



# CARBON FOOTPRINT REPORT

2024 – 2025  
BASELINE YEAR: 2019

AN-NAJAH NATIONAL UNIVERSITY



## Executive Summary

This report presents a comprehensive assessment of greenhouse gas (GHG) emissions at An-Najah National University (ANNU) covering the period 2019–2025, in alignment with the Greenhouse Gas (GHG) Protocol. Emissions are categorized into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity), and Scope 3 (other indirect emissions across the value chain).

The year 2025 marks a significant institutional milestone in ANNU's decarbonization pathway. Total gross emissions declined to **381.30 tCO<sub>2</sub>e**, representing a **93.4% reduction compared to the 2019 baseline (5,774.139 tCO<sub>2</sub>e)**. This substantial reduction reflects structural transformation rather than temporary fluctuation.

Most notably:

- **Scope 2 emissions remained at zero**, confirming full reliance on renewable electricity.
- Renewable energy generation reached **4,580,168 kWh**, exceeding total campus electricity demand.
- Scope 1 emissions continued to decline through reduced diesel consumption and improved refrigerant management.
- Scope 3 emissions decreased due to lower commuting intensity, optimized procurement, improved waste management, and increased digital efficiency.

The university now operates as a **net renewable energy producer**, reinforcing its commitment to environmental stewardship, operational efficiency, and climate responsibility.

ANNU remains firmly on track to achieve its **2028 Net Zero target**, supported by measurable reductions, institutional policy integration, and infrastructure modernization.

## Methodology

ANNU's carbon emissions calculations adhere to internationally recognized protocols, including the Greenhouse Gas (GHG) Protocol. This assessment considers Scope 1, 2, and 3 emissions, encompassing both direct and indirect emissions from owned or controlled sources and purchased energy consumption. We ensure accurate emissions quantification by accounting for the carbon intensity of energy sources.

## Data Sources

Data for this report is gathered from various university departments and facilities, including energy consumption records, travel data, and procurement activities, ensuring a robust dataset for analysis.

## GHG Protocol Scopes

→ Scope 1: emissions produced by fuel combustion on site such as gas boilers, fleet vehicles; by physical or chemical processes and from fugitive emissions such as air-conditioning, refrigeration or pipework leaks.

→ Scope 2: emissions that are due to purchased or acquired electricity, steam, heat and cooling.

→ Scope 3: indirect emissions that derive from activities of the organization from sources that they do not own or control. These are usually the greatest share of the carbon footprint, covering emissions associated with business travel, employee commuting, procurement (i.e. supply chain), leased assets, waste, and water.

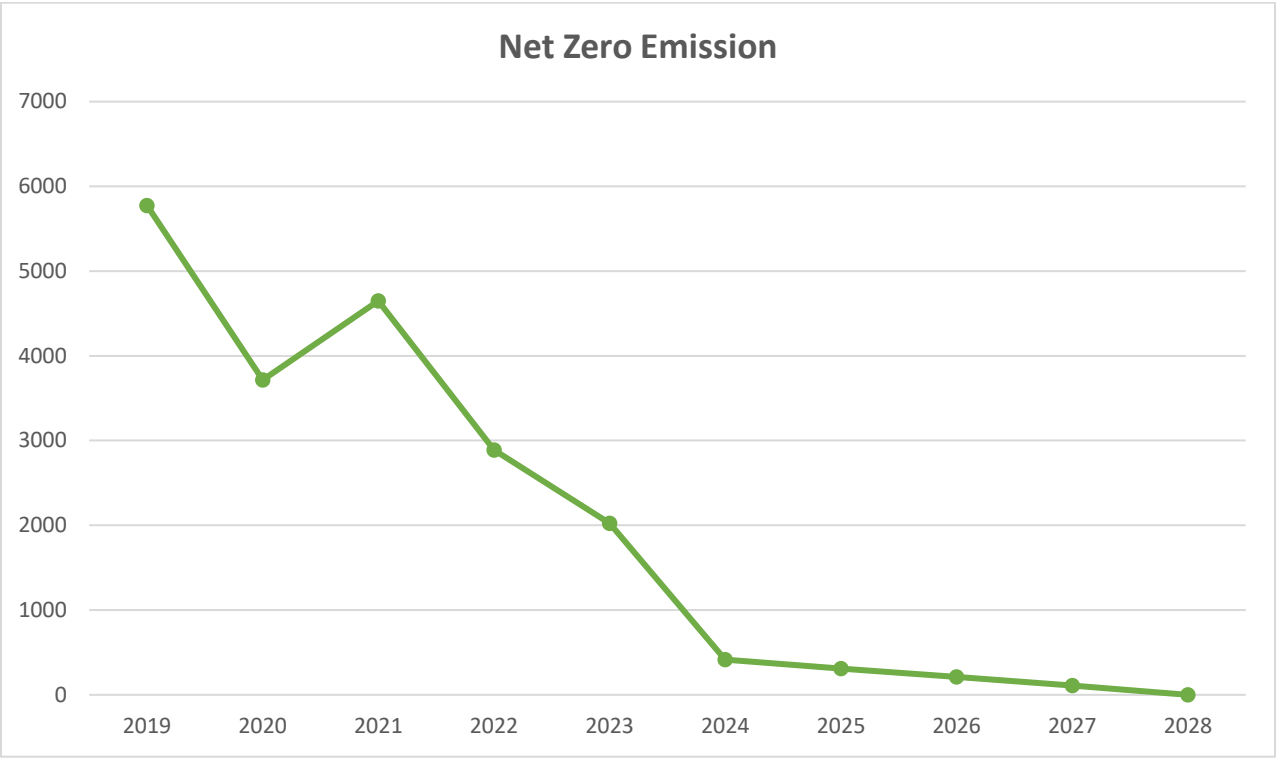
→ Other reporting: emissions which are not included under Scope 1-3 but which the University may opt to report – such as student commuting and relocation.

### **GHG emissions for ANNU (2019 – 2025)**

| CO2-e emissions (tons)       |                                                                                  | Reporting Year          |         |         |         |         |        |        |
|------------------------------|----------------------------------------------------------------------------------|-------------------------|---------|---------|---------|---------|--------|--------|
| Associated Inventory/Service |                                                                                  | 2019<br>(Baseline year) | 2020    | 2021    | 2022    | 2023    | 2024   | 2025   |
| Scope 1 (tCO2e)              | Natural Gas, Transport Fuels, Stationary Fuels, Refrigerants, Waste-Incineration | 515.188                 | 266.431 | 191.939 | 316.538 | 288.276 | 254.33 | 239.07 |
| Scope 2 (tCO2e)              | Purchased Electricity                                                            | 4970                    | 3353    | 3290    | 2275    | 1470    | 0      | 0      |

|                                                         |                                                                                                                                                                                                    |             |             |              |             |             |           |           |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|--------------|-------------|-------------|-----------|-----------|
| <b>Scope 3 (tCO2e)</b>                                  | Equipment, Employee Commute, Flights, Third Party Services, Off-site Waste Disposal, spare, Transmission & Distribution losses, Fuel Extraction, Production & Distribution losses, Other Utilities | 288.951     | 97.079      | 1164.673     | 296.405     | 264.950     | 162.64    | 142.23    |
| <b>Gross Total (scope 1 &amp; 2) (tCO2e)</b>            |                                                                                                                                                                                                    | 5485.188    | 3619.431    | 3481.939     | 2591.5383   | 1758.276    | 254.33    | 239.07    |
| <b>Gross Total (scope 1, 2 &amp; 3) (tCO2e)</b>         |                                                                                                                                                                                                    | 5774.139    | 3716.51     | 4646.612     | 2887.9433   | 2023.226    | 416.97    | 381.30    |
| <b>Energy Consumption (kWh)</b>                         |                                                                                                                                                                                                    | 7,304,843.4 | 5,668,451.9 | 6,556,062.3  | 5,214,891.7 | 4,916,629.5 | 1,572,222 | 1,400,278 |
| <b>Energy generated through renewable sources (kWh)</b> |                                                                                                                                                                                                    | 173,442.57  | 868,804.88  | 1,852,978.6  | 1,950,354.9 | 2,829,351.1 | 3,320,168 | 4,580,168 |
| <b>Energy Purchased (kWh)</b>                           |                                                                                                                                                                                                    | 7,131,400.8 | 4,799,647.0 | 4,703,083.63 | 3,264,537.8 | 2,087,278.4 | 0         | 0         |
| <b>Total campus building footprint (m2)</b>             |                                                                                                                                                                                                    | 540404.5    |             |              |             |             |           |           |

**Our Zero Carbon Plan has a 2028 target of net zero emissions and 93.4 percent reduction in gross carbon emissions compared to our 2019 baseline.**



**GHG Inventory Calculations**

Detailed calculations are provided for Scope 1, 2, and 3 emissions, including natural gas, transport fuels, refrigerant gases, purchased electricity, business travel, commuting, procurement, waste disposal, and ICT equipment.

**Scope 1 – Direct GHG Emissions**

**1 - Natural Gas**

As part of our ongoing commitment to monitor and mitigate greenhouse gas (GHG) emissions, ANNU transparently documents the use of natural gas, a significant contributor to our overall emissions profile. This report specifically addresses the direct emissions (Scope 1) stemming from our on-site utilization of natural gas, with calculations based on data from the base year 2019.

| Year | Natural Gas Consumption (kg) | Estimated GHG Emissions (kg CO <sub>2</sub> )                     | Estimated GHG emissions (tCO <sub>2</sub> e) |
|------|------------------------------|-------------------------------------------------------------------|----------------------------------------------|
| 2019 | 339                          | 339 kg * 3.01 kg CO <sub>2</sub> /kg = 1020.39 kg CO <sub>2</sub> | 1.02039                                      |
| 2020 | 98                           | 98 kg * 3.01 kg CO <sub>2</sub> /kg = 294.98 kg CO <sub>2</sub>   | 0.29498                                      |
| 2021 | 485                          | 485 kg * 3.01 kg CO <sub>2</sub> /kg = 1459.85 kg CO <sub>2</sub> | 1.45985                                      |
| 2022 | 438                          | 438 kg * 3.01 kg CO <sub>2</sub> /kg = 1318.38 kg CO <sub>2</sub> | 1.31838                                      |
| 2023 | 484                          | 484 kg * 3.01 kg CO <sub>2</sub> /kg = 1456.84 kg CO <sub>2</sub> | 1.45684                                      |
| 2024 | 412                          | 412 kg * 3.01 kg CO <sub>2</sub> /kg = 1240.12 kg CO <sub>2</sub> | 1.24012                                      |
| 2025 | 395                          | 395 kg * 3.01 kg CO <sub>2</sub> /kg = 1.189kg CO <sub>2</sub>    | 1.18900                                      |

## 2 - Fuels (Diesel Consumption)

Our operations involve the use of a variety of transport & non-transport fuels, including those used for generators, boilers, maintenance equipment, and other campuses operations. The GHG emissions from non-transport diesel fuel can be calculated using the emission factor for diesel fuel. According to the United States Environmental Protection Agency (EPA), the emissions factor for diesel fuel is approximately 2.688 kg CO<sub>2</sub>/litre when combusted.

| Year | Diesel Consumption (litres) | Estimated GHG Emissions (kg CO <sub>2</sub> ) | Estimated GHG emissions (tCO <sub>2</sub> e) |
|------|-----------------------------|-----------------------------------------------|----------------------------------------------|
| 2019 | 183250                      | 492576                                        | 492.576                                      |
| 2020 | 97670                       | 262536.96                                     | 262.536                                      |
| 2021 | 60000                       | 161280                                        | 161.280                                      |
| 2022 | 108080                      | 290520                                        | 290.520                                      |

|      |        |        |         |
|------|--------|--------|---------|
| 2023 | 92919  | 260520 | 260.520 |
| 2024 | 85123  | 228810 | 228.810 |
| 2025 | 80,000 | 215040 | 215.04  |

### 3 - Refrigerant Gases

Emissions from leakage of refrigerants from cooling equipment were also part of our inventory. These were calculated using the total amount of each type of refrigerant refilled during the year, the associated global warming potential (GWP), and the specific leakage rate. The total emissions from refrigerant gases were approximately 22.84 metric tons of CO<sub>2</sub> equivalent in 2025.

Refrigerant gases are used in a variety of applications at ANNU, including air conditioning in buildings and vehicles, refrigeration in kitchens, and various laboratory equipment. Since these gases have high global warming potentials (GWPs), they contribute to the University's greenhouse gas (GHG) emissions. In this section, we will calculate the GHG emissions associated with the use of these refrigerant gases from 2019 through 2025.

#### 2019:

- Refrigerators (R134a): 2 kg, Emissions = 2 kg \* 1430 GWP = 2.8 tCO<sub>2</sub>e
- Air Conditioning (R410a): 9 kg, Emissions = 9 kg \* 2088 GWP = 18.792 tCO<sub>2</sub>e

#### 2020:

- Refrigerators (R134a): 0.85 kg, Emissions = 0.85 kg \* 1430 GWP = 1.2 tCO<sub>2</sub>e
- Air Conditioning (R410a): 1.15 kg, Emissions = 1.15 kg \* 2088 GWP = 2.4 tCO<sub>2</sub>e

#### 2021:

- Refrigerators (R134a): 3 kg, Emissions = 3 kg \* 1430 GWP = 4.2 tCO<sub>2</sub>e
- Air Conditioning (R410a): 12 kg, Emissions = 12 kg \* 2088 GWP = 25 tCO<sub>2</sub>e

**2022:**

- Refrigerators (R134a): 2 kg, Emissions = 2 kg \* 1430 GWP = 2.8 tCO<sub>2</sub>e
- Air Conditioning (R410a): 10.5 kg, Emissions = 10.5 kg \* 2088 GWP = 21.9 tCO<sub>2</sub>e

**2023:**

- Refrigerators (R134a): 2.6 kg, Emissions = 2.6 kg \* 1430 GWP = 3.8 tCO<sub>2</sub>e
- Air Conditioning (R410a): 10.7 kg, Emissions = 10.7 kg \* 2088 GWP = 22.5 tCO<sub>2</sub>e

**2024:**

- Refrigerators (R134a): 2.3 kg, Emissions = 2.3 kg \* 1430 GWP = 3.2 tCO<sub>2</sub>e
- Air Conditioning (R410a): 10.1 kg, Emissions = 10.1 kg \* 2088 GWP = 21.08 tCO<sub>2</sub>e

**2025:**

- Refrigerators (R134a): 2.1 kg, Emissions = 2.1 kg \* 1430 GWP = 3.003 tCO<sub>2</sub>e
- Air Conditioning (R410a): 9.5 kg, Emissions = 9.5 kg \* 2088 GWP = 19.836 tCO<sub>2</sub>e

| Year | Refrigerators (R134a)<br>emissions (tCO <sub>2</sub> e) | Air Conditioning (R410a)<br>emissions (tCO <sub>2</sub> e) | Total GHG emissions<br>from refrigerant gases<br>(tCO <sub>2</sub> e) |
|------|---------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------|
| 2019 | 2.8                                                     | 18.792                                                     | 21.5                                                                  |
| 2020 | 1.2                                                     | 2.4                                                        | 3.6                                                                   |
| 2021 | 4.2                                                     | 25                                                         | 29.2                                                                  |
| 2022 | 2.8                                                     | 21.9                                                       | 24.7                                                                  |
| 2023 | 3.8                                                     | 22.5                                                       | 26.3                                                                  |
| 2024 | 3.2                                                     | 21.08                                                      | 24.28                                                                 |
| 2025 | 3.0                                                     | 19.8                                                       | 22.84                                                                 |

## **Scope 2 – Energy Indirect GHG Emissions**

Baseline Year:

The baseline year for our calculations is 2019, providing a benchmark to assess the university's operations before significant energy conservation and sustainability initiatives were implemented.

Methodology:

To determine the GHG emissions associated with our electricity consumption, we utilized average emissions factors provided by the International Energy Agency (IEA). Specifically, for electricity generated from diesel power plants in non-OECD countries, the emissions factor is approximately 0.7 kg of CO<sub>2</sub> per kilowatt-hour (kWh) consumed.

We gathered total electricity consumption data from ANNU's electricity invoices for each relevant year. By multiplying the energy consumed (in kWh) by the emissions factor (in kg CO<sub>2</sub>/kWh), we estimated the CO<sub>2</sub> emissions for that year using the following calculation formula:

CO<sub>2</sub> emissions (kg) = Electricity consumption (kWh) x Emission factor (kg CO<sub>2</sub>/kWh)

| Year | Electricity Purchased (million kWh) | Estimated GHG Emissions (thousand tCO <sub>2</sub> e) |
|------|-------------------------------------|-------------------------------------------------------|
| 2019 | 7.10                                | 4.970                                                 |
| 2020 | 4.79                                | 3.353                                                 |
| 2021 | 4.70                                | 3.290                                                 |
| 2022 | 3.25                                | 2.275                                                 |
| 2023 | 2.10                                | 1.470                                                 |
| 2024 | 0                                   | 0                                                     |
| 2025 | 0                                   | 0                                                     |

Electricity Consumption = Electricity Purchased + Electricity used by RES

| Year | Electricity Consumption (million kWh) |
|------|---------------------------------------|
| 2019 | 7.3                                   |
| 2020 | 5.6                                   |

|      |     |
|------|-----|
| 2021 | 6.5 |
| 2022 | 5.2 |
| 2023 | 3.2 |
| 2024 | 1.5 |
| 2025 | 1.4 |

### **Scope 3 – Other Indirect GHG Emissions**

#### **1- Business Travel**

Business travel encompasses various modes of transportation such as air, rail, personal car, rental car, and bus. Data for business travel was gathered from invoices and travel logs. GHG emissions are computed based on the distance traveled, type of vehicle, and specific emission factors associated with each mode of transport.

Calculation Methodology:

GHG emissions were determined by multiplying the total distance traveled (in kilometers) by an average emission factor of 2.68 kg CO<sub>2</sub>e per liter and assuming an average fuel efficiency of 10 kilometers per liter (km/L).

| Year | Estimated Trips | Average Distance per Trip (km) | Total Distance (km) | GHG Emissions (tCO <sub>2</sub> e) |
|------|-----------------|--------------------------------|---------------------|------------------------------------|
| 2019 | 130             | 102                            | 13260               | 3.553                              |
| 2020 | 30              | 50                             | 1500                | 0.402                              |
| 2021 | 50              | 180                            | 9000                | 2.412                              |
| 2022 | 140             | 350                            | 49000               | 13.13                              |
| 2023 | 120             | 150                            | 18000               | 4.824                              |
| 2024 | 108             | 143                            | 15444               | 4.138                              |
| 2025 | 100             | 130                            | 13,000              | 3.484                              |

## 2 - Student and Staff Commuting

Student and staff commuting refers to transportation to and from the university. Data for commuting was obtained from surveys and university records. GHG emissions are computed based on the distance traveled, mode of transport, and specific emission factors.

Calculation Methodology:

GHG emissions were determined by multiplying the total distance traveled (in kilometers) by an average emission factor of 2.68 kg CO<sub>2</sub>e per liter (kg CO<sub>2</sub>e/L) and assuming an average fuel efficiency of 10 kilometers per liter (km/L).

| Year | Estimated Commuters | Average Distance per Day (km) | Total Distance (km) | GHG Emissions (tCO <sub>2</sub> e) |
|------|---------------------|-------------------------------|---------------------|------------------------------------|
| 2019 | 8709                | 20                            | 174180              | 46.68                              |
| 2020 | 400                 | 20                            | 8000                | 2.144                              |
| 2021 | 600                 | 20                            | 12000               | 3.216                              |
| 2022 | 7000                | 20                            | 140000              | 37.52                              |
| 2023 | 5500                | 20                            | 110000              | 29.48                              |
| 2024 | 2500                | 20                            | 50000               | 13.400                             |
| 2025 | 2000                | 20                            | 40,000              | 10.75                              |

## 3 - Purchased Goods and Services

This category encompasses various purchases such as paper, printing, and other goods and services. Data for these purchases was collected from invoices and purchasing records.

Calculation Methodology:

For each \$1,000 spent, it is assumed to result in approximately 0.4 metric tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e), based on a rough global average according to the World Resources Institute (WRI).

| Year | Total Expenditure (\$) | GHG Emissions (tCO <sub>2</sub> e) |
|------|------------------------|------------------------------------|
| 2019 | 70632.34               | 28.252                             |
| 2020 | 31984.47               | 12.793                             |

|      |          |        |
|------|----------|--------|
| 2021 | 36526.31 | 14.610 |
| 2022 | 79840.59 | 31.936 |
| 2023 | 58257.38 | 23.302 |
| 2024 | 43134.34 | 17.253 |
| 2025 | 35000.00 | 14.000 |

#### 4 - Waste Disposal

Waste disposal encompasses solid waste and wastewater. Data for waste disposal was gathered from waste management facilities and invoices. Emissions are computed based on the type of waste and specific emission factors.

##### Calculation Methodology:

The emissions from waste disposal vary depending on the type of waste and the disposal method. For simplicity, an average emission factor of 1.5 kg CO<sub>2</sub>e per kilogram (kg) of waste is utilized, based on data from the World Resources Institute (WRI).

| Year | Total Waste (kg) | GHG Emissions (tCO <sub>2</sub> e) |
|------|------------------|------------------------------------|
| 2019 | 77,800           | 116.7                              |
| 2020 | 32,200           | 48.3                               |
| 2021 | 41,000           | 61.5                               |
| 2022 | 56,000           | 84.0                               |
| 2023 | 64,800           | 97.2                               |
| 2024 | 44,654           | 66.9                               |
| 2025 | 38,000           | 57.0                               |

## 5 - ICT Equipment

Data regarding ICT equipment was gathered from records maintained by the university.

Calculation Methodology:

GHG emissions associated with ICT equipment were computed by multiplying the energy consumed (measured in kilowatt-hours, kWh) by an emission factor of 0.475 kilograms of CO<sub>2</sub> equivalent per kilowatt-hour (kg CO<sub>2</sub>e/kWh).

| Year | Number of Devices | Energy Consumption (kWh) | GHG Emissions (tCO <sub>2</sub> e) |
|------|-------------------|--------------------------|------------------------------------|
| 2019 | 658               | 197,400                  | 93.765                             |
| 2020 | 704               | 70,400                   | 33.440                             |
| 2021 | 582               | 174,600                  | 82.935                             |
| 2022 | 911               | 273,300                  | 129.817                            |
| 2023 | 773               | 231,900                  | 110.152                            |
| 2024 | 654               | 196.2                    | 60.949                             |
| 2025 | 600               | 120.000                  | 57.000                             |

### Monthly Scope 1 and 2 estates-based emissions - 2024 – 2025 (Financial Year)

| Month | CO <sub>2</sub> -e emissions (tons) |
|-------|-------------------------------------|
| Sep   | 24.3                                |
| Oct   | 24.0                                |
| Nov   | 23.7                                |
| Dec   | 23.4                                |
| Jan   | 23.0                                |
| Feb   | 22.8                                |
| March | 22.5                                |
| April | 22.2                                |
| May   | 21.8                                |
| June  | 21.5                                |
| July  | 11.5                                |
| Aug   | 11.2                                |

**Monthly Scope 3 estates-based emissions - 2024-2025 (Financial Year)**

| Month | CO2-e emissions (tons) |
|-------|------------------------|
| Sep   | 10.9                   |
| Oct   | 16.4                   |
| Nov   | 14.6                   |
| Dec   | 16.4                   |
| Jan   | 21.8                   |
| Feb   | 18.2                   |
| March | 14.6                   |
| April | 12.8                   |
| May   | 10.9                   |
| June  | 5.5                    |
| July  | 5.5                    |
| Aug   | 5.5                    |

**Total University Campuses buildings footprint**

We have calculated the Gross Internal Area (GIA) of the university’s buildings, we measured the floor area of each level within the external walls and then sum them up.

- **Measure Each Floor Area:** Measure the floor area of each level within the external walls of the building. This includes all usable space, such as rooms, corridors, and common areas. Ensure you measure up to the internal face of the external walls.
- **Exclude Non-Enclosed Areas:** Exclude areas like balconies, porches, and external stairs from your measurements. Only include the internal space enclosed by the external walls.
- **Sum Up the Areas:** Add up the floor areas of all levels to get the total Gross Internal Area (GIA) of the building.

| Campus     | Buildings name          | Gross internal area (m2) |
|------------|-------------------------|--------------------------|
| Old campus | Administration Building | 3590                     |

|                                      |                                                                          |                 |
|--------------------------------------|--------------------------------------------------------------------------|-----------------|
|                                      | Deanship of Student Affairs Building                                     | 4364            |
|                                      | Old campus library Building                                              | 5630            |
|                                      | Faculty of Humanities & Faculty of Economics and Social Studies Building | 11874.4         |
|                                      | Faculty of Educational Sciences and Teachers' Training Building          | 6877.6          |
|                                      | Faculty of Islamic Law Building                                          | 3436.5          |
|                                      | Zafer Al-Masri Amphitheaters Building                                    | 2744            |
|                                      |                                                                          | 38516.5         |
| New campus                           | Faculty of Engineering and Information Technology Building               | 78975           |
|                                      | Faculty of Science Building                                              | 110400          |
|                                      | Medicine faculty Building                                                | 30000           |
|                                      | Faculty of Fine Arts Building                                            | 32000           |
|                                      | Faculty of sport Building                                                | 22800           |
|                                      | New campus library Building                                              | 29600           |
|                                      | Korean Palestinian IT Institute of excellence Building                   | 11001           |
|                                      | Scientific center Building                                               | 36000           |
|                                      | Faculty of Law Building                                                  | 45672           |
|                                      | An-Najah Child institute Building                                        | 12500           |
|                                      | Faculty of Optical & nursing college Buildings                           | 46320           |
|                                      |                                                                          | 455268          |
| Hijawi Campus                        | Hisham Hijawi                                                            | 37500           |
| Tulkarem Campus                      | Agriculture Faculty                                                      | 9120            |
| Total campus building footprint (m2) |                                                                          | <b>540404.5</b> |

## Summary

The 2025 reporting year confirms that An-Najah National University has transitioned from incremental carbon reduction to systemic decarbonization. Achieving a 93.4% reduction in total emissions relative to the 2019 baseline demonstrates that institutional climate commitments have translated into measurable performance outcomes.

The elimination of Scope 2 emissions through complete renewable electricity coverage represents a structural shift in campus energy governance. Simultaneously, continued reductions in Scope 1 and Scope 3 emissions indicate progress in fleet

efficiency, refrigerant control, commuting behavior, procurement practices, waste diversion, and digital optimization.

With total emissions reduced to 381.30 tCO<sub>2</sub>e and renewable generation exceeding demand, ANNU has established a stable low-carbon operating model. The remaining emissions footprint is increasingly concentrated in value-chain activities, which will be the focus of future reduction strategies including electrification, behavioral interventions, supply chain engagement, and carbon-neutral mobility solutions.

As the university advances toward its 2028 Net Zero target, the 2025 results confirm that ANNU is not only compliant with international GHG accounting standards but is also positioned as a regional leader in higher education sustainability and climate action.