

13.4.1 University target date by which it will become carbon neutral according to the Greenhouse Gas Protocols

Alexandria University set the year 2030 to be a target date to become carbon neutral according to the greenhouse Gas protocol. The following are current projects that are steps towards reaching the target.

- **Green Cycle project in the Faculty of Pharmacy - Alexandria University**

The project began in October 2022 by organizing a number of events in cooperation between the Community Service and Environmental Development Committee, ASPSA, and the Alexandria Rotary Clubs, under the supervision and organization of Faculty of Pharmacy - Alexandria University.

Faculty members and college employees by developing an application, prepared for smart phones, specific to the project that enables college members to share cars for transportation in a safe manner in order to reduce carbon emissions resulting from car exhausts.

- **The European Union project to convert several buildings of Alexandria University into green buildings by reducing energyconsumption in addition to establishing solar-powered powerstations in 2023-2024**

- In light of the keenness to rationalize energy consumption in university buildings and the general trend to increase the percentage of reliance on new and renewable sources in electricity production, and in cooperation with the European Union, the European Union funding was accepted for a project to transform some buildings of Alexandria University into green buildings by reducing energy consumption in addition to constructing Electrical power stations powered by solar energy on the roofs of some qualified faculty and institute buildings suitable for this purpose.

- Accordingly, three buildings belonging to the university's faculties were chosen as a first stage to study the feasibility of applying the project to them in terms of the building's ability to bear the weight of solar stations to produceelectricity, as well as studying the spaces available for building these stations and the extent of those spaces' exposure tosolar radiation throughout the day. The opportunities available to reduce reliance on usual energy sources were also studied in terms of using more efficient lighting, increasing reliance on natural lighting during the day, and reducing the building's air conditioning loads.

- After research and review, the specialized scientific programs will be developed in the Faculty of Engineering, the Faculty of Education building within the Literary faculties Complex, and the Manchester Building in the Faculty of Medicine, which were chosen due to the recent construction of these buildings and their ability to accommodate the proposed development in terms of the electrical load network and the development of air conditioning systems and water heating systems used in laboratories and bathrooms.

- These buildings were visited and their suitability for the project was evaluated. The current electricity consumption and the possibility of covering these loads with electricity generated from solar energy were studied. The roof areas facing south and suitable for establishing solar stations were inspected and raised. The available roof area in the Specialized Scientific Programs Building

at the Faculty of Engineering, Alexandria University, was 2,400 square meters. It can be used to create a solar station with an area of 1,000 square meters with a capacity of **120 kilowatts**, so that the station will be able to generate **360 megawatt hours** of electricity annually. As for the Faculty of Education building, the total area of the building was 4,000 square meters, and the appropriate spaces for building the station accommodate 1,000 square meters of solar cells with a capacity of **120 kilowatts**, so that the station is capable of generating **360 megawatt hours** of electricity annually, and for the Manchester building at the Faculty of Medicine, 1,200 square meters is capable of accommodating a solar power station with an area of 800 square meters. With a capacity of **96 kilowatts**, the station is capable of generating **288 megawatt hours** of electricity annually. These stations also contribute to reducing carbon dioxide emissions by a total of approximately 214 tons annually. The total expected cost of the project is about 300,000 euros.

- The time to recover the capital was estimated through providing the electricity consumed in the three buildings for approximately seven years from the date the stations entered service at full capacity, considering the periodic maintenance necessary to continue the station's operation with the greatest possible efficiency. Detailed reports were also prepared for each building and submitted to the general coordinator of the project, for review and to take the necessary steps to start this vital project, which is an important step in strengthening the efforts of the Egyptian state towards switching to renewable energy and reducing dependence on fossil fuels that have a negative impact on the environment.



The European Union project to convert several buildings of Alexandria University into green buildings by reducing energy consumption in addition to establishing solar-powered power stations: the Specialized Scientific Programs Building at the Faculty of Engineering, the Faculty of Education Building within the Literary Colleges Complex, and the Manchester Building at the Faculty of Medicine.

Greenhouse gas emission reduction program

Table: Greenhouse gas emission sources at Alexandria University Campus

	Emission data	Definition
Scope 1	Stationary combustion	Stationary combustion refers to the burning of fuels to produce electricity, steam, and heat in a fixed location, such as boilers, burners, heaters, kilns, and engines.
	Mobile combustion	Burning of fuels by institution-owned transportation devices
	Process emissions	Direct greenhouse gas (GHG) emissions from physical or chemical processes rather than from fuel combustion
	Fugitive emissions	Hydrofluorocarbon releases during the use of refrigeration and air conditioning equipment and methane leakage from natural gas transport
Scope 2	Purchased electricity	Indirect GHG emissions result from the generation of the electricity purchased and used by the institution
	Energy Efficiency	Buildings and Infrastructure:
	Renewable Energy Deployment	Solar and Wind Power: increasing the share of renewable energy in the energy mix.
Scope 3	Waste	Indirect GHG emissions resulting from the incineration or landfill of your institution's solid waste
	Purchased water	Indirect GHG emissions resulting from the generation of water supply purchased and used by the institution
	Commuting	Indirect GHG emissions resulting from regular commuting from and to institutions by students and employees (i.e., reducing regular commuting by using shared vehicles, carpooling)
	Air travel	Indirect GHG emissions resulting from air travels paid by institutions (i.e., reducing the number of staff air travel opportunities)
Scope 4	Innovation and Technology Development	Investment in Green Technologies: Support research and development in innovative technologies like hydrogen fuel cells, battery storage, and artificial photosynthesis to capture and utilize carbon.
Scope 5	Digitalization	Promote digital solutions
Scope 6	Public Awareness and Behavioral Change	Educational Campaigns: Raise awareness about the importance of reducing GHG emissions and the role individuals can play in everyday actions, such as reducing energy use, recycling, and adopting sustainable transport.
Scope 7	International Collaboration and Partnerships	Collaborate with other countries and institutions to share knowledge, technology, and expertise on GHG emission reduction.

- **Scope 1, Stationary combustion and Mobile combustion:** These GHG sources are reduced by Ride Share using the University Shuttle and Carpool, by the decrease of burning of fuels. Regular vehicle maintenance to reduce greenhouse gas emissions. In addition, the use of bicycles reduces the GHG source. Reducing the individual

carbon footprint of students, faculty members and college employees by developing an application, prepared for smart phones. The Green Cycle project was organized by Faculty of Pharmacy- Alexandria University that enables faculty members to share cars for transportation in a safe manner in order to reduce carbon emissions resulting from car exhausts. Is project is a succesful project which was performed as a prototype at the Faculty of Pharmacy. Alexandria University’s plan is to establish the Green Cycle project in all Faculties.

- **Scope 1, Fugitive emissions:** All new buildings in Abis campus are designed with large windows to get maximum benefit from daylight and natural ventilation. In addition, all University buildings have good natural ventilation and daylight. This will reduce the use air conditioning equipment and accordingly decrease GHG.
- Alexandria University has the lead and leadership in establishing the environmental sector and community service, and it has an effective role in preserving the environment in Alexandria and the neighboring governorates. The university, with its various colleges and institutes, is committed to implementing Law No. 4 of 1994 and its regulations. The university has environmental records for most colleges and institutes, and it also conducts environmental impact assessment studies for all its projects by consultants accredited by the Ministry of Environment.
- The university is also environmentally friendly and disposes of waste in a safe manner, as it has contracts with transportation companies for hazardous, medical, non-hazardous, solid and liquid waste.
- The university also monitors greenhouse gases and suspended and inhaled solid particles. It is committed to preserving the environment from emissions that may lead to environmental pollution and then climate change. The monitoring is carried out by faculty members who hold consultant certificates for self-monitoring of facilities, as well as environmental measurements in laboratories accredited by the Environmental Affairs Agency.



An application, prepared for smart phones, specific to Green Cycle project enables college members to share cars (car pooling) for transportation (Alexandria University)

Alexandria University's Carbon Footprint (2023/2024)

During the very few past years, the climate change and the global warming facing the entire universe have gained much more attention due to their direct effects on the human life on earth. As a result, countries, organizations, and people have noticed that it is now the time to face these challenges and as an initial step, we must first determine or calculate the amount of pollution that we cause to our planet, then we shall work on ourselves to minimize this pollution. One of the most famous methods to monitor the climate change is to determine what is known by Carbon Footprint.

The term "Carbon Footprint" is usually used as shorthand for the amount of emitted carbon (in tons) by an organization or country. This footprint is also an important component of the Ecological Footprint, since it is one competing demand for biologically productive space. Carbon emissions from burning fossil fuel usually accumulate in the atmosphere if there is not enough biocapacity dedicated to absorb these emissions. Therefore, when the carbon footprint is reported within the context of the total Ecological Footprint, the tons of carbon dioxide emissions are expressed as the amount of productive land area required to sequester those CO₂ emissions, which tells us how much biocapacity is necessary to neutralize these emissions.

Measuring Carbon Footprint in a certain area just shows us how much biocapacity is needed to take care of our untreated carbon waste and to prevent carbon accumulation in the atmosphere, which as a consequent can enable us to address the climate change challenge in a clearer way. In fact, the climate problem emerges because the planet does not have enough biocapacity to neutralize all these emissions. Humanity's carbon Footprint has increased 11-fold since 1961. Reducing humanity's carbon Footprint is the most essential step we can take to end overshoot and live within the means of our planet.

The climate pact approved in Paris in December 2015 represented an important step in re-imagining a fossil-free future for our planet. Nearly 200 countries around the world, including Egypt, agreed to keep global temperature rise well below 2°C. According to the known data from (Intergovernmental Panel on Climate Change) IPCC's 2014 report that a concentration of greenhouse gases in the atmosphere of 450 ppm CO₂ equivalent gives us a 66% chance to comply with the Paris Agreement's (2°C) goal. In contrast, the National Oceanic and Atmospheric Administration of the United States Department of Commerce (or NOAA) reports that in 2020 we were already at 504 ppm CO₂ equivalent. This confirms that the problem is increasing and there is a critical demand to rapidly solve it. Although Egypt contributes with a small portion in the global emissions of greenhouse gases, but this small portion is growing with time. In addition, Egypt is also expected to suffer from shortage of water, decrease in agricultural crops, rising sea levels due to increase in temperature and change in rainfall patterns.

In the light of the above mentioned information and according to the "Sustainable Development Strategy: Egypt's Vision 2030", Alexandria University, as a very important educational institution, has taken the first steps to work on reducing carbon emissions as one of the most important sources of greenhouse gases and has implemented a plan to monitor and calculate the "Carbon Footprint since the academic year 2018 / 2019" for all its faculties, institutes and its administrative buildings in order

to aid in decision-making.

When calculating the Carbon Footprint for all Alexandria University buildings for the Academic year (2023/2024), the approximate amount of emitted CO₂ was **4,284.13765 CO₂e**.

The total carbon footprint of the Faculties and Institutes of Alexandria University (Ton CO₂e)

Faculty/Institute	2020/2021	2021/2022	2022/2023	2023/2024
University Administration Building	NA	186.330	257.8696	235.6893
Faculty of Arts	235.887	179.299	126.5596	174.3114
Faculty of Commerce	412.128	29.3102	134.991	128.3933
Faculty of Education	21.807	9.264	28.61872	12.7546
Faculty of Medicine	1817.232	433.984	528.7561	442.4181
Faculty of Dentistry	705.702	29.379	301.0882	250.8576
Faculty of Engineering	693.748	675.702	530.7443	543.4759
Faculty of Agriculture	1326.267	1066.346	743.709	739.2388
Faculty of Pharmacy	318.059	306.118	273.1078	205.75421
Faculty of Science	317.362	218.947	222.71091	148.0105
Faculty of Nursing	122.79	161.580	140.3059	169.1397
Faculty of Veterinary Medicine	186.221	172.431	144.0973	157.2076
Higher Institute of Public Health	12.646	59.204	51.1156	48.2525
Medical Research Institute	555.478	186.894	144.438	186.7957
Institute of Graduate Studies and Research	10.92	7.246	16.0455	14.9636
Faculty of Physical Education for girls	277.671	380.872	306.9452	309.61494
Faculty of Physical Education for boys	214.835	319.100	235.999	192.7736
Faculty of Specific Education	12.069	3.613	11.8411	11.8663
Saba Pasha Faculty of Agriculture	92.785	109.632	98.6493	80.0543
Faculty of Education for Early Childhood	33.4747	4.745	19.0013	24.3051
Faculty of Fine Arts	22.654	19.541	20.6138	20.8157
Faculty of Tourism and Hotels	9.924	4.525	6.5065	3.9269
Faculty of Law	141.668	151.137	147.9066	183.5180
Total	7,541.33 CO₂e	4,715.1992 CO₂e	4,491.62033 CO₂e	4,284.13765 CO₂e

This report came out as a result of the concerted efforts of the academic community of Alexandria University during the academic year 2023/2024 in collecting, analyzing and editing this report in accordance with international standards and controls for carbon footprint calculations.

In order to allocate the specific position of Alexandria University regarding the extent of its contribution to carbon emissions among similar institutions, it was necessary to compare these emissions with other universities around the world.

University	Last Carbon Footprint Report	Carbon Footprint Total value (metric tons)
American University in Cairo (AUC)	2019/2020	34,391.3 CO _{2e}
Cape Town University (Republic of South Africa)	2018	75,187 CO _{2e}
Arizona University (USA)	2017	258,088 CO _{2e}
Alexandria University (Egypt)	2022/2023	4,491.62033 CO _{2e}
Alexandria University (Egypt)	2023/2024	4,284.13765 CO _{2e}

Conclusion:

According to the Carbon Footprint for all Alexandria University buildings for the Academic year (2023/2024), which is approximately 4,284.13765 CO_{2e}, one can conclude that the sustainability program of Alexandria University was successful. The total electricity consumption of Alexandria University for the academic year 2023/2024 is **4519154.69** kilowatts per hour. Total electricity use increased slightly compared to 2023 (**4329779.781** kilowatts per hour) the total electricity usage increased slightly compared to year 2022/2023. Which is not a significant increase. The total gas use on the Alexandria University campus in the year 2023/2024 is **8,784 m³** (99,809 KWh), which decreased almost of 35% compared to the academic year 2022/2023, where the total gas used was **13471 m³** (153,066 kWh). On the main campus area of Alexandria University electricity is used for lighting, cooling, heating and laboratory appliances.

On the other hand, a significant decrease in the consumption of paper packages is observed. The paper packages used in all Alexandria University buildings for the Academic year (2020/2021) was 84689 paper packages. While in the year (2021/2022) it was reduced to 47911 packages. In the academic year (2022/2023), the consumed paper packages slightly increased to reach 55712 packages. In the academic year (2023/2024), the consumed paper packages reached **46876 packages**.

- An academic team (Ph.D.) from the Faculty of Science at Alexandria University teaches a course titled 'Man and Environment' (University Elective Course – 2 Credits). The course addresses environmental problems, types of natural resources, pollution, environmental footprint, carbon footprint, waste management, recycling, climate change and global warming, biodiversity, and the Sustainable Development Goals (SDGs). It is offered to students from various faculties at Alexandria University, such as:
 - 1) Faculty of Science
 - 2) Faculty of Tourism
 - 3) Faculty of Agriculture
 - 4) Faculty of Sport Education
 - 5) Faculty of Business
 - 6) Faculty of Computers and Data Science
 - 7) Faculty of Dentistry
 - 8) Faculty of Economics and Political Science
 - 9) Faculty of Arts
 - 10) Faculty of Nursing

Also, this course is offered in some programs at Alexandria National University, including:

- A. Computer and Data Sciences (CDS) Programs
- B. Oral and Dental Surgery Program
- C. Software and Multimedia Production Program (SIM)

Alexandria University's Research on Greenhouse Gas Emissions

- Researchers from various faculties at Alexandria University have been conducted 731 research articles and reviews, within 2021-2025, to mitigate the Greenhouse Gas Emissions across different scientific fields.

The screenshot shows a Google Scholar search interface. The search bar contains the query "Alexandria University" & "greenhouse gas". Below the search bar, a red box highlights the text "About 731 results (0.11 sec)". On the left side, there are filters for "Any time", "Since 2024", "Since 2023", "Since 2020", and "Custom range...". The "Custom range..." filter is expanded to show "2021" and "2025" with a minus sign between them, and a "Search" button below it. Below the filters, there are three search results. The first result is "CO2 Emissions, Green House Gas Calculations and Controlling in the Gas Plant" by EE Ebrahim, AA Noaman... from the Egyptian Journal of Chemistry, 2021. The second result is "[HTML] Thermo-economic analysis of potential desalination processes utilized by no greenhouse gas emissions power plant" by WM El-Ashmawy, WM El-Maghlany, M Elhelw from Alexandria Engineering, 2024. The third result is "Experimental and Techno-Economic Analysis of Solar PV System for Sustainable Building and Greenhouse Gas Emission Mitigation in Harsh Climate: A Case Study" by EM Abd Elsadek, H Kotb, AS Abdel-Khalik from Sustainability, 2024. Each result includes a "Save" icon, a "Cite" icon, and a "Related articles" link.