CARBON FOOTPRINT REPORT

2022 – 2023
BASELINE YEAR: 2019

AN-NAJAH NATIONAL UNIVERSITY

Executive Summary

This report offers a comprehensive analysis of An-Najah National University's (ANNU) carbon footprint from 2019 to 2023, covering emissions across all campuses and activities involving students and staff. Emissions are categorized into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity), and Scope 3 (other indirect emissions) in alignment with the Greenhouse Gas Protocol, the globally recognized standard for greenhouse gas accounting.

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.

Impact of the COVID-19 Pandemic on Greenhouse Gas Emissions at An-Najah National University

The observed fluctuations in greenhouse gas (GHG) emissions at An-Najah National University between 2019 and 2023, with peaks in 2019, 2022, and 2023, and troughs in 2020 and 2021, underscore the profound impact of the global COVID-19 pandemic on the university's operational dynamics.

Analysis of potential effects:

• **Reduced Campus Activities**: The pandemic prompted a significant reduction in on-campus engagements, including classes, events, and research activities. This decline in campus occupancy and operations likely led to diminished energy consumption, resulting in decreased Scope 1 and Scope 2 emissions, particularly from heating, cooling, and electricity usage.

• **Shift to Remote Work and Learning**: The pivot to remote work and online learning platforms precipitated a decrease in transportation-related emissions, as fewer students, faculty, and staff commuted to campus. This shift contributed to lower Scope 3 emissions associated with employee commute and transportation.

• **Changes in Waste Generation**: With a decrease in on-campus presence, there has been a noticeable shift in waste generation patterns, including reduced waste from food services, paper usage, and other campus activities. This has led to a decrease in emissions from waste management processes, thereby contributing to overall emission reductions.

• **Altered Procurement and Supply Chains**: The pandemic-induced disruptions in supply chains and procurement processes likely impacted emissions linked to the acquisition and transportation of goods and services. Changes in purchasing behavior, such as increased reliance on local suppliers or shifts in procurement priorities, have influenced Scope 3 emissions related to third-party services and other indirect sources.

• **Operational Adaptations**: An-Najah National University swiftly implemented operational adjustments and sustainability initiatives in response to the pandemic. These initiatives, including energy efficiency upgrades, remote monitoring systems, and waste reduction measures, have contributed to emissions reductions across various scopes.

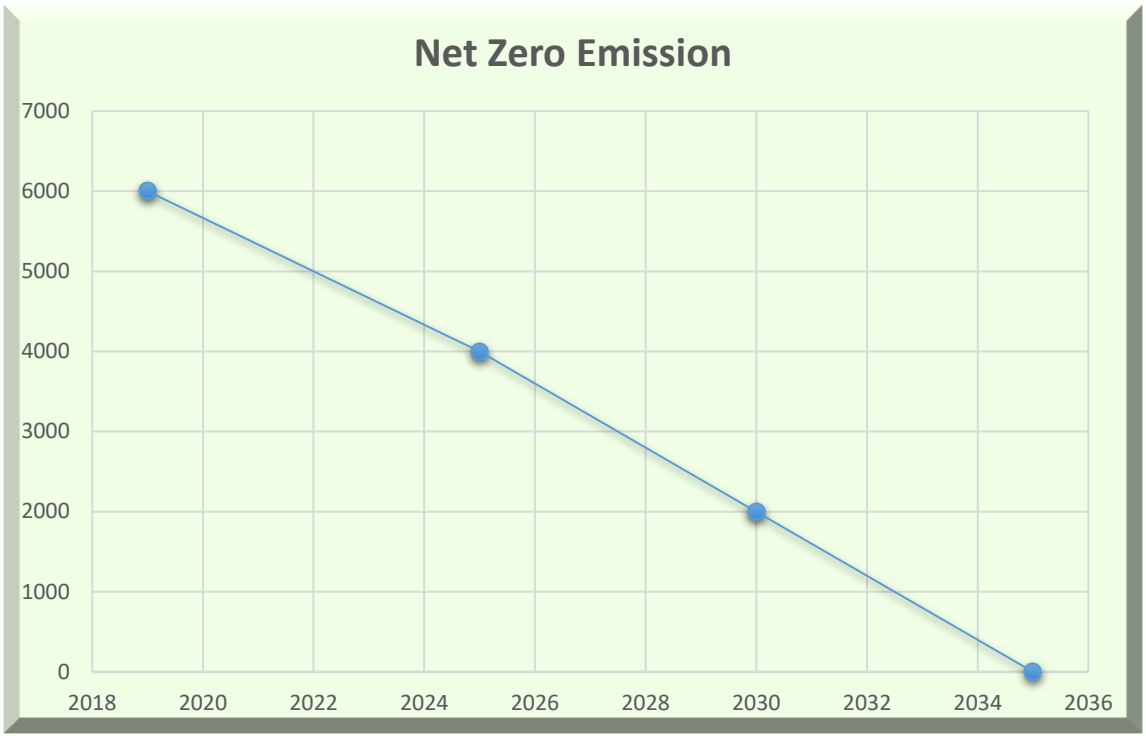
• **Data Availability and Reporting**: Assessing the precise impact of the pandemic on GHG emissions at An-Najah National University poses challenges due to factors such as data availability, reporting practices, and the complexity of emission calculations. Accurate measurement and reporting of emissions data are crucial for discerning trends and identifying areas for improvement.

In conclusion, while the COVID-19 pandemic engendered temporary reductions in GHG emissions at An-Najah National University through alterations in campus activities and operations, the long-term sustainability ramifications hinge on factors such as post-pandemic recovery efforts, ongoing sustainability initiatives, and institutional commitment to carbon reduction goals. Regular monitoring and evaluation of emissions data will be pivotal for gauging the university's progress and steering future sustainability endeavors.

GHG emissions for ANNU (2019 – 2023)

CO2-e emissions (tons)		Reporting Year				
Associated Inventory/Service		**2019 (Baseline year)**	**2020**	**2021**	**2022**	**2023**
Scope 1 (tCO2e)	Natural Gas, Transport Fuels, Stationary Fuels, Refrigerants, Waste-Incineration	515.188	266.431	191.939	316.538	288.276
Scope 2 (tCO2e)	Purchased Electricity	4970	3353	3290	3493	4186
Scope 3 (tCO2e)	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
Gross Total (scope 1 & 2) (tCO2e)		5485.188	3619.431	3481.939	3809.5383	4474.276
Gross Total (scope 1, 2 & 3) (tCO2e)		5774.139	3716.51	4646.612	4105.9433	4739.226
Energy Consumption (kWh)		7,304,843.4	5,668,451.9	6,556,062.3	7,214,891.70	8,216,629.5
Energy generated through renewable sources (kWh)		173,442.57	868,804.88	1,852,978.67	2,219,354.9	2,229,351.1
Energy Purchased (kWh)		7,131,400.8	4,799,647.02	4,703,083.63	4,995,536.8	5,987,278.4
Total campus building footprint (m2)				540404.5		

Our Zero Carbon Plan has a 2035 target of net zero emissions and 18 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 CO2)	Estimated GHG emissions (tCO2e)
2019	339	339 kg * 3.01 kg CO2/kg = 1020.39 kg CO2	1.02039
2020	98	98 kg * 3.01 kg CO2/kg = 294.98 kg CO2	0.29498
2021	485	485 kg * 3.01 kg CO2/kg = 1459.85 kg CO2	1.45985
2022	438	438 kg * 3.01 kg CO2/kg = 1318.38 kg CO2	1.31838
2023	484	484 kg * 3.01 kg CO2/kg = 1456.84 kg CO2	1.45684

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 CO2/litre when combusted.

Year	Diesel Consumption (litres)	Estimated GHG Emissions (kg CO2)	Estimated GHG emissions (tCO2e)
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

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 26.3 metric tons of CO2 equivalent in 2023.

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 2023.

2019:

- Refrigerators (R134a): 2 kg, Emissions = 2 kg * 1430 GWP = 2.8 tCO2e
- Air Conditioning (R410a): 9 kg, Emissions = 9 kg * 2088 GWP = 18.792 tCO2e

2020:

- Refrigerators (R134a): 0.85 kg, Emissions = 0.85 kg * 1430 GWP = 1.2 tCO2e
- Air Conditioning (R410a): 1.15 kg, Emissions = 1.15 kg * 2088 GWP = 2.4 tCO2e

2021:

- Refrigerators (R134a): 3 kg, Emissions = 3 kg * 1430 GWP = 4.2 tCO2e
- Air Conditioning (R410a): 12 kg, Emissions = 12 kg * 2088 GWP = 25 tCO2e

2022:

- Refrigerators (R134a): 2 kg, Emissions = 2 kg * 1430 GWP = 2.8 tCO2e
- Air Conditioning (R410a): 10.5 kg, Emissions = 10.5 kg * 2088 GWP = 21.9 tCO2e

2023:

- Refrigerators (R134a): 2.6 kg, Emissions = 3.5 kg * 1430 GWP = 3.8 tCO2e

- Air Conditioning (R410a): 10.7 kg, Emissions = 12.5 kg * 2088 GWP = 22.5 tCO2e

Year	Refrigerators (R134a) emissions (tCO2e)	Air Conditioning (R410a) emissions (tCO2e)	Total GHG emissions from refrigerant gases (tCO2e)
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

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 CO2 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 CO2/kWh), we estimated the CO2 emissions for that year using the following calculation formula:

CO2 emissions (kg) = Electricity consumption (kWh) x Emission factor (kg CO2/kWh)

Year	Electricity Purchased (million kWh)	Estimated GHG Emissions (thousand tCO2e)
2019	7.10	4.970
2020	4.79	3.353
2021	4.70	3.290
2022	4.99	3.493
2023	5.98	4.186

Electricity Consumption = Electricity Purchased + Electricity production by RES

Year	Electricity Consumption (million kWh)
2019	7.3
2020	5.6
2021	6.5
2022	7.2
2023	8.2

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 CO2e 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 (tCO2e)
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

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 CO2e per liter (kg CO2e/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 (tCO2e)
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

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 CO2 equivalent (tCO2e), based on a rough global average according to the World Resources Institute (WRI).

Year	Total Expenditure ($)	GHG Emissions (tCO2e)
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

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 CO2e per kilogram (kg) of waste is utilized, based on data from the World Resources Institute (WRI).

Year	**Total Waste (kg)**	**GHG Emissions (tCO2e)**
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

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 CO2 equivalent per kilowatt-hour (kg CO2e/kWh).

Year	Number of Devices	Energy Consumption (kWh)	GHG Emissions (tCO2e)
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

Monthly Scope 1 and 2 estates-based emissions - 2022 – 2023 (Financial Year)

Month	**CO2-e emissions (tons)**
Sep	420
Oct	415
Nov	410
Dec	405
Jan	400
Feb	395
March	390
April	385
May	380
June	375
July	200
Aug	190

Monthly Scope 3 estates-based emissions - 2022-2023 (Financial Year)

Month	CO2-e emissions (tons)
Sep	30
Oct	45
Nov	40
Dec	45
Jan	60
Feb	50
March	40
April	35
May	30
June	15
July	15
Aug	15

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)**		**540404.5**

Summary

In summary, An-Najah National University demonstrates a strong commitment to sustainability, with a specific emphasis on improving its greenhouse gas emissions inventory. The university is actively engaged in refining methodologies, ensuring data accuracy, and broadening inventory coverage to provide a comprehensive overview. Additionally, An-Najah is resolute in its efforts to reduce emissions through the implementation of energy-efficient practices, the integration of renewable energy sources, and the promotion of sustainable commuting options. This dedication underscores the university's commitment to environmental responsibility and its proactive stance towards mitigating climate change.