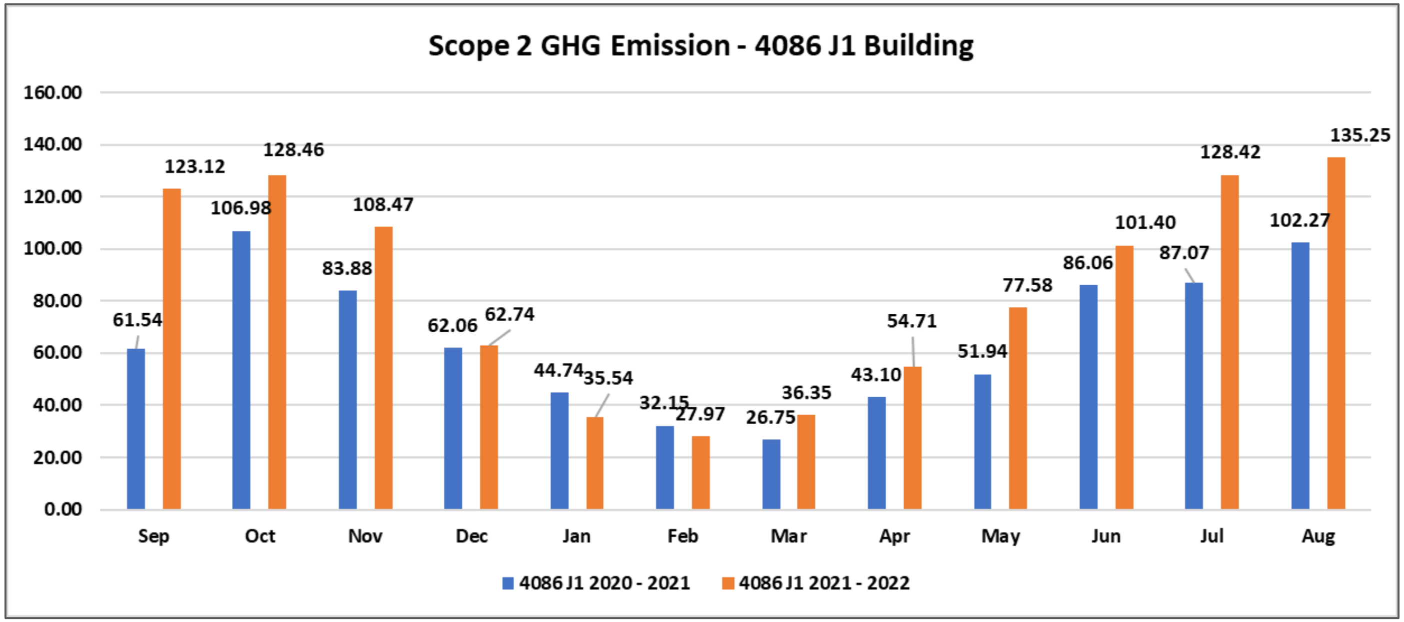


Figure 26. Scope 2 GHG emission associated with electricity consumption only, in the S. Complex.

Figure 27. Scope 2 GHG emission associated with electricity consumption only, in building 4086 J1.



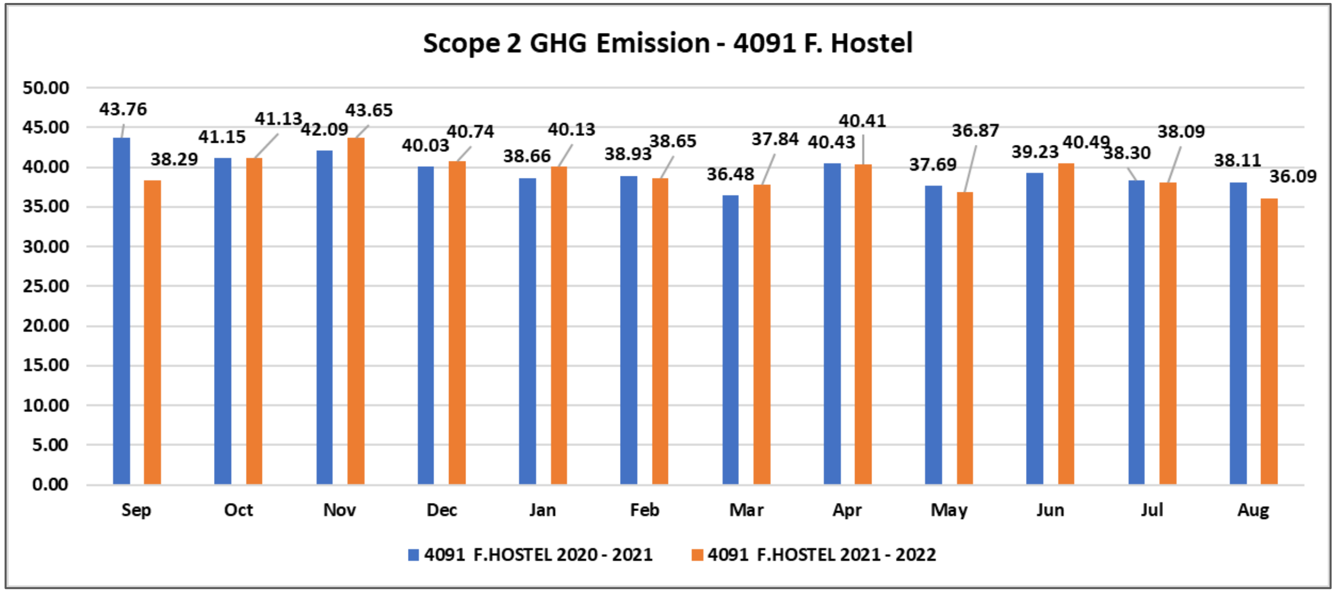


Figure 29. Scope 2 GHG emission associated with electricity consumption only, in the 4091 F. Hostel.

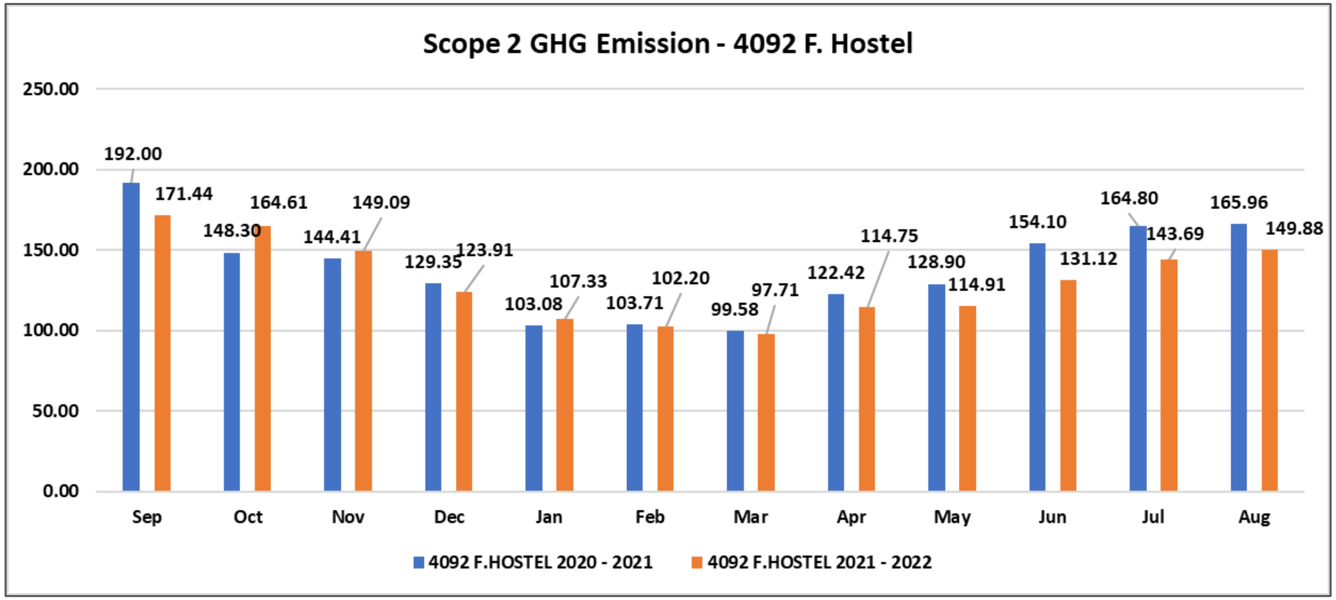


Figure 28. Scope 2 GHG emission associated with electricity consumption only, in the 4092 F. Hostel.

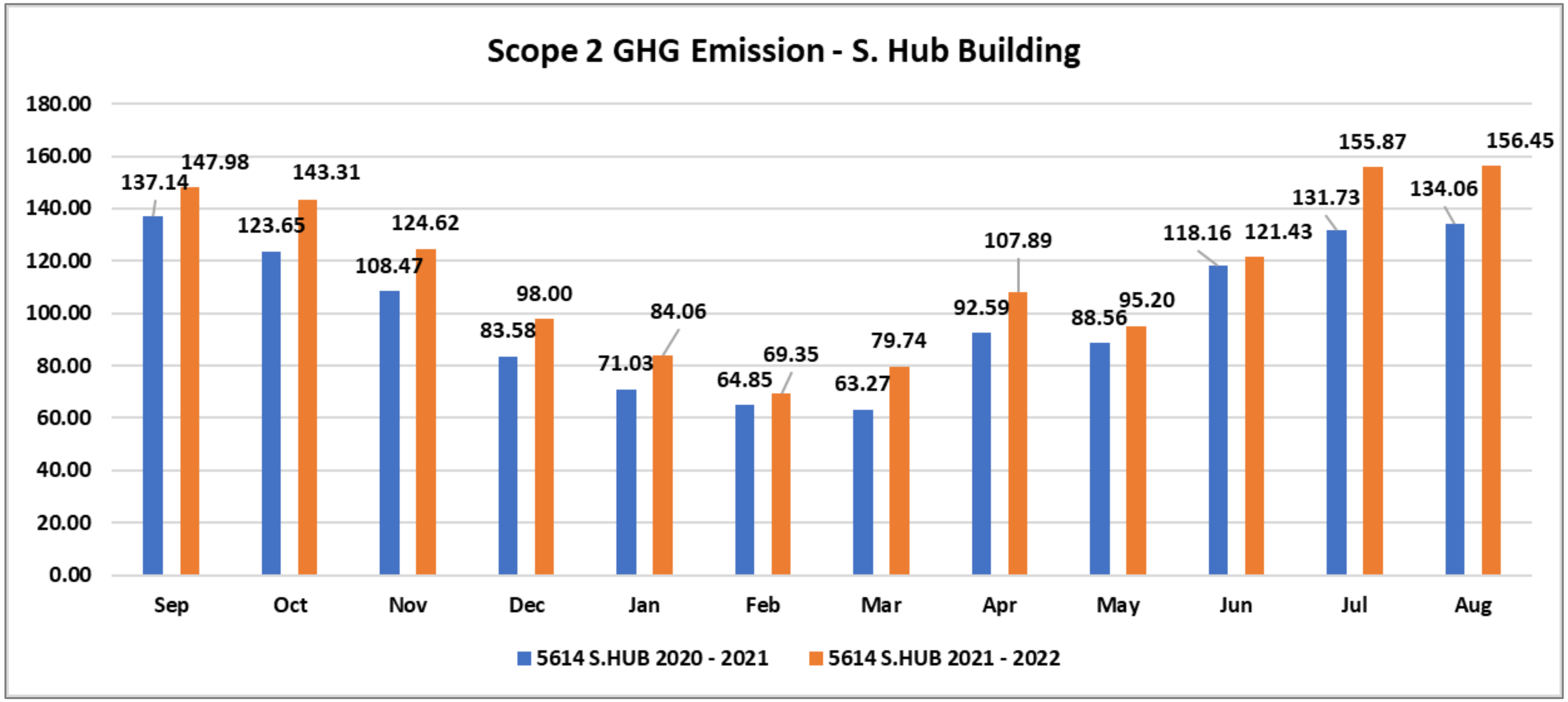


Figure 30. Scope 2 GHG emission associated with electricity consumption only, in the S. Hub.

5. SUMMARY OF SCOPE 1 AND SCOPE 2 GHG EMISSIONS

This report described the Scope 1 and Scope 2 GHG Emissions attributed to Ajman University during the periods 2020 – 2021 and 2021 – 2022. Scope 3 GHG emissions will be added in the final report when Axosomatic receives the requested data. In addition, the final report shall contain detailed description of the following:

1. The methodology used to calculate the GHG emissions.
2. The errors/incompleteness found in the provided data and suggestions for correction.
3. The emissions of other greenhouses gasses.
4. The Axosomatic Net-Zero Carbon Intelligence framework to reduce the GHG emissions at Ajman University.

5.1 Notes on Scope 1 GHG Emissions

1. The highest carbon emission in stationary combustion, is attributed to the consumption of LPG. This could be because the data provided were the number of LPG cylinders purchased but not the actual consumption. This needs to be verified.
2. The carbon emission due to the leakage of refrigerant was not calculated, because Ajman University does not record the leakage of refrigerant in each charging period. This needs to be corrected.
3. The highest carbon emission in mobile combustion is attributed to the use of diesel-operated buses. This could be reduced by finding the optimum bus trajectory that will reduce diesel consumption.

5.2 Notes on Scope 2 GHG Emissions

1. There are 13 buildings, but the electricity consumption of 12 buildings was provided.
2. The water consumption for all buildings was not provided.
3. The carbon emission due to the electricity consumption in building "4083 J2" is the highest, followed by "4092 F. Hostel", and SZC buildings.

6. SCOPE 3: INDIRECT GHG EMISSIONS

Scope 3 indirect GHG emissions attributed to Ajman University, occurred from the consumptions of Upstream Activities (categories 1 to 7, excluding 6), listed in the following table:

Category	Emission Sources	Status
1. Purchased goods and services	Food & Beverages, Printing Papers, Toilet Papers, Tissue Papers, Water, and Cloud Services.	Included
2. Capital goods	IT Equipment, Office Furniture, Medical Equipment	Included
3. Fuel- and energy-related activities	Transmission and Distribution (T&D) losses of purchased electricity.	Included
4. Upstream T&D	T&D of Purchased Good and Capital Good	Included
5. Waste generated in operations	Wastewater, General Waste, Medical Waste, Food Waste, Paper Waste.	Included
6. Business travel	Travel and accommodation of employees/contractors.	Not Included
7. Employee commuting	Employee commuting from and to AU.	Included
8. Upstream leased assets	Operation of assets leased by AU (lessee) in the reporting year and not included in scopes 1 or 2.	Not applicable
9. Downstream T&D	T&D of products sold by the organization.	Not applicable
10. Processing of sold products	Processing of intermediate products sold by the organization.	Not applicable
11. Use of sold products	Use of sold goods that require energy to operate.	Not applicable
12. End-of-life treatment of sold products	Waste disposal and treatment of sold products.	Not applicable
13. Downstream Leased Assets	Emissions from the operation of assets that are owned by AU company and leased to other entities.	Not applicable
14. Franchises	Emissions from the operation of franchises to sell or distribute another company's goods or services within a certain location.	Not applicable
15. Investments	Emissions associated with AU's investments.	Not applicable

Table 26. List of Scope 3 Categories.

6.1 Axosomatic Comments

Business travel data was not provided by AU at this stage. Partial Upstream T&D (Transmission and Distribution) data was provided, for the delivery of Food and Beverages to in-campus cafeterias.

With respect to capital goods, Axosomatic received a list of IT equipment located in some building, but not in all buildings.

6.2 Scope 3 GHG Emissions Summary by Category

2020 - 2021			
Category	**Descriptions**	**tCO2e**	**% of Total**
1. Purchased goods and services	Food & Beverages, Printing Papers, Toilet Papers, and Tissue Papers. Water, Cloud Services.	98.266	1.424%
2. Capital goods	IT Equipment, Office Furniture, and Medical Equipment	6,658.335	96.456%
3. Fuel- and energy- related activities	Transmission and Distribution (T&D) losses of purchased electricity.	117.279	1.699%
4. Upstream T&D	T&D of Purchased Good and Capital Good	1.532	0.022%
5. Waste generated in operations	Wastewater, General Waste, Medical Waste, Food Waste, Paper Waste.	19.098	0.277%
6. Employee commuting	Employee and Student commuting from and to AU.	8.465	0.123%
	Total Scope 3 GHG Emissions	6,902.975	100.000%

Table 27. Scope 3 GHG Emissions by Category 2020 - 2021.

Notes:

1. Business travel data was not provided.
2. T&D of purchased good was provided for the in-campus cafeterias only.

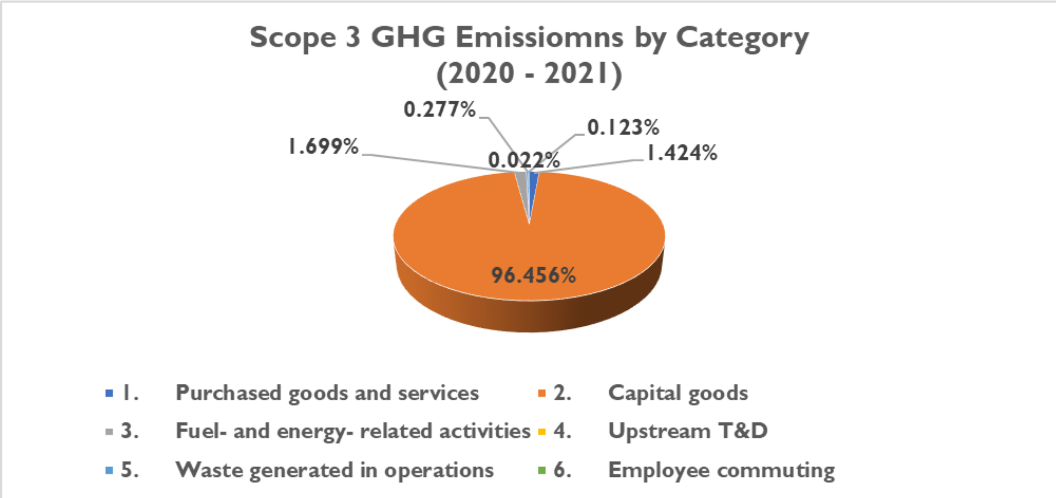


Figure 31. Scope 3 GHG emissions by category 2020 – 2021.

2021 - 2022			
Category	**Descriptions**	**tCO2e**	**% of Total**
1. Purchased goods and services	Food & Beverages, Printing Papers, Toilet Papers, and Tissue Papers. Water, Cloud Services.	118.783	1.69%
2. Capital goods	IT Equipment, Office Furniture, and Medical Equipment	6,740.846	95.83%
3. Fuel- and energy- related activities	Transmission and Distribution (T&D) losses of purchased electricity.	136.628	1.94%
4. Upstream T&D	T&D of Purchased Good and Capital Good	1.532	0.02%
5. Waste generated in operations	Wastewater, General Waste, Medical Waste, Food Waste, Paper Waste.	20.919	0.30%
6. Employee commuting	Employee and Student commuting from and to AU.	15.652	0.22%
	Total Scope 3 GHG Emissions	7,034.360	100.00%

Table 28. Scope 3 GHG Emissions by Category 2021 – 2022.

Notes:

1. Business travel data was not provided.
2. T&D of purchased good was provided for the in-campus cafeterias only.

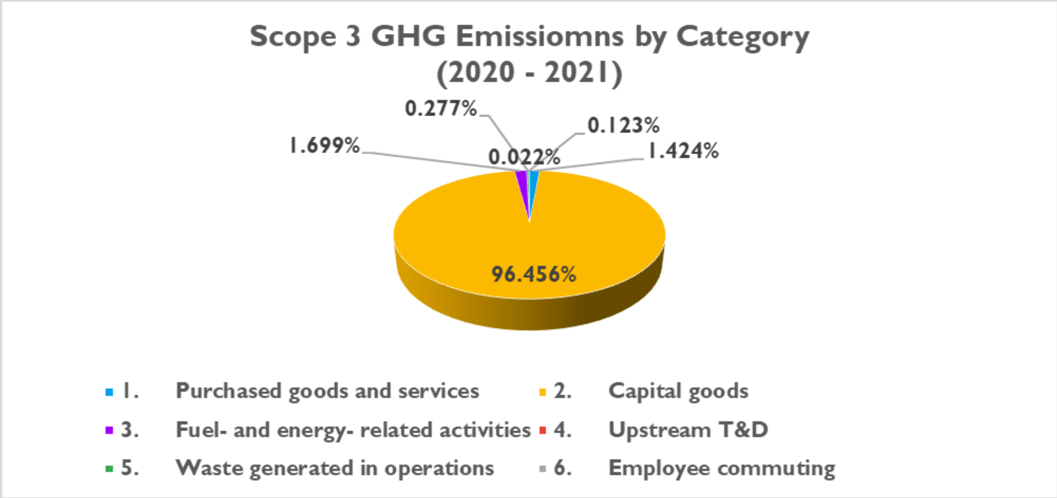


Figure 32. Scope 3 GHG emissions by category 2021 – 2022.

6.3 Scope 3 GHG Emissions Breakdown

The following tables present, respectively, the GHG emissions associated with the sources in each category, as a percentage of the total Scope 3 GHG emissions during the periods 2020 – 2021 and 2021 – 2022:

Total Scope 3 GHG Emissions (2020 – 2021)			6,902.975 (tCO_2e)	
Category 1				
Purchased Good & Services	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Food & Beverages	USD	53,280	21.169	0.31%
Food & Beverages	ton	4.200	15.546	0.23%
Printing Papers	ton	3.500	3.218	0.05%
Toilet Papers	ton	1.400	1.287	0.02%
Tissue Papers	ton	4.500	4.137	0.06%
Water	m3	37,966	9.359	0.14%
Cloud Services	Euros	47,494	43.550	0.63%
Total Category 1 GHG Emissions			98.266	1.42%
Category 2				
Capital Assets	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
IT Equipment	Quantity	1,603	829.315	12.01%
Furniture	Euros	2,607,072	2,390.690	34.63%
Medical Equipment	Euros	3,749,546	3,438.330	49.81%
Total Category 2 GHG Emissions			6,658.335	96.46%
Category 3 & 4				
T&D Loss and Upstream T&D	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
T&D Loss - Purchased Electricity	MWh	20,930	0.2886	1.699%
T&D - Purchased Good	KM	8,400	1.7706	0.022%
Total Category 3 & 4 GHG Emissions			118.811	1.721%
Category 5				
Waste	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Wastewater	m3	36,068	17.673	0.26%
General Waste	ton	41.6	0.886	0.01%
Plastic Waste	ton	4.7	0.100	0.00%
Medical Waste	ton	19.24	0.410	0.01%
Food Waste	ton	1.4	0.030	0.00%
Total Category 5 GHG Emissions			19.098	0.28%
Category 6				
Commuting	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Employee Commuting	KM	5,713	1.008	0.01%
Student Commuting	KM	48,019	7.457	0.11%
Total Category 6 GHG Emissions			8.465	0.12%

Table 29. Scope 3 GHG emissions breakdown 2020 – 2021.

Total Scope 3 GHG Emissions (2021 – 2022)	7,034.360 (tCO_2e)			
Category 1				
Purchased Good & Services	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Food & Beverages	USD	53,280	21.169	0.30%
Food & Beverages	ton	5.145	19.044	0.27%
Printing Papers	ton	8.300	7.631	0.11%
Toilet Papers	ton	1.100	1.011	0.01%
Tissue Papers	ton	7.500	6.896	0.10%
Water	m3	73,026	19.863	0.28%
Cloud Services	Euros	47,077	43.170	0.61%
		Total Category 1 GHG Emissions	118.783	1.69%
Category 2				
Capital Assets	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
IT Equipment	Quantity	1,245	780.656	11.10%
Furniture	Euros	2,750,118	2,521.860	35.85%
Medical Equipment	Euros	3,749,546	3,438.330	48.88%
		Total Category 2 GHG Emissions	6,740.846	95.83%
Category 3 & 4				
T&D Loss and Upstream T&D	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
T&D Loss - Purchased Electricity	MWh	21,755	136.6279	1.94%
T&D - Purchased Good	KM	8,400	1.5320	0.02%
		Total Category 3 & 4 GHG Emissions	138.1599	1.96%
Category 5				
Waste	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Wastewater	m3	73,026	18.870	0.27%
General Waste	ton	45.4	0.966	0.01%
Plastic Waste	ton	7.9	0.168	0.00%
Medical Waste	ton	41.1	0.875	0.01%
Food Waste	ton	1.88	0.040	0.00%
		Total Category 5 GHG Emissions	20.919	0.30%
Category 6				
Commuting	**Unit**	**Consumption**	**tCO_2e**	**% of Total Scope 3**
Employee Commuting	KM	11,968	2.079	0.03%
Student Commuting	KM	87,334	13.573	0.19%
		Total Category 6 GHG Emissions	15.652	0.22%

Table 30. Scope 3 GHG emissions breakdown 2021 – 2022.

6.4 Scope 3 GHG Emissions Comparison

The following table presents a comparison of Scope 3 GHG emissions (**tCO_2e**) associated with each category, in the periods 2020 – 2021 and 2021 – 2022, in terms of the percentage increase:

	2020 - 2021	2021 - 2022	
	Category 1		
Purchased Good & Services	**tCO_2e**	**tCO_2e**	**% Increase**
Food & Beverages	21.169	21.169	0.00%
Food & Beverages	15.546	19.044	22.50%
Printing Papers	3.218	7.631	137.14%
Toilet Papers	1.287	1.011	-21.43%
Tissue Papers	4.137	6.896	66.67%
Water	9.359	19.863	112.24%
Cloud Services	43.550	43.170	-0.87%
Total Category 2 GHG Emissions	98.266	118.783	20.88%
	Category 2		
Capital Assets	**tCO_2e**	**tCO_2e**	**% Increase**
IT	829.315	780.656	-5.87%
Furniture	2,390.690	2,521.860	5.49%
Medical Equipment	3,438.330	3,438.330	0.00%
Total Category 3 GHG Emissions	6,658.335	6,740.846	1.24%
	Category 3 & 4		
T&D Loss and Upstream T&D	**tCO_2e**	**tCO_2e**	**% Increase**
T&D Loss - Purchased Electricity	117.279	136.628	16.50%
T&D - Purchased Good	1.532	1.532	0.00%
Total Category 3 & 4 GHG Emissions	118.811	138.160	16.29%
	Category 5		
Waste	**tCO_2e**	**tCO_2e**	**% Increase**
Wastewater	17.673	18.870	6.77%
General Waste	0.886	0.966	9.13%
Plastic Waste	0.100	0.168	68.09%
Medical Waste	0.410	0.875	113.62%
Food Waste	0.030	0.040	34.29%
Total Category 5 GHG Emissions	19.098	20.919	9.54%
	Category 6		
Commuting	**tCO_2e**	**tCO_2e**	**% Increase**
Employee Commuting	1.008	2.079	106.19%
Student Commuting	7.457	13.573	82.01%
Total Category 6 GHG Emissions	8.465	15.652	84.89%
Total Scope 3 GHG Emissions	**6,902.975**	**7,034.360**	**1.90%**

Table 31. Scope 3 GHG Emissions Comparison.

6.5 Scope 3 GHG Emissions by Source

6.5.1 F&B, Papers, Water, and Cloud Services

	Unit	Consumption	tCO_2e	% of Total
Food & Beverages	USD	53,280	21.169	21.54%
Food & Beverages	ton	4.2	15.546	15.82%
Printing Papers	ton	3.5	3.218	3.27%
Toilet Papers	ton	1.4	1.287	1.31%
Tissue Papers	ton	4.5	4.137	4.21%
Water	m^3	37,966.00	9.359	9.52%
Cloud Services	Euros	47,494.00	43.550	44.32%
		Total	98.266	100.00%

Table 32. Scope 3 GHG Emissions by source 1 (2020 – 2021)

	Unit	Consumption	tCO_2e	% of Total
Food & Beverages	USD	53,280.000	21.169	17.82%
Food & Beverages	ton	5.145	19.044	16.03%
Printing Papers	ton	8.300	7.631	6.42%
Toilet Papers	ton	1.100	1.011	0.85%
Tissue Papers	ton	7.500	6.896	5.81%
Water	m^3	73,026.000	19.863	16.72%
Cloud Services	Euros	47,077.000	43.170	36.34%
		Total	118.783	100%

Table 33. Scope 3 GHG Emissions by source 1 (2021 – 2022).

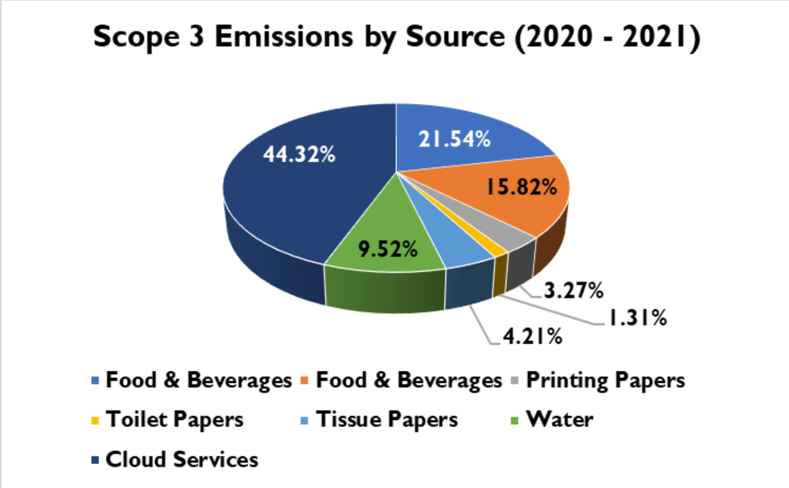


Figure 33. Scope 3 GHG emissions of category 1 sources 2020 – 2021.

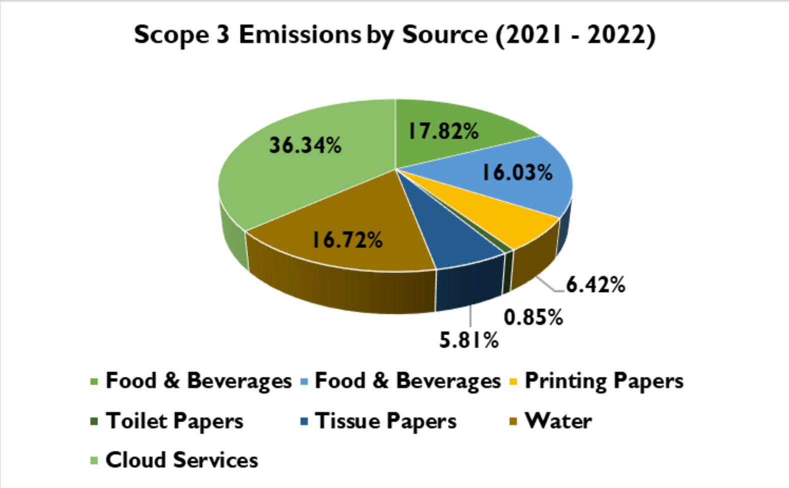


Figure 34. Scope 3 GHG emissions of category 1 sources 2021 – 2022.

6.5.2 IT, Furniture, and Medical Equipment

	Unit	Consumption	tCO_2e	% of Total
IT	Quantity	1,603	829.315	12.46%
Furniture	Euros	2,607,072.0	2,390.690	35.91%
Medical Equipment	Euros	3,749,545.67	3,438.33	51.64%
		Total	6,658.335	100%

Table 34. Scope 3 GHG Emissions of category 2 sources (2020 – 2021).

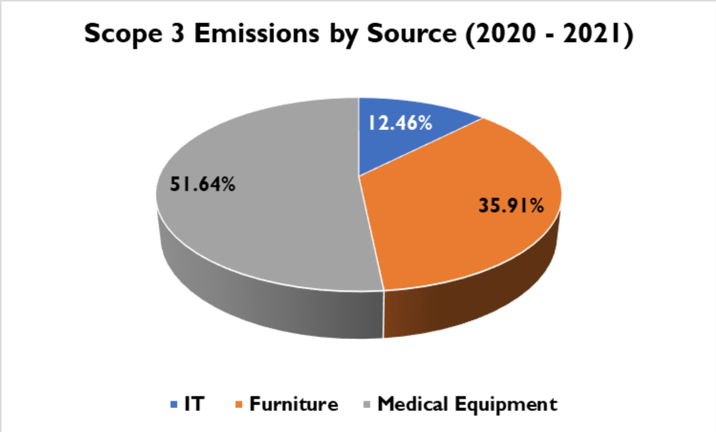


Figure 35. Scope 3 GHG emissions of category 2 sources 2020 – 2021.

	Unit	Consumption	tCO_2e	% of Total
IT	Quantity	1,245	780.656	11.58%
Furniture	Euros	2,750,118.00	2,521.860	37.41%
Medical Equipment	Euros	3,749,545.67	3,438.330	51.01%
		Total	6,740.846	

Table 35. Scope 3 GHG Emissions of category 2 sources (2021 – 2022).

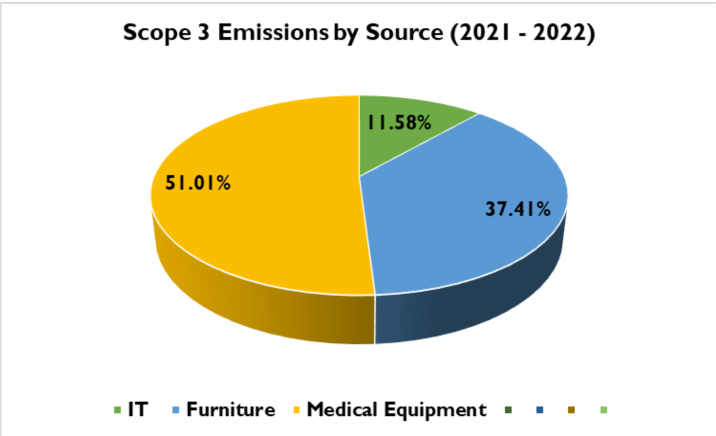


Figure 36. Scope 3 GHG emissions of category 2 sources 2021 – 2022.

6.5.3 Scope 3 GHG Emissions Associated with IT Equipment

The following tables lists, respectively, the GHG emissions associated with the IT equipment at AU campus:

Equipment	Quantity	tCO2e	% of Total	**% of Total GHG Emissions**
PC	34	17.078	2.06%	0.09%
Laptop	110	46.027	5.55%	0.23%
Apple iMac	2	1.005	0.12%	0.01%
Mac Book	5	2.092	0.25%	0.01%
Printer	24	2.296	0.28%	0.01%
PC Monitors	81	37.486	4.52%	0.19%
Display Monitor	22	1.257	0.15%	0.01%
Interactive Display	4	0.229	0.03%	0.00%
Server	1	0.162	0.02%	0.00%
Other Equipment	1320	721.684	87.02%	3.65%
Total	**1603**	**829.315**		

Equipment	Quantity	tCO2e	% of Total	**% of Total GHG Emissions**
PC	245	123.0654	17.36%	0.60%
Laptop	209	87.45157	12.34%	0.43%
Apple iMac	9	4.520769	0.64%	0.02%
Mac Book	7	2.929	0.41%	0.01%
Printer	50	4.782609	0.67%	0.02%
3D Printer	5	0.478261	0.07%	0.00%
MFPs	5	0.478261	0.07%	0.00%
PC Monitors	152	70.34433	9.92%	0.34%
Display Monitor	8	0.457143	0.06%	0.00%
Interactive Display	4	0.228571	0.03%	0.00%
Server	17	122.2725	17.25%	0.60%
Other	534	291.9538	41.18%	1.43%
Total	**1245**	**708.9622**		

AU provided a list of 1603 equipment for 2020 – 2021, and 1245 equipment for 2021 – 2022. The lists contain IT, communication, sound, security, and some medical equipment, in some and not all buildings: College of Dentistry, Female Hostel, J1 Building, J2 Building, Main Store & Maintenance Area, Male Hostel, Student Hub. It was not possible, therefore, to report the emissions for each building.

The carbon footprint of the equipment listed in the above two tables, are taken from the manufacturers' database and it should be noted that the figures are approximate, according to the manufactures.

6.5.4 T&D Loss, and T&D of Purchased Good

The tables and figures shown below present the GHG emissions associated with T&D losses of purchased electricity and purchased goods (Food and Beverages) delivered to the in-campus cafeterias:

	Unit	Consumption	tCO_2e	% of Total
T&D Loss - Purchased Electricity	MWh	20,930	0.289	14.02%
T&D - Purchased Good	KM	8,400.0	1.771	85.98%
		Total	2.059	100%

Table 36. Scope 3 GHG Emissions of category 3 and 4 sources (2020 – 2021).

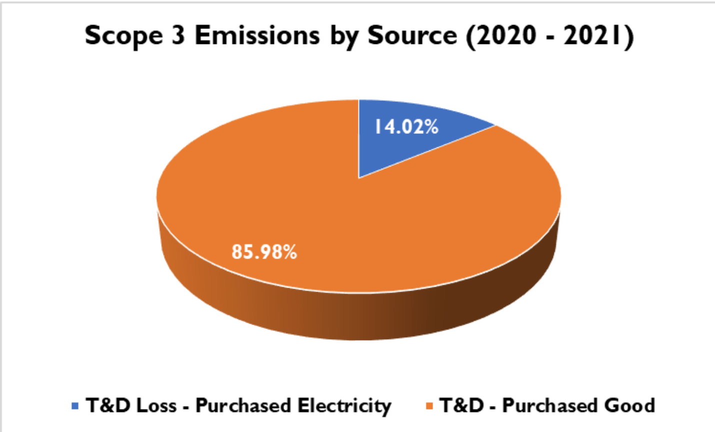


Figure 37. Scope 3 GHG Emissions of category 3 and 4 sources (2020 – 2021)

	Unit	Consumption	tCO_2e	% of Total
T&D Loss - Purchased Electricity	MWh	21,755	0.300	14.49%
T&D - Purchased Good	KM	8,400.00	1.771	85.51%
		Total	2.071	100%

Table 37. Scope 3 GHG Emissions of category 3 and 4 sources(2021 – 2022).

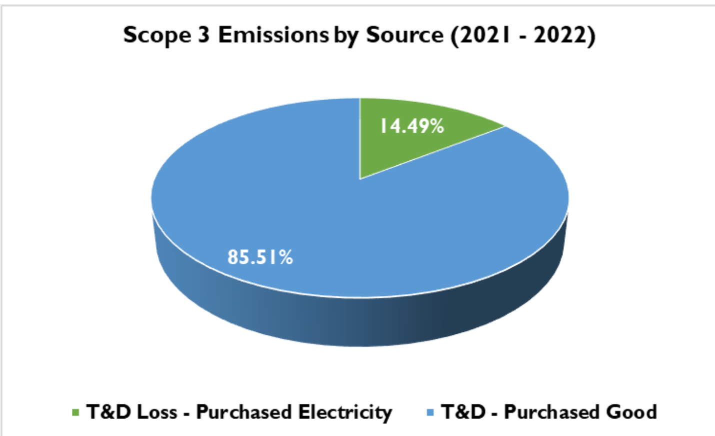


Figure 38. Scope 3 GHG Emissions of category 3 and 4 sources(2021 – 2022)

6.5.5 Waste

The following tables present the GHG emissions associated with the waste generated from activities at AU campus.

	Unit	Consumption	tCO_2e	% of Total
Wastewater	m^3	36,068	17.673	92.54%
General Waste	ton	41.600	0.886	4.64%
Plastic Waste	ton	4.700	0.100	0.52%
Medical Waste	ton	19.240	0.410	2.14%
Food Waste	ton	1.400	0.030	0.16%
		Total	19.098	100.00%

Table 38. Scope 3 GHG Emissions of category 5 sources (2020 – 202).

General waste consists of general waste and paper/cardboard waste. Types of medical waste was estimated based on international best practice. The food waste provided by the in-campus cafeterias.

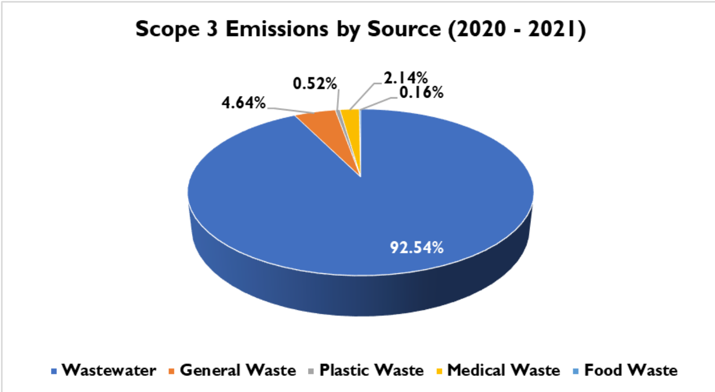


Figure 39. Scope 3 GHG Emissions of category 5 sources (2020 – 202).

	Unit	Consumption	tCO_2e	% of Total
Wastewater	m^3	73,026	18.870	90.20%
General Waste	ton	45.400	0.966	4.62%
Plastic Waste	ton	7.900	0.168	0.80%
Medical Waste	ton	41.100	0.875	4.18%
Food Waste	ton	1.880	0.040	0.19%
		Total	20.919	100%

Table 39. Scope 3 GHG Emissions of category 5 sources (2021 – 2022).

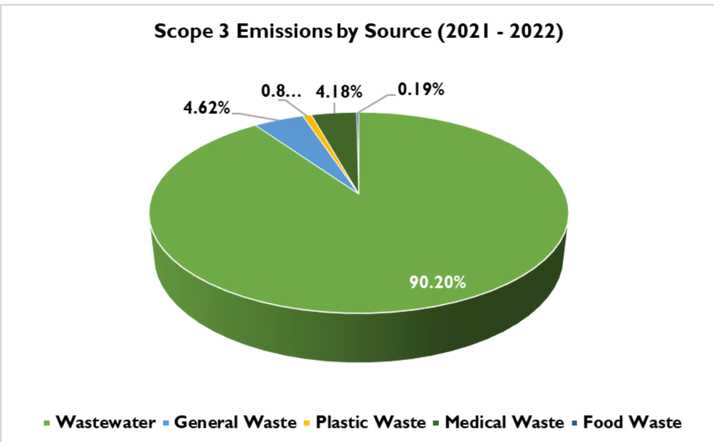


Figure 40. Scope 3 GHG Emissions of category 5 sources (2021 – 2022)

6.5.6 Employee and Student Commuting

The following tables present a summary of employee and student commuting during the base and performance years:

	Unit	Consumption	tCO_2e	% of Total
Employee Commuting	KM	5,713	0.952	11.84%
Student Commuting	KM	48,019.000	7.088	88.16%
		Total	8.040	100.00%

Table 40. Scope 3 GHG Emissions of category 7 sources (2020 – 2021).

The data provided for employee and student commuting was not complete. We used averaging and conservative approach to complete the missing data.

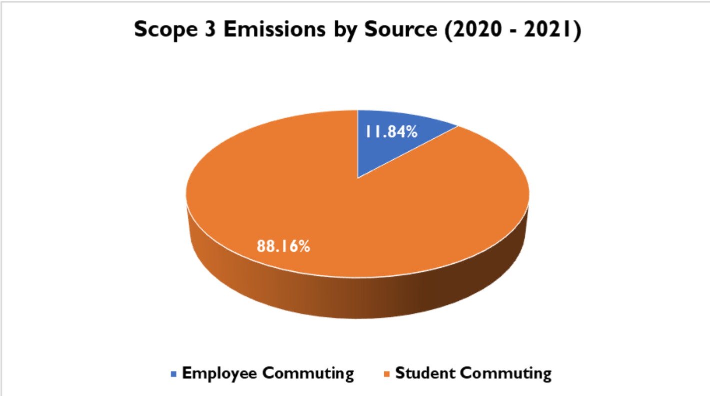


Figure 41. Scope 3 GHG Emissions of category 7 sources (2020 – 2021)

	Unit	Consumption	tCO_2e	% of Total
Employee Commuting	KM	11,968	1.978	13.29%
Student Commuting	KM	87,333.591	12.900	86.71%
		Total	14.597	100%

Table 41. Scope 3 GHG Emissions of category 7 sources (2021 – 2022).

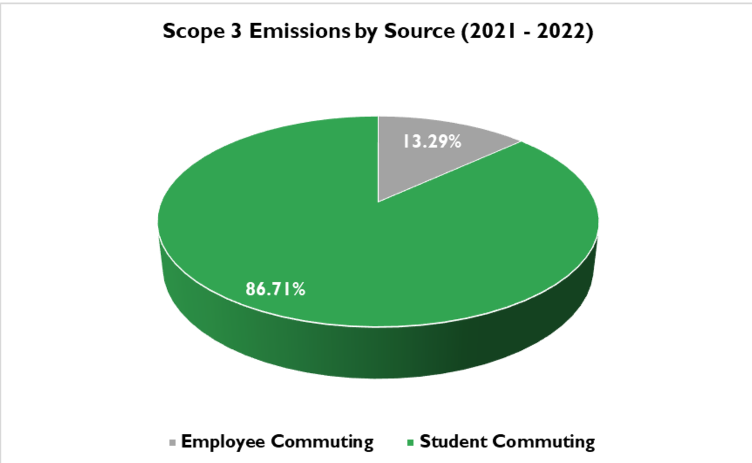


Figure 42. Scope 3 GHG Emissions of category 7 sources (2021 – 2022).

6.2.5.1 Employee Commuting

	FTEE	T Distance	tCO_2e	% of Total
Own Vehicle - KM	648	4,644.876	0.8096	80.31%
Own Vehicle - Passenger.Km	103	707.229	0.1233	12.23%
Public Transportation	0	-	-	0.00%
University Transportation	0	-	-	0.00%
Taxi	52	360.982	0.0752	7.46%
Total	803	5,713.087	1.0081	100%

Table 42. Scope 3 GHG Emissions – Employee Commuting (2020 – 2021).

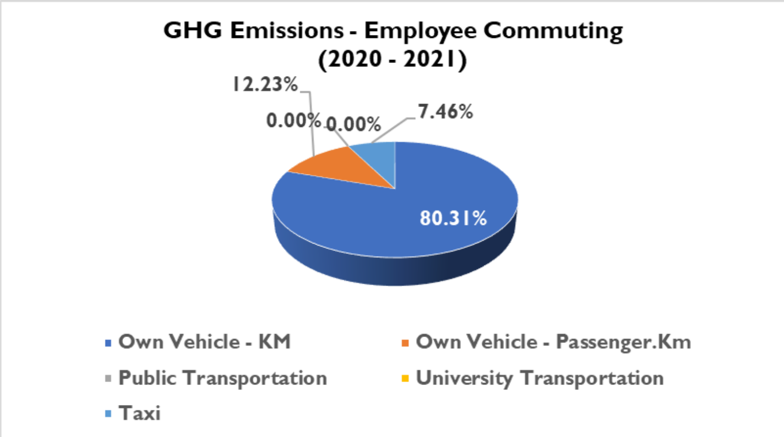


Figure 43. Scope 3 GHG Emissions – Employee Commuting (2020 – 2021).

	FTEE	T Distance	tCO_2e	% of Total
Own Vehicle - KM	656	9,705.441	1.692	81.39%
Own Vehicle - Passenger.Km	105	1,532.073	0.235	11.29%
Public Transportation	0	0	-	0.00%
University Transportation	0	0	-	0.00%
Taxi	52	730.954	0.152	7.32%
Total	813	11,968.468	2.079	

Table 43. Scope 3 GHG Emissions – Employee Commuting (2021 – 2022).

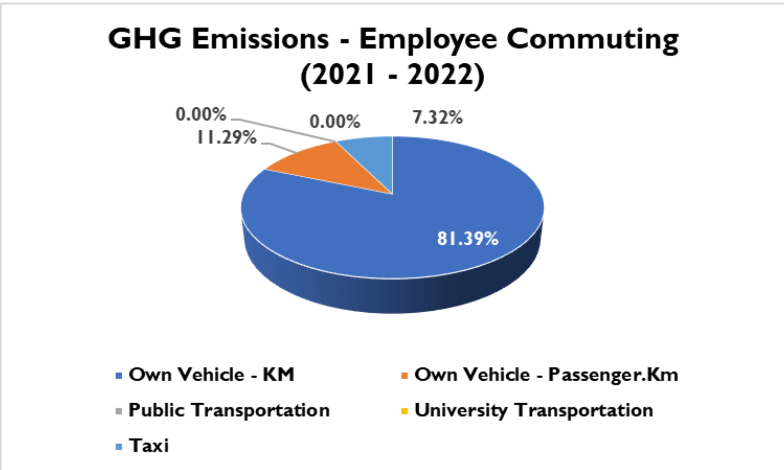


Figure 44. Scope 3 GHG Emissions – Employee Commuting (2021 – 2022)

6.2.5.2 Student Commuting

	FTSE	T Distance	tCO_2e	% of Total
Own Vehicle - KM	3,098	22,671.727	3.9519	53.0%
Own Vehicle - Passenger.Km	1,971	12,673.636	2.2091	29.6%
Public Transportation	282	3,520.455	0.3600	4.8%
University Transportation	845	9,153.182	0.9361	12.6%
Taxi	0	-	-	0%
Total	6,196	48,019.000	7.4572	100%

Table 44. Scope 3 GHG Emissions – Student Commuting (2020 – 2021).

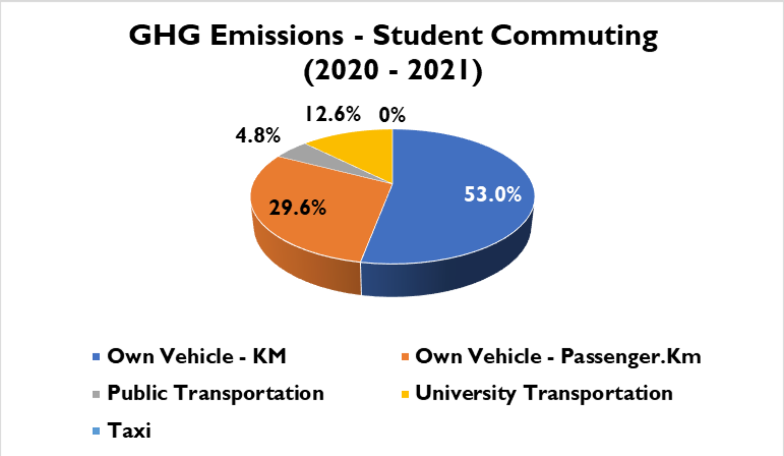


Figure 45. Scope 3 GHG Emissions – Student Commuting (2020 – 2021).

	FTSE	T Distance	tCO_2e	% Total
Own Vehicle - KM	2,769	41,527.500	7.2387	53.3%
Own Vehicle - Passenger.Km	1,762	22,903.045	3.9922	29.4%
Public Transportation	252	6,292.045	0.6435	4.7%
University Transportation	755	16,611.000	1.6988	12.5%
Taxi	-	-	0.00	0%
Total	5,537	87,333.591	13.5732	

Table 45. Scope 3 GHG Emissions – Student Commuting (2021 – 2022).

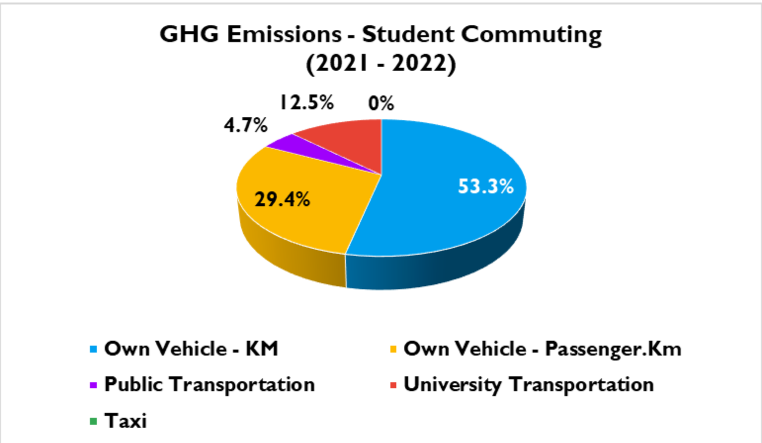


Figure 46. Scope 3 GHG Emissions – Student Commuting (2021 – 2022).

6.5.7 Other Energy Related Activities

In the context of GHG protocol, Well-to-Tank (WTT) is included as part of Scope 3 emissions. It refers to the emissions associated with the entire life cycle of a fuel, including its extraction, production, transportation, and distribution, up to the point where it is stored in a vehicle's fuel tank.

Based on the data provided by AU, the WTT related emissions are listed in the following table for the periods 2020 – 2021 and 2021 – 2022. Please note that the WTT emissions are added to category 3 &4, and category 6 in the respective tables and figures presented previously.

WTT Related Emissions		
	2020 - 2021	2021 - 2022
Scope 1	tCO2e	
LPG	92.650	92.650
Petrol	9.202	13.467
Diesel	12.816	25.906
Total Scope 1	114.668	132.023
Scope 3		
FTSE	tCO2e	
Own Vehicle - KM	1.108	2.029
Own Vehicle - Passenger.Km	0.619	1.119
Public Transportation	0.088	0.157
University Transportation	0.228	0.414
Taxi	0.00	0.00
Total FTSE	2.043	3.719
FTEE	tCO2e	
Own Vehicle - KM	0.227	0.474
Own Vehicle - Passenger.Km	0.035	0.075
Public Transportation	0.00	0.00
University Transportation	0.00	0.00
Taxi	0.018	0.037
Total FTEE	0.280	0.474
T&D F&B	0.300	0.300
Total WTT Emissions	**117.29**	**136.63**

Table 46. WTT Related Emissions.

6.6 Summary of Scope 3 GHG Emissions

AU provided most of the data required for calculating the Scope 3 GHG emissions. From the emission data of Scope 3 presented above, we note the following:

1. The tCO_2e of F&B during 2021 – 2022 is slightly higher than that in 2020 – 2021. This is because this year was the lockdown year. We expect the tCO_2e of F&B to increase during 2022 – 2023.
2. The tCO_2e of purchased goods remains almost the same during the two periods, but with slight deviation.
3. The tCO_2e of T&D of purchased electricity depends on the electricity consumption and the local energy parameters.
4. The tCO_2e of T&D of purchased and capital goods is unusually low. This is because relevant data for air, land, and see freights was not provided. We expect this emission will increase when accurate data is provided.
5. The tCO_2e of waste in both periods are approximately identical. We suggest that AU define a plan to reduce print paper consumption.
6. The tCO_2e of business travel was not calculated. This is because business travel data was not provided by AU.
7. The calculated data of tCO_2e of employee and student commuting was an approximate. This is because complete data was not provided. We suggest that AU implement a plan to collect commuting data from all employees and students.

7. DATA ASSUMPTION & ESTIMATION

The following table provides information about the data submitted by AU and methods used by Axosomatic to estimate the missing data:

Scope 1	Provided Data	Comments/Recommendations
Stationary Combustion	AU does not consume diesel and/oil for generation of electricity. AU provided consumption data of LPG, and no data was provided for Refrigerant Leakage	The provided LPG consumption was the same for each year. We suggest the LPG consumption be corrected to measure the consumed LPG per period and not the purchased volume. Axosomatic recommends that the refrigerant leakage be measured at each charging period.
Mobile Combustion	AU was able to provide data of the models and manufacturing years of their fleet of cars, buses, and other vehicles; and the petrol and diesel consumptions for each vehicle.	The provided data was very helpful to determine the GHG emissions with applying approximation.
Scope 2	**Provided Data**	**Comments/Recommendations**
Purchased Electricity	There are 13 buildings at the AU campus. AU provided the electricity consumptions of 12 buildings, for the two periods, and the water consumptions of 6 buildings for year 1, and 5 building for year 2.	The missing data of water consumptions slightly affected the scope 3 GHG emissions calculations.
Scope 3	**Provided Data**	**Comments/Recommendations**
Purchased goods and services	AU does not operate restaurants in its campus, but there are cafeterias operated by external business. Data about Food & Beverages, Printing Papers, Toilet Papers, Tissue Papers, Water, and Cloud Services were provided for the 2 periods.	We suggest that AU improves its procurement procedures, the product and process Life Cycle Assessment to improve data acquisition and GHG emissions calculation accuracy.
Capital goods	IT Equipment, Office Furniture, Medical Equipment	Sufficient data was provided to estimate the GHG emissions related to the IT equipment and furniture. Axosomatic used approximate data for the medical equipment at AU.
Fuel- and energy- related activities	Transmission and Distribution (T&D) losses of purchased electricity.	T&D losses of purchased electricity was based on the consumption of electricity provided by AU.
Upstream T&D	T&D of Purchased Good and Capital Good	Data for T&D of purchased goods was provided for the in-campus cafeterias only. AU was unable to provide similar data for all the goods purchased, such as LPG, papers, etc.
Waste generated in operations	Wastewater, General Waste, Medical Waste, Food Waste, Paper Waste.	AU provided complete data for all types of waste.
Business travel	Travel and accommodation of employees/contractors.	No data for business travel were provided.
Employee commuting	Employee commuting from and to AU.	AU provided partial data for employee and student commuting. Axosomatic applied statistical averaging and conservative approach to estimate the missing data.

Table 47. Data Assumption and Estimation.

ANNEX I

Lifetimes, radiative efficiencies and direct (except for CH4) GWPs relative to CO2. For ozone-depleting substances and their replacements, data are taken from IPCC/TEAP (2005) unless otherwise indicated.

Industrial Designation or Common Name	Chemical Formula	Lifetime (years)	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$)	Global Warming Potential for Given Time Horizon (years)			
				SAR‡ (100-yr)	20-yr	100-yr	500-yr
Carbon dioxide	CO_2	See below[a]	[b]1.4×10^{-5}	1	1	1	1
Methane[c]	CH_4	12[c]	3.7×10^{-4}	21	72	25	7.6
Nitrous oxide	N_2O	114	3.03×10^{-3}	310	289	298	153
Substances controlled by the Montreal Protocol							
CFC-11	CCl_3F	45	0.25	3,800	6,730	4,750	1,620
CFC-12	CCl_2F_2	100	0.32	8,100	11,000	10,900	5,200
CFC-13	$CClF_3$	640	0.25		10,800	14,400	16,400
CFC-113	CCl_2FCClF_2	85	0.3	4,800	6,540	6,130	2,700
CFC-114	$CClF_2CClF_2$	300	0.31		8,040	10,000	8,730
CFC-115	$CClF_2CF_3$	1,700	0.18		5,310	7,370	9,990
Halon-1301	$CBrF_3$	65	0.32	5,400	8,480	7,140	2,760
Halon-1211	$CBrClF_2$	16	0.3		4,750	1,890	575
Halon-2402	$CBrF_2CBrF_2$	20	0.33		3,680	1,640	503
Carbon tetrachloride	CCl_4	26	0.13	1,400	2,700	1,400	435
Methyl bromide	CH_3Br	0.7	0.01		17	5	1
Methyl chloroform	CH_3CCl_3	5	0.06		506	146	45
HCFC-22	$CHClF_2$	12	0.2	1,500	5,160	1,810	549
HCFC-123	$CHCl_2CF_3$	1.3	0.14	90	273	77	24
HCFC-124	$CHClFCF_3$	5.8	0.22	470	2,070	609	185
HCFC-141b	CH_3CCl_2F	9.3	0.14		2,250	725	220
HCFC-142b	CH_3CClF_2	17.9	0.2	1,800	5,490	2,310	705
HCFC-225ca	$CHCl_2CF_2CF_3$	1.9	0.2		429	122	37
HCFC-225cb	$CHClFCF_2CClF_2$	5.8	0.32		2,030	595	181
Hydrofluorocarbons							
HFC-23	CHF_3	270	0.19	11,700	12,000	14,800	12,200
HFC-32	CH_2F_2	4.9	0.11	650	2,330	675	205
HFC-125	CHF_2CF_3	29	0.23	2,800	6,350	3,500	1,100
HFC-134a	CH_2FCF_3	14	0.16	1,300	3,830	1,430	435
HFC-143a	CH_3CF_3	52	0.13	3,800	5,890	4,470	1,590
HFC-152a	CH_3CHF_2	1.4	0.09	140	437	124	38
HFC-227ea	CF_3CHFCF_3	34.2	0.26	2,900	5,310	3,220	1,040
HFC-236fa	$CF_3CH_2CF_3$	240	0.28	6,300	8,100	9,810	7,660
HFC-245fa	$CHF_2CH_2CF_3$	7.6	0.28		3,380	1030	314
HFC-365mfc	$CH_3CF_2CH_2CF_3$	8.6	0.21		2,520	794	241
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	15.9	0.4	1,300	4,140	1,640	500
Perfluorinated compounds							
Sulphur hexafluoride	SF_6	3,200	0.52	23,900	16,300	22,800	32,600
Nitrogen trifluoride	NF_3	740	0.21		12,300	17,200	20,700
PFC-14	CF_4	50,000	0.10	6,500	5,210	7,390	11,200
PFC-116	C_2F_6	10,000	0.26	9,200	8,630	12,200	18,200

Table 48. GWP 100 years for common gases.