Sustainable
Environmental
Services

اس اي اس
الخدمات البيئية المستدامة

Carbon Footprint Study

for

Misr University for Science & Technology

MUST

Prepared by

Sustainable Environmental Services Team

S.E.S.

2024-2025

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Executive Summary

This study outlines the key elements and deliverables that our experienced team will provide. This study includes establishing the project scope, defining

organizational boundaries and collecting data with precision and adherence to office standards. Our team of sustainability experts, data analysts, and subject matter specialists ensure the reliability and comprehensiveness of the data collection process.

Carbon footprint calculations methodology adheres to internationally recognized standards and incorporates industry-specific data collection techniques and emission factors. By considering the entire value chain and upstream emissions, study offers a holistic view of Misr University for Science & Technology (MUST) carbon footprint.

Using robust calculation methodologies, we analyze the collected data to determine carbon emissions across different scopes, including direct (Scope 1), indirect from energy consumption (Scope 2), and value chain emissions (Scope 3). This comprehensive approach will provide valuable insights into significant emission sources and opportunities for reduction.

Engaging our team guarantees accurate data analysis, valuable insights, and actionable recommendations for emission reduction and sustainability improvement. We are committed to supporting MUST sustainability goals and environmental stewardship.

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1. Introduction

In the context of growing global emphasis on environmental sustainability and corporate accountability, assessing and managing an institution's carbon footprint has become an essential component of responsible operations and long-term strategic planning. With increasing pressure from international climate frameworks and regulatory expectations, organizations are required to systematically measure, transparently report, and proactively reduce their greenhouse gas emissions.

Misr University for Science and Technology (MUST), located in 6th of October City, Giza, Egypt, is recognized as the first private university established in Egypt, with a student population exceeding 20,000. Since its founding in 1996, the university has built a strong reputation for delivering high-quality academic programs and demonstrating measurable progress in sustainability initiatives. Its continued commitment to excellence has positioned MUST as a leading institution in the higher education sector.

As a nationally accredited technological university, MUST provides a comprehensive and advanced educational system, supported by strong research capabilities and distinguished scholarship programs across a wide range of academic disciplines.

The university is fully licensed by the relevant educational authorities in Egypt and is authorized to confer B.A., B.S., M.A., M.S., and Ph.D. degrees in various fields. All academic programs are accredited by the Supreme Council of Universities in Egypt, ensuring compliance with national education standards.

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In addition, MUST maintains active membership in several reputable international and regional academic organizations, including the Association of Arab Universities, the International Association of University Presidents, and the Association of African Universities.

This study follows a rigorous and structured methodology for carbon footprint assessment. It begins with a clear definition of the study scope, including organizational boundaries and identified emission sources, to ensure a holistic evaluation of both direct and indirect emissions across institutional operations and the associated value chain.

A key pillar of this methodology is the collection of accurate, consistent, and verifiable data. The project team systematically gathers detailed information on energy consumption, fuel usage, transportation patterns, waste generation, and other relevant operational indicators required to produce a reliable and comprehensive carbon footprint assessment.

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2. Objectives

- Identify Emission Sources:

Through a comprehensive carbon footprint assessment, this study systematically identifies and evaluates the primary sources of greenhouse gas emissions across operational activities, supply chains, and the broader value chain. This analysis provides critical insights into the most carbon-intensive activities, enabling the development and prioritization of targeted and effective emission reduction strategies.

- Establish a Baseline:

This assessment establishes a baseline for MUST carbon footprint, serving as a reference point against which future progress can be measured. This baseline will enable you to track emissions over time, set reduction targets, and monitor the effectiveness of sustainability initiatives.

- Understand Hotspots and Drivers:

This study identifies emission "hotspots" within your operations, highlighting activities that contribute disproportionately to carbon footprint. By understanding the key drivers of emissions, you will be better equipped to implement targeted mitigation measures and optimize resource use.

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- Benchmarking and Comparison:

Through this assessment, we benchmark MUST carbon footprint against standards and best practices. This comparison will provide valuable insights into MUST relative performance and help identify opportunities for improvement and innovation.

- Provide Recommendations for Emission Reduction:

Based on the findings of the assessment, we provide practical recommendations and strategies for reducing MUST carbon footprint. These recommendations may include energy efficiency measures, adoption of renewable energy sources, supply chain optimizations, waste management improvements.

- Support Regulatory Compliance:

The assessment will ensure that MUST remain compliant with applicable environmental regulations and reporting requirements.

- Enhance Sustainability and Reputation:

By proactively addressing MUST carbon footprint, you will enhance sustainability profile and demonstrate a commitment to environmental responsibility. This can improve MUST brand reputation, attract environmentally conscious customers and investors, and strengthen relationships with stakeholders who prioritize sustainability.

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- Cost Optimization:

Identifying opportunities for emission reductions can lead to cost savings through improved energy efficiency, resource management, and waste reduction. Our assessment will help uncover potential areas for optimization, allowing you to reduce operational costs while minimizing environmental impact.

- Foster a Culture of Sustainability:

By engaging in this carbon footprint assessment, you will raise awareness and foster a culture of sustainability within your organization. The assessment findings and recommendations can serve as a catalyst for employee engagement, behavior change, and the integration of sustainable practices into MUST operations.

3. Scope of Work:

Define Organizational Boundaries:

• **Geographical Boundaries:** Clearly establish the geographical scope of the carbon footprint assessment. Specify whether the evaluation will cover a single campus, multiple facilities, or the entire organization operating across different regions or countries. Clearly delineate the physical boundaries within which emissions will be calculated to ensure accuracy and consistency of the assessment.

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Operational Boundaries:

Identify the operational units or departments within the organization that will be included in the carbon footprint assessment. This may encompass divisions, production sites, administrative offices, warehouses, or any other significant operational entities. Special attention should be given to the activities and processes within these units that directly contribute to the institution's carbon footprint.

Ownership and Control:

Clarify whether the assessment will account for emissions from facilities and operations that are fully owned and directly controlled by the university. For joint ventures or partnerships, explicitly determine whether their associated emissions will be included in the assessment or excluded, to ensure transparency and consistency in reporting.

Subsidiaries and Affiliates:

Determine whether the carbon footprint assessment will encompass emissions from subsidiaries, affiliated companies, or other entities under the university's ownership or control. Assess the degree of control and influence the university exercises over these entities, as well as their relative significance in contributing to overall emissions. This ensures a comprehensive and transparent accounting of all relevant emission sources.

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Supply Chain Considerations:

Assess whether the carbon footprint calculation will extend to include emissions associated with the university supply chain. This may involve upstream emissions from purchased goods and services, transportation of raw materials, or downstream emissions related to the use or disposal of the university products.

Exclusions:

Identify any specific emission sources or activities that will be excluded from the assessment due to technical limitations, data availability constraints, or other justifiable reasons. Clearly communicate the rationale for these exclusions to ensure transparency.

Identify Emission Sources:

Identify the key emission sources within the university operations, such as energy consumption (electricity, fuel), transportation (fleet, logistics), manufacturing processes, waste generation, and indirect emissions from purchased goods and services. Consider industry-specific emission sources and any unique aspects of the university operations.

Data Collection and Inventory:

Develop a comprehensive data collection plan to gather the necessary information for the carbon footprint calculation. This may involve collecting energy bills, fuel consumption records, waste generation data. Determine the appropriate data collection methods, frequency, and quality assurance processes.

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Calculation Methodology:

Specify the calculation methodology to be used, ensuring alignment with internationally recognized standards such as the Greenhouse Gas Protocol or ISO 14064. Describe the emission factors, conversion factors, and methodology for calculating both direct (Scope 1) and indirect (Scope 2) and value chain (Scope 3) emissions.

Quality Assurance and Validation:

Outline the quality assurance processes and validation measures to ensure the accuracy and reliability of the carbon footprint assessment. Consider internal and external review procedures, data validation techniques, and third-party verification options, if desired.

4. Methodology

Calculation Methodology for the Carbon Footprint Calculation Proposal:

The calculation methodology for the carbon footprint assessment will follow internationally recognized standards and guidelines, ensuring accuracy, credibility, and comparability. The proposed methodology includes the following steps:

4.1 Scope Definition:

Define the scope of the assessment based on the university operational boundaries, including direct emissions (Scope 1), indirect emissions from purchased electricity (Scope 2), and other indirect emissions along the value chain (Scope 3). Clearly outline the emission sources and categories to be considered within each scope.

4.2 Data Collection:

Collect comprehensive and reliable data on energy consumption, fuel use, transportation, waste generation, and other relevant activities. Obtain data from utility bills, energy meters, fleet records, production data, and other reliable sources. Ensure data quality and accuracy through validation and verification procedures.

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4.3 Calculation Formulas:

Calculate direct emissions (Scope 1) by multiplying activity data (e.g., fuel consumption) with respective emission factors for each greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide). Calculate indirect emissions from purchased electricity (Scope 2) by multiplying electricity consumption with the corresponding emission factor.

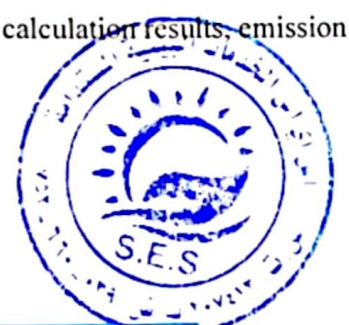
Calculate Scope 3 emissions by considering upstream and downstream emissions (measurements) associated with the value chain activities, using appropriate emission factors and activity data.

4.4 Calculation Tools:

Utilize specialized carbon footprint calculation software, spreadsheets, or online calculators to streamline and automate the calculation process. Ensure that the selected tools are compatible with the chosen methodology and provide reliable and accurate results.

4.5 Documentation and Reporting:

Document the calculation methodology, including the formulas, emission factors used, data sources, and any assumptions made. Provide transparent and detailed documentation to support the calculation process and ensure replicability and consistency. Prepare a comprehensive carbon footprint report that presents the calculation results, emission breakdowns, and associated uncertainties.



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5. Data Collection

The collected data from MUST listed in the below table:

No	Item	Quantity	Notes
1	Employees	Total 1765	1562 Staff 203 employees
2	University area	App. 145000 m^2	Buildings 100000 m^2 Gardens 40000 m^2
3	Electricity	12009271 kilo watts. h	yearly
4	Cars and travelled distances	a- 55 Buses for employees with total 12000 km travelled per day. (Never enter university) b- 25 Buses for students with a total of 4000 km travelled per day. (Never enter university) c- 440 cars belong to university staff with a total of 35200 km travelled per day. (300 cars only enter university – 4 km travelled inside daily)	yearly
5	Planes travelling yearly	16 trips – Total of 572900 km for all trips	Staff Conferences
6	Working hours	8 hours 5 days 6 hours for Thursday only Friday is a weekend	Weekly
7	Wastes generating	Average 750 kg (office paper + food waste)	Daily

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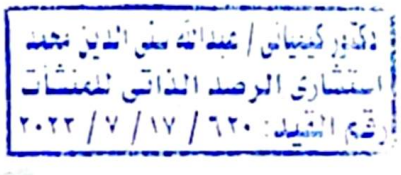

6. Carbon footprint Calculations:

First: Calculation of GHG emissions:
According to the standards, the main calculation formula is:

A	×	EF	=	E
(activity)		(emission factor $mtCO_2e$/unit)		(Greenhouse gas emissions)

Greenhouse gases emissions result for all activity will be:

No	Item	Emission factor	GHG Emissions/ unit	Total GHG emissions (yearly)
1	Electricity	4.33×10^{-4}	2634.25552	3951.38328
2	Average consumed petrol	8.78×10^{-4}	0.01756	5.268
3	Planes travelling	6.98×10^{-4}	18.01	288.16
4	Wastes generating	2×10^{-3}	1.66	86.41

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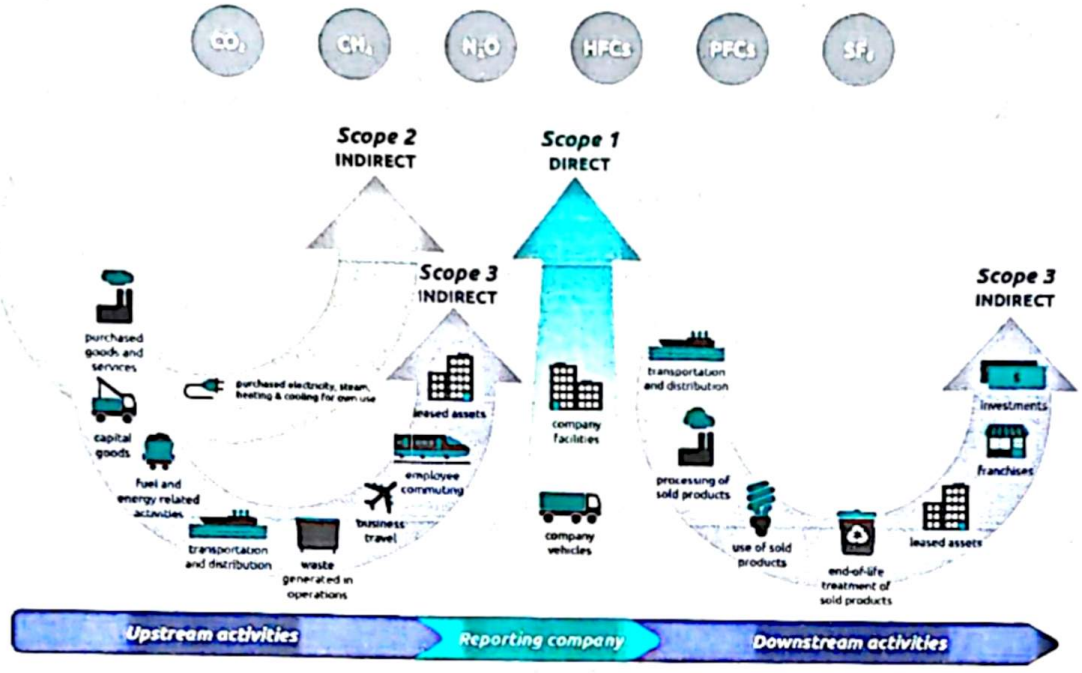
Second: Carbon footprint:

To calculate Carbon footprint there are three scopes must be applied as below:



<u>Scope 1: direct emissions:</u>

For MUST, we found that the direct emission is fuel consumption by university staff vehicles.

This direct carbon emission can be calculated by using the next equation:

$$\text{Emissions} = \text{Fuel} \times \text{CC} \times 44/12$$

Where:

Emissions = Mass of CO_2 emitted

Fuel = Mass or volume of fuel combusted

CC = Fuel carbon content, in units of mass of carbon per mass or volume of fuel

44/12 = ratio of molecular weights of CO_2 and carbon

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Mass of CO_2 emitted directly by MUST University = 2903.8 × 87% ×44/12

= 9263.122 kg daily

= 2778936.6 kg yearly

$mtCO_2eq$ = 2778.94 metric tons yearly

Scope 2: indirect emissions:
For MUST, we found that the indirect emission is electricity.
This indirect carbon emission can be calculated by using the next equation:

Emissions = Electricity x EF

Where:
Emissions = Mass of CO_2 emitted
Electricity = Quantity of electricity purchased
EF = CO_2 emission factor

Mass of CO_2 emitted indirectly by MUST = 61292292 × 0.237 = 1452627.32 kg yearly

$mtCO_2eq$ = 1452.62732 metric tons yearly

<u>Total energy generated from Solar Cells:</u>

2897.346 MWh = 2897346 kWh

Mass of CO_2 emitted indirectly by MUST (Solar Cells) = 2897346 × 0.237 = 686671.002 kg yearly

$mtCO_2eq$ = 686.671002 metric tons yearly

Mass of CO_2 Absorbed indirectly by MUST = 2897346 × 0.237 = 686671.002 kg yearly

$mtCO_2eq$ = 686.671002 metric tons yearly

This Value is calculated as a minus value from the total emitted CO_2eq which emitted from the university campus.

So, The Scope 2 mass of CO_2 indirectly by MUST is:

$mtCO_2eq$ = Electricity – Solar = 759.9563 metric tons yearly

Scope 3: value chain and indirect emissions:

First: Indirect emissions:
Waste generating – Business travelling (aircraft)

A- Waste emissions = Weight of paper (kg) x EF
= $39000 \times 2 \times 10^{-2}$ = 780 kg yearly

B- Business travelling emissions (Planes) = Number of kilometers (units) x EF
= $322900 \times 6.98 \times 10^{-4}$ = 225.3842 kg yearly

C- Business travelling emissions (Car) = Number of kilometers (units) x EF
= 35200 × 0.174 = 6124.8 kg yearly

D- Water Consumption emissions = Number of consumed water by cubic meters x EF
= $239460 \times 4.2 \times 10^{-2}$ = 10057.32 kg yearly

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Second: value chain:

A- Staff Commuting = Number of kilometers (units) x EF
= 3600000 × 0.185 = 666000 kg yearly

B- Student Commuting = Number of kilometers (units) x EF
= 1500000 × 0.185 = 277500 kg yearly

Scope 3 Total is:

$mtCO_2eq$ = 960.6875042 metric tons yearly

Misr University for Science & Technology directly and indirectly Carbon Emission (Carbon footprint) = 2778.94 + 759.9563 + 960.6875042 = 4499.5838042 mt CO2e

7. Conclusion

Misr University for Science & Technology is one of the pioneers in the field of calculating carbon footprints to achieve the normal conditions of carbon emissions to cooperation between human beings to avoid the damage effects of climate change.

MUST Carbon footprint emission is low. We will work harder to make it lower till reach zero-carbon emission.

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"Calculation of the Carbon Footprint Emissions for Each Building."

Building	Basement	Ground	First	Second	Third	Total Area	% of Total Area	Carbon footprint (mt CO2e)
Student Services Building	4508.71	4134.16	4204.58	4208.67	4210.95	21267.07	14.67%	660.0889
Media Building	0	3950	3950	3950	3950	15800	10.90%	490.4546
Engineering Building	0	4375.5	4375.5	4375.5	4375.5	13126.5	9.05%	407.2123
Hospital	0	1665	1665	1665	1665	4995	3.44%	154.7857
Administration & Opera Hall	657	5444	4959.5	4959.5	0	16020.0	11.05%	497.204
Central Library	0	2964.5	3980.25	3980.25	0	10925.0	7.53%	338.8187
Air Conditioning Building	1925	1925	0	0	0	3850	2.66%	119.6889
Mosque & Events Hall	0	1720	0	0	0	1720	1.19%	53.545
Football Fields	0	4230	0	0	0	4230	2.92%	131.3878
Gym - Mall	0	1120	1120	0	0	1120	0.77%	34.6468
Squash Courts	0	222	0	0	0	222	0.15%	6.7494
Tennis Courts	0	3900	0	0	0	3900	2.69%	121.0388
Athletics Courts	0	260	0	0	0	260	0.18%	8.0993
Basketball Courts	0	560	0	0	0	560	0.39%	17.5484
Cafeterias	0	1650	0	0	0	1650	1.14%	51.2953

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Carbon Final Calculations

1. Scope 1:-

Source		Diesel (vehicles)	Gasoline (vehicles)	Natural Gas (boilres)	LPG	Propan
Year	unit	liters	liters	cubic meters	liters	liters
2024/2025	Annual usage	15000	30000	0	0	0
	emission factor (kg Co2e/unit)	0.87*44/12	0.87*44/12	0	0	0
	total emissions (kgCO2e)	47850 (47.85 ton)	95700 (95.7 ton)		0	0
2023/2024	Annual usage	12000	24000	0	0	0
	emission factor (kg Co2e/unit)	0.87*44/12	0.87*44/12	0	0	0
	total emissions (kgCO2e)	38280 (38.28 ton)	76560 (76.56 ton)	0	0	0

1. Scope 1 final Numbers:-

Item	Year	tCo2e
Direct Fuel Carbon Emissions (Scope 1)	2024/2025	2778.94
	2023/2024	2223.15

2. Scope 2:-

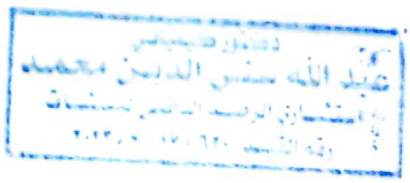
Year	Annual usage	Unit	Emission factor (kg Co2e/unit)	Total emissions (kg CO2e)	Total emissions (tCO2e)
2024/2025	61292292	kw.h/year	0.237	1452627.32	1452.6273
2023/2024	59305408	kw.h/year	0.237	14055381.7	1405.5382
Renewable energy Solar Cells 2024/2025	2897346	kw.h/year	0.237	686671.002	686.671
Solar Cells 2023/2024 (not from previous report)	398537	kw.h/year	0.237	94453.269	94.4533

Scope 2 final Numbers:

Item	Year	tCo2e
Energy Consumption Carbon Emissions (Scope 2)	2024/2025	Electricity - Solar = 759.9563
	2023/2024	Electricity - Solar = 1311.0849

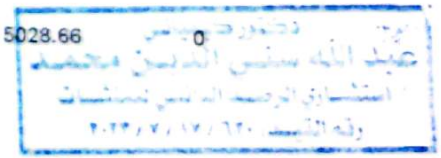
Scope 1 & 2 final Numbers:

Item	Year	tCo2e
Carbon Emissions (Scope 1 & 2)	2024/2025	2778.94 + 759.9563 = 3538.8963
	2023/2024	2223.15 + 1311.0849 = 3534.2349



Scope 3 Total:

Category6.		Staff Commuting	Student Commuting	Business Travel (Car)	Business Travel (Air)	Purchased Goods	Waste Disposal	Water Consumption	Wastewater Treatment
Year	**Unit description**	**km/year**	**km/year**	**km/year**	**km/year**	**kg/year**	**kg/year**	**m^3/year**	**m^3/year**
	Annual usage	3600000	1500000	35200	322900	0	39000	239460	0
2024/2025	**emission factor (kg Co2e/unit)**	0.185	0.185	0.174	6.98*10-4	0	$2*10^{-2}$	$4.2*10^{-2}$	0
	total emissions (kgCO2e)	666000	277500	6124.8	35325.431	0	780	10057.32	0
	Annual usage	3600000	1500000	35200	10000	0	3120	119730 (not included in previous report)	0
2023/2024	**emission factor (kg Co2e/unit)**	0.185	0.185	0.174	6.98*10-4	0	$2*10^{-2}$	$4.2*10^{-2}$	0
	total emissions (kgCO2e)	666000	277500	6124.8	6.98	0	62.4	5028.66	0

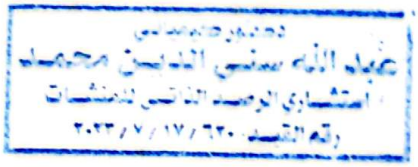


Scope 3 Total

Year	Total emission (tCO2e)
2024/2025	995.697551
2023/2024	954.72604

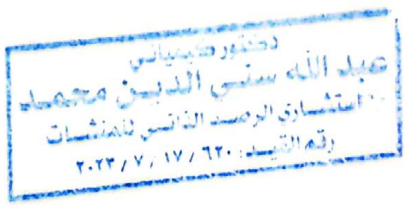
Carbon Emissions

Year	Scope 1 and 2 Total emission (tCO2e)	Scope 3 Total emission (tCO2e)	Total Carbon emission (tCO2e)
2024/2025	3538.8963	995.697551	4534.593851
2023/2024	3534.2349	954.72604	4488.96094



"Calculation of the Carbon Emissions for Each Building." Year 2023/2024

Building	Basement	Ground	First	Second	Third	Total Area	% of Total Area	Carbon footprint (t CO2e)
Student Services Building	4508.71	4134.16	4204.58	4208.67	4210.95	21267.07	14.67%	658.63067
Media Building	0	3950	3950	3950	3950	15800	10.90%	489.2967
Engineering Building	0	4375.5	4375.5	4375.5	4375.5	13126.5	9.05%	406.2509
Hospital	0	1665	1665	1665	1665	4995	3.44%	154.4203
Administration & Opera Hall	657	5444	4959.5	4959.5	0	16020.0	11.05%	496.0302
Central Library	0	2964.5	3980.25	3980.25	0	10925.0	7.53%	338.01876
Air Conditioning Building	1925	1925	0	0	0	3850	2.66%	119.4064
Mosque & Events Hall	0	1720	0	0	0	1720	1.19%	53.4186
Football Fields	0	4230	0	0	0	4230	2.92%	131.0776
Gym - Mall	0	1120	1120	0	0	1120	0.77%	34.565
Squash Courts	0	222	0	0	0	222	0.15%	6.7334
Tennis Courts	0	3900	0	0	0	3900	2.69%	120.753
Athletics Courts	0	260	0	0	0	260	0.18%	8.0801
Basketball Courts	0	560	0	0	0	560	0.39%	17.5069
Cafeterias	0	1650	0	0	0	1650	1.14%	51.1742



"Calculation of the Carbon Emissions for Each Building." Year 2024/2025

Building	Basement	Ground	First	Second	Third	Total Area	% of Total Area	Carbon footprint (t CO2e)
Student Services Building	4508.71	4134.16	4204.58	4208.67	4210.95	21267.07	14.67%	665.2246
Media Building	0	3950	3950	3950	3950	15800	10.90%	494.2704
Engineering Building	0	4375.5	4375.5	4375.5	4375.5	13126.5	9.05%	410.3805
Hospital	0	1665	1665	1665	1665	4995	3.44%	155.9899
Administration & Opera Hall	657	5444	4959.5	4959.5	0	16020.0	11.05%	501.0723
Central Library	0	2964.5	3980.25	3980.25	0	10925.0	7.53%	341.4547
Air Conditioning Building	1925	1925	0	0	0	3850	2.66%	120.6201
Mosque & Events Hall	0	1720	0	0	0	1720	1.19%	53.9616
Football Fields	0	4230	0	0	0	4230	2.92%	132.4101
Gym - Mall	0	1120	1120	0	0	1120	0.77%	34.9163
Squash Courts	0	222	0	0	0	222	0.15%	6.8019
Tennis Courts	0	3900	0	0	0	3900	2.69%	121.9805
Athletics Courts	0	260	0	0	0	260	0.18%	8.1623
Basketball Courts	0	560	0	0	0	560	0.39%	17.6849
Cafeterias	0	1650	0	0	0	1650	1.14%	51.6943