جامعة الإسكندرية
ALEXANDRIA UNIVERSITY

SDG13



Climate Action

2025-2026

13.2.1 Measure the amount of low carbon energy used across the university

Alexandria University is upgrading existing facilities through a comprehensive energy efficiency strategy that enhances solar energy conversion, optimizes battery and energy storage systems, and improves overall performance under varying temperature and operational conditions. Using advanced climate models, simulation, and data analysis, the institution evaluates electrical loads, current, and potential to reduce carbon dioxide emissions and increase system stability. The plan applies innovative materials, thin films, solar cells, and wind power technologies, combined with intelligent control systems to ensure efficient energy utilization and long-term sustainable development. This approach supports campus infrastructure modernization through improved structure, process optimization, and enhanced renewable energy integration.

Alexandria University implements an integrated carbon management approach focused on reducing carbon dioxide emissions through energy efficiency operations, renewable energy expansion, and sustainable resource use. The University applies advanced monitoring, analysis, and performance evaluation systems to track CO2 emissions and improve environmental stability across campus. Through optimized process dynamics, innovative technology, and compliance with national and international environmental standards, Alexandria University continually enhances its climate action efforts. This comprehensive framework supports long-term sustainable development, aligns with national vision targets, and strengthens the University's leadership in low-carbon transition shift.

- The consistent downward trajectory aligns with the emission reduction pathways recommended by the Intergovernmental Panel on Climate Change for limiting global warming to 1.5 °C. It supports Egypt's updated Nationally Determined Contributions under the Paris Agreement. By embedding these measures into core operational planning, the university demonstrates a replicable model of science-based climate governance within the higher education sector.
- Alexandria University has consistently published its sustainability report on its official website for four consecutive years, covering the 2022, 2023, 2024, and 2025 reporting periods. Each report provides a comprehensive overview of the university's sustainability achievements, including environmental performance, green campus infrastructure, academic and research initiatives aligned with sustainable development goals, and community engagement activities that support Egypt Vision 2030. The reports also highlight formal institutional policies and governance frameworks for integrating sustainability across education, research, operations, and outreach. These policies remain publicly accessible and systematically embedded within strategic planning and operational practices. Continuous annual publication reflects strong commitment to transparency, accountability, and sustainable development.
- The university also monitors greenhouse gases and solid particles to prevent environmental pollution and mitigate climate change. Monitoring is conducted by faculty members holding consultant certificates for self-monitoring of facilities, alongside environmental measurements performed in accredited laboratories.

- The university has introduced several renewable-energy projects, including:
    - Solar photovoltaic panels installed on university buildings.
    - Solar-energy research and training facilities at the Faculty of Agriculture.
    - Wind-energy installations and hybrid solar-wind systems.
    - Solar installations at the Faculties of Engineering, Education, and Medicine.

Indicator	Reported amount
Total electricity consumption	4,228,995.91 kWh
Renewable energy production	1,213,291.2 kWh/year
Renewable electricity share	28.69%
Reduction in natural gas usage	70%

- Renewable-energy monitoring and energy-efficiency initiatives.

Measurement of Low-Carbon Energy

According to Alexandria University's 2024–2025 Sustainability Report:

The university reports that renewable energy accounts for 28.69% of its total electricity use.

Calculation

The percentage of low-carbon electricity is calculated using:

Renewable electricity share (%) = (Renewable electricity generated ÷ Total electricity consumed) × 100

Using the reported figures:

(1,213,291.2 ÷ 4,228,995.91) × 100 = approximately 28.69%.

This indicates that approximately 28.69% of the university's reported electricity consumption was supplied by renewable energy.

- To ensure accurate measurement across all faculties, the university should:
- Record electricity generated by every solar installation using generation meters.
- Measure electricity supplied by wind turbines.
- Collect monthly electricity-consumption bills from every faculty.
- Separate renewable electricity consumed on campus from electricity exported to the grid.
- Record renewable electricity purchased from external suppliers separately.
- Calculate the renewable-energy percentage for each faculty and for the entire university.
- Prepare annual energy-monitoring reports to compare performance over time.

- **Energy Conservation Advisory Group in Center for Graduate Studies and Research – Institute of Graduate Studies and Research – Alexandria University**

This group is concerned with reviewing energy in all its forms at all levels, such as measuring and analyzing exhaust gases in furnaces and boilers with the aim of improving combustion efficiency and reducing emissions, measuring and analyzing boiler water, in addition to tests of thermal insulation efficiency, lighting efficiency, electrical energy analysis, and compatibility with electrical loads. It also determines the power factor to increase efficiency. Rationalizing the energy used, reviewing energy use, radiation measurements and safety tests for radioactive sources. The group has a mobile laboratory that can visit sites and make environmental measurements related to energy as well as emissions and study energy consumption and the extent of thermal insulation in industrial sites.

- **Solar Energy Center at the Faculty of Agriculture (Alexandria University)**

Hybrid Renewable Energy Systems to Supply Services in Rural Settlements of Mediterranean Partner Countries.

The services provided by the center:

1) **Research and development**: Encouraging applied research on renewable energy at AU and through collaborations with other national and international universities. Development of hybrid systems in renewable energy and its uses in water pumping and water desalination and development of remote and desert areas. Development of research in energy from biomass and waste. Development of thermal uses of solar energy.
2) **Consultations:** Various consultations in renewable energy systems, especially hybrid systems, drying and solar heating.
3) **Education and Training:** Supporting the renewable energy education at AU. Developing and delivering courses, e-learning, workshops, training courses, and conferences on various renewable energy systems.

Serving the Egyptian community by providing all renewable energy information to the public.



ano Filtration

- **Renewable energy sources:**

Renewable Energy Sources in Campus: 1,228,291.2 kWh/year

1. **Solar Thermal Systems:** Solar collectors generate renewable thermal energy to support heating and hot water demands and complement building energy systems.
2. **Wind Energy:** Wind turbines convert wind energy into renewable electricity to support campus operations and reduce dependence on conventional energy sources.
3. **Biodiesel Production:** Biodiesel derived from biological feedstocks such as plant oils, used cooking oil, and other renewable organic materials serves as a cleaner alternative fuel for energy generation and operational activities.
4. **Green Hydrogen:** Hydrogen produced through water electrolysis using renewable electricity (e.g., solar or wind power) serves as a clean energy carrier that can support electricity generation, thermal applications, and future low-carbon energy systems, including CHP applications where implemented.
5. **Biomass Energy:** Biomass utilization includes advanced conversion technologies such as carbonization, torrefaction, gasification, pyrolysis, and biochar production, contributing to renewable energy generation and efficient resource utilization.
6. **Waste-to-Energy Systems:** Organic or biodegradable waste is converted into useful energy, with CHP applications enabling simultaneous production of electricity and recoverable heat.

Together, these renewable energy technologies contribute to increasing renewable energy production, improving energy efficiency, reducing greenhouse gas emissions, and supporting sustainable campus development and smart building implementation.

	
Automatically Controlled Biodiesel Production Unit. (Faculty of Engineering, Alexandria University)	Activated carbon cloth from biomass fibrous resources (Faculty of Engineering, Alexandria University)
	
Design and Fabrication of Biodiesel Burner test rig. (Faculty of Engineering, Alexandria University)	Green Hydrogen/Diesel Dual-Fuel Retrofit: A Scalable Pathway to Industrial Decarbonization (Faculty of Engineering, Alexandria University)
	
Design of Integrated Augmented Vertical Axis Wind Turbine (VAWT) With Solar Energy System for High Rise Urban Applications (Faculty of Engineering, Alexandria University)	Experimental and Simulation Study of Natural Gas–Hydrogen/Diesel RCCI for Engine Decarbonization (Faculty of Engineering, Alexandria University)



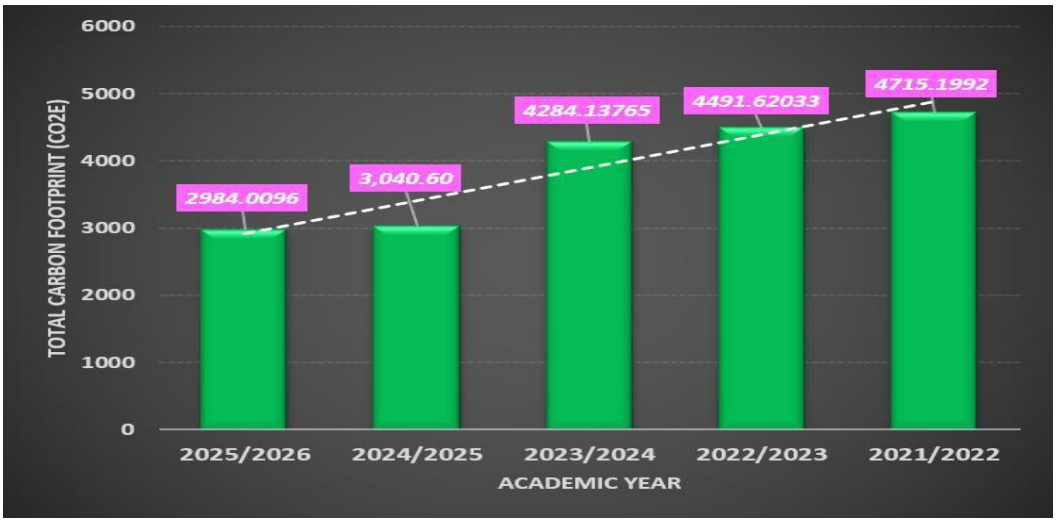
Solar Energy Center at the Faculty of Agriculture (Alexandria University)



Windmill and Solar Panels (Solar Energy Center at the Faculty of Agriculture - Alexandria University)

- **Carbon Footprint**

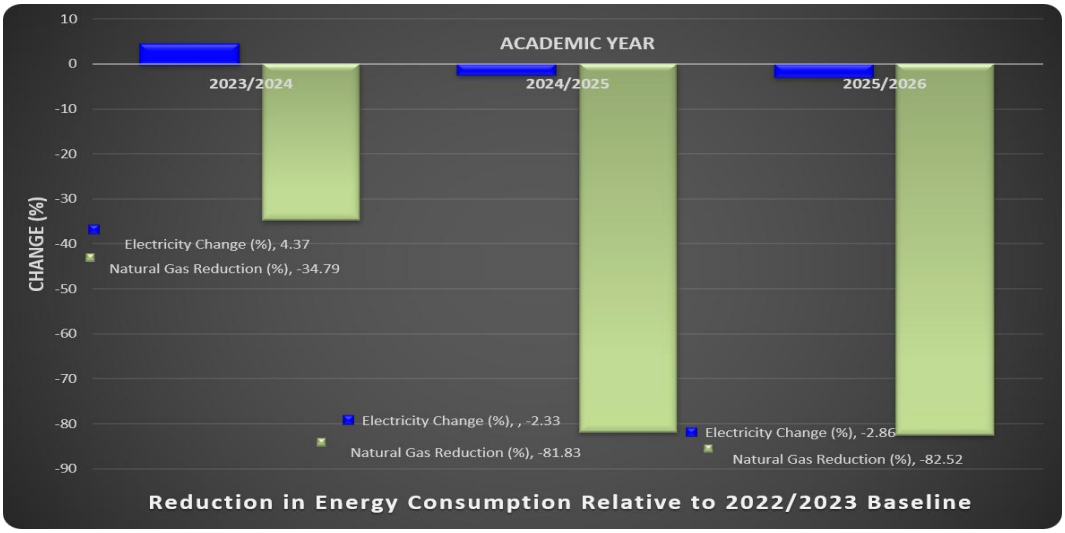
  Alexandria University has achieved a continuous reduction in its carbon footprint through the implementation of energy-efficient technologies, renewable energy initiatives, and sustainable campus management practices. As shown in the figure, total carbon emissions decreased from 4,715.20 tCO_2e in the 2021/2022 academic year to 4,491.62 tCO_2e in 2022/2023 and 4,284.14 tCO_2e in 2023/2024. This downward trend continued with emissions declining to 3,040.60 tCO_2e in 2024/2025 and further to 2,984.01 tCO_2e in 2025/2026. Overall, the University achieved a reduction of approximately 36.7% compared with the 2021/2022 baseline, reflecting its commitment to climate action, energy conservation, and the transition toward a low-carbon and sustainable campus.



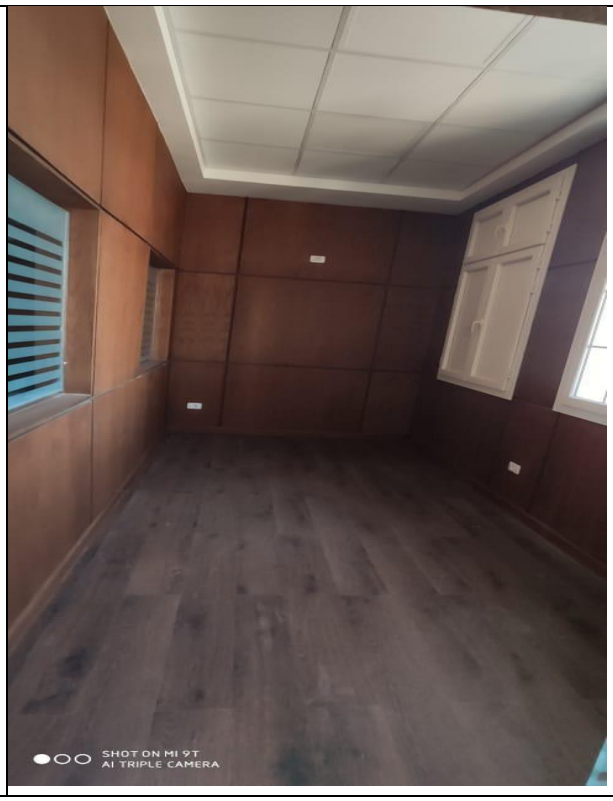
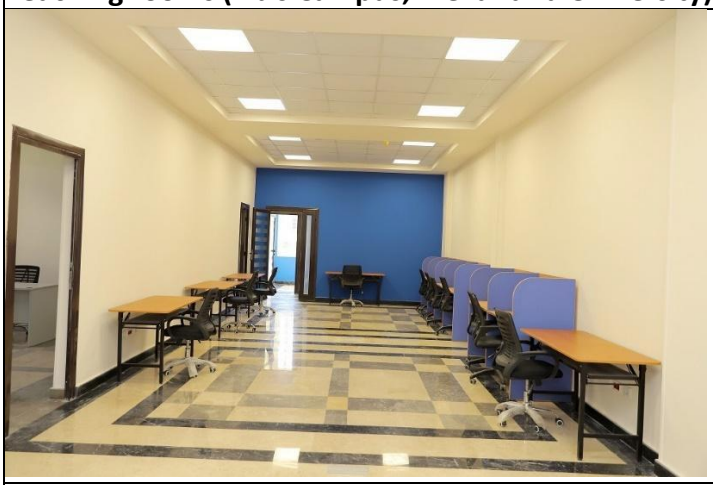
- **Improvement in Energy Efficiency:**

  Alexandria University continuously enhances its energy efficiency through targeted energy management initiatives and infrastructure upgrades. Compared with the 2022/2023

baseline, natural gas consumption decreased significantly by 34.79% in 2023/2024, 81.83% in 2024/2025, and 82.52% in 2025/2026. Electricity consumption also declined by 2.33% in 2024/2025 and 2.86% in 2025/2026, following a temporary increase of 4.37% in 2023/2024. These results demonstrate the University's ongoing commitment to reduce energy consumption, improve operational efficiency, and lower greenhouse gas emissions in support of sustainable development goals and regional sustainability frameworks.



- Driven by the University's keen commitment to transforming into an environmentally friendly institution dedicated to enhancing resource management and rationalizing energy consumption, the Department of Community Service Development launched a comprehensive project aimed at the total transformation of all used fluorescent lighting by replacing them with modern LED bulbs. These light-emitting diodes provide significantly higher efficiency, lower energy consumption, and extended operational lifespans compared to conventional fluorescent lamps. Initiated in 2019, the project has been systematically implemented in structured phases, beginning with a complete inventory of the total quantities required across all university faculties and institutes. During the first quarter, 30% of the necessary stock—covering specific 60 cm, 120 cm, and 9-watt bulb categories—was procured and installed. Concurrently, appropriate measures were executed to safely discard the decommissioned fluorescent lamps through specialized environmental disposal contractors. The second stage involved purchasing and transitioning 37% of the total university requirements, while the third stage accounted for another 25%. In the final phase, the complete transformation of all remaining LED units was successfully performed. The table below summarizes the total quantity of LED bulbs required for this total transition to a green energy source, detailing the replacement percentages achieved over the past four years.

<table>
<tr><td></td><td>
</td></tr>
<tr><td colspan="2">Teaching rooms (Abis Campus, Alexandria University)</td></tr>
<tr><td></td><td></td></tr>
<tr><td>All teaching rooms contain well-equipped technological facilities (screens, data shows, and white boards).</td><td>Smart screens are used in all lecture halls</td></tr>
</table>

- **Sustainable Waste Management:**

Alexandria University continues to strengthen its sustainable waste management system through integrated initiatives in waste reduction, recycling, and digital transformation. During the 2025/2026 academic year, the University generated 183.19 tons of paper and plastic waste, a 2.76-ton reduction from the previous academic year. Plastic waste decreased from 77.00 tons to 74.94 tons (a reduction of 2.06 tons), while paper waste declined from 108.95 tons to 108.25 tons (a reduction of 0.70 tons). These improvements were achieved through a comprehensive strategy that includes electronic books, paperless administrative services, online examinations, learning management systems, digital communication, QR-code forms, and electronic student services, significantly reducing paper consumption across the University.

Institutional side-by-side comparison of plastic waste and paper waste alongside the cumulative Total Waste tonnage between last



year and this year. Over a two-year tracking period, 2024/2025 and 2025/2026.

Projects:

University administration building

The project of "supplying, installing and operating the photovoltaic solar plant with a capacity of 20.1 kW above the administration building of Alexandria University in Shatby was launched by the Arab Renewable Energy Company, on 2/14/2020. The capacity of the station per month is 20.1 kW, while the capacity consumed from the building is 255 kW /month, meaning that the station provides within 8% of the total monthly consumption. Total Solar energy per year = **241.2 KWh**.

Higher Institute of Public Profession

The Institute has two initiatives to exploit solar energy at the Institute through two units of photovoltaic cells (50 watts each) that are currently installed and are exploited to provide the electrical energy necessary to operate the Ultra- Filtration unit located in one of the laboratories of the Department of Materials Science for educational purpose.

Moreover, five units of photovoltaic cells (260 watts each) were installed to operate the discussion room at the Institute and to provide it with sufficient energy for lighting purposes and to operate its display device. Total Solar energy per year = **360 KWh**.

The Faculty of Engineering

The implantation of the new Solar Station is completed. The implementation of the solar photovoltaic panels was performed in December 2022 with a capacity of **220** kilowatts on the 2000 m^2 roof top of the building of the Mechanical Engineering Department at the Faculty of Engineering.

Alexandria University have generalized this initiative in some of the faculties of Alexandria University in gradual stages.



Solar photovoltaic with a capacity of 220 kilowatts on the 2000 m^2 roof top of the building of the Mechanical Engineering Department at the Faculty of Engineering

13.2.2.1 Total energy used

Alexandria University implements a comprehensive energy management strategy focused on evaluating total energy utilization, monitoring CO2 emissions, and optimizing clean energy resources across all campus facilities. Through advanced performance assessment models, life cycle analysis, and integrated data tracking, the institution measures electricity and natural gas consumption to improve energy conservation, enhance energy efficiency, and lower greenhouse gas emissions. Combining solar energy conversion, smart grid technologies, and sustainable renewable energy sources, this systematic approach drives carbon footprint reduction, supports climate change mitigation, and advances long-term sustainable development.

1. Electricity Consumption (2024–2025)

- **Total Electricity Used: 4,228,995.91 kWh** (Kilowatt-hours) per year
- **Year-over-Year Change:** Represents a **6.42% decrease** compared to the 2023/2024 academic year (4,519,154.69 kWh) due to energy-saving retrofits and efficiency measures.

2. Clean & Renewable Energy Contribution

- **Total Renewable Energy Generated: 1,213,291.2 kWh/year**
- **Share of Total Electricity: 28.69%** of the university's total electricity demand was met by clean solar and hybrid systems installed across campus roofs.

3. Natural Gas Usage

- **Reduction:** Natural gas consumption decreased by **70%** compared to the previous reporting cycle as a result of transitioning to cleaner and more efficient heating systems.

Energy indicator	Reported value
Electricity consumption	4,228,995.91 kWh/year
Renewable electricity production	1,213,291.2 kWh/year
Renewable share of electricity use	28.69%
Natural gas consumption	70% reduction

The electricity figure is equivalent to approximately 14,685,563 GJ.

13.3.1 Local education programmes or campaigns on climate change risks, impacts, mitigation, adaptation, impact reduction and early warning

Climate change is one of the most significant global challenges, with increasing risks and impacts on ecosystems, communities, and economic development. In Alexandria, Egypt, climate change is particularly important because of the city's coastal location and its vulnerability to sea-level rise, coastal flooding, extreme weather events, and water-related challenges. Addressing these risks requires public awareness, education, and active participation in climate action.

In this context, Alexandria University plays an important role in promoting local education programmes and campaigns that raise awareness of climate change risks and impacts and encourage practical solutions. Through workshops, research projects, student activities, and environmental initiatives, the university contributes to climate change mitigation, adaptation, impact reduction, and the development of sustainable practices. These activities also support knowledge sharing and community engagement, helping students, staff, and the wider community better understand climate-related challenges and possible responses.

Furthermore, climate education can strengthen understanding of early warning systems and the importance of timely information in preparing for climate-related hazards and reducing potential damage. Documenting Alexandria University's local education programmes and campaigns during 2025 provides an opportunity to assess its contribution to climate awareness, resilience, and sustainable development in alignment with Sustainable Development Goal 13, particularly Target 13.3, which emphasizes education, awareness-raising, and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.

- Alexandria University adopts a sustainable land cover strategy that balances academic development with environmental protection across all campuses and international branches. The University's infrastructure planning prioritizes green conservation landscapes, efficient land utilization, and healthy learning environments that contribute to ecosystem resilience and climate change adaptation.
- The University has achieved 55.6% implementation of smart building technologies through the progressive integration of digital infrastructure and intelligent management systems across campus facilities. Key applications include QR code–based smart attendance systems, automated monitoring and reporting platforms, fire alarm and smoke detection systems, video surveillance, and digital access and safety controls. Training programs have also been conducted to support effective system adoption and operation. These initiatives contribute to improved operational efficiency, enhanced safety and security, reduced manual processes, and the advancement of a connected, data-driven campus environment promoting sustainability and climate action.
- Alexandria University has established a comprehensive portfolio of 26 innovative programs and projects that promote renewable energy, energy efficiency, climate change mitigation, and sustainable resource management. These initiatives integrate education, research, infrastructure, and community engagement through renewable energy centers, solar and wind power systems, green building technologies, biofuel research, circular economy projects, and international academic partnerships. The University operates renewable energy centers at the Faculty of Agriculture, Faculty of Science, and Faculty of Engineering, where hybrid solar–wind systems, photovoltaic installations, and Building-Integrated Photovoltaic (BIPV) technologies support both campus operations and applied research. In addition, Alexandria University offers specialized postgraduate programs in climate change, sustainable fisheries, natural resource sustainability, and the blue economy through Erasmus+ and other international collaborations. Campus sustainability projects, including the Green Cycle initiative, greywater recycling, energy-efficient buildings, solar power stations, and plastic recycling laboratories, further demonstrate the University's commitment to reducing carbon emissions, improving resource efficiency, and preparing graduates to address global environmental challenges.

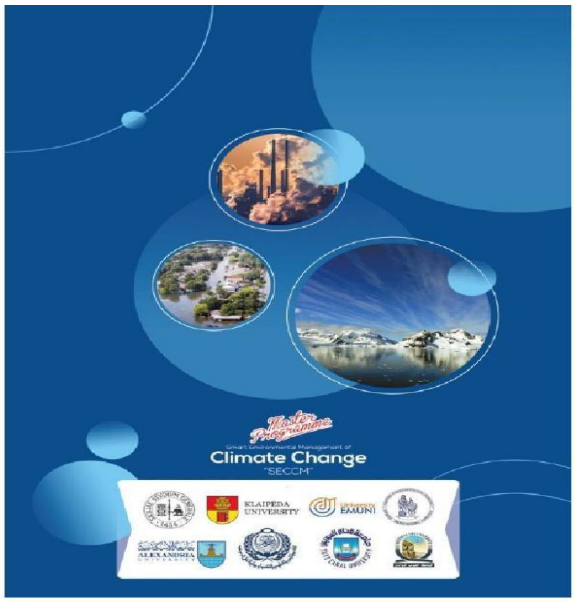
- The University's commitment to waste reduction extends beyond campus operations through research, innovation, and community engagement. Alexandria University established the PECA Fab Lab for recycling plastic waste into new products using digital manufacturing technologies, while students and researchers have developed innovative projects such as converting used cooking oil into environmentally friendly plasticizers. Community initiatives, including beach-cleaning campaigns, recycling workshops, environmental awareness programs, and partnerships with national and international organizations, further promote responsible consumption, environmental stewardship, and public participation in SDG 13 – Climate Action, sustainability, and greenhouse gas emission reduction.
- The University's Central Laboratory and specialized research facilities perform chemical and physical analyses of water quality in accordance with internationally recognized standards, ensuring effective environmental monitoring and protecting surrounding ecosystems. Community initiatives, including coastal cleanup campaigns, marine conservation activities, and environmental awareness programs, further strengthen the University's contribution to protecting aquatic environments and supporting climate change action.
- The University has implemented 22 sustainable transportation initiatives designed to reduce private vehicles and greenhouse gas emission levels. These include shuttle services, carpooling programs, bicycle parking facilities, pedestrian-friendly campus design, awareness campaigns, sustainable mobility competitions, smart parking management, and incentives encouraging environmentally responsible travel. Together, these initiatives help decrease traffic congestion, improve campus safety, and enhance air quality protection.
- Alexandria University continues to strengthen its role as a leading research institution by advancing high-impact sustainability research that addresses global environmental, social, and economic challenges. During the 2025 academic year, the University published 6,690 scholarly publications related to sustainability. These publications span a wide range of disciplines, including climate change, renewable energy, environmental protection, water resources, waste management, air pollution control, biodiversity conservation, ecosystem restoration, sustainable agriculture, and green technologies, reflecting the University's multidisciplinary approach to sustainable development.
- Research and innovation are supported through the Alexandria University Water Resilience Center of Excellence (AWR-CoE), which serves as a national platform for applied research, capacity building, professional training, and international collaboration. The Center advances sustainable water technologies through research on wastewater treatment, desalination, water reuse, circular economy approaches, and climate change resilience while offering specialized academic programs, workshops, scholarships, and partnerships with leading national and international institutions.



Natural Resources Sustainability for Land Development (Erasmus+ Project, European Union) in collaboration of Alexandria University (Egypt) with Aachen University (Germany)



Production of Bio-Diesel from Algae in Selected Mediterranean Countries: Med-Algae Project, Faculty of Science, Alexandria University, Egypt. Fuded by CBCMED-ENPI (CROSS BORDER COOPERATION IN THE MEDITERRANEAN-European Neighborhood and Partnership Instrument)





Smart Environmental Management of Climate Change in collaboration with Catania University, Italy. (AdapTm-Erasmus project) – Faculty of Science, Alexandria University, Egypt.

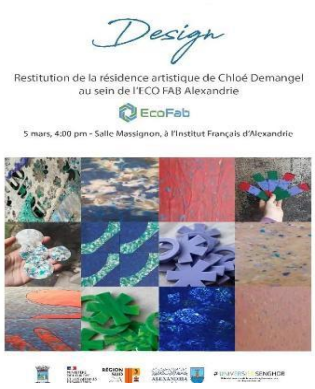


Sustainable Management of Fisheries and Aquaculture Science, in collaboration with University of Aveiro, Portugal (Erasmus+ Project, European Union) - Faculty of Science, Alexandria University, Egypt.



Alexandria University Center for Maritime Archaeology & Underwater Cultural Heritage was established as a European Union project under the EU-Tempus III Program

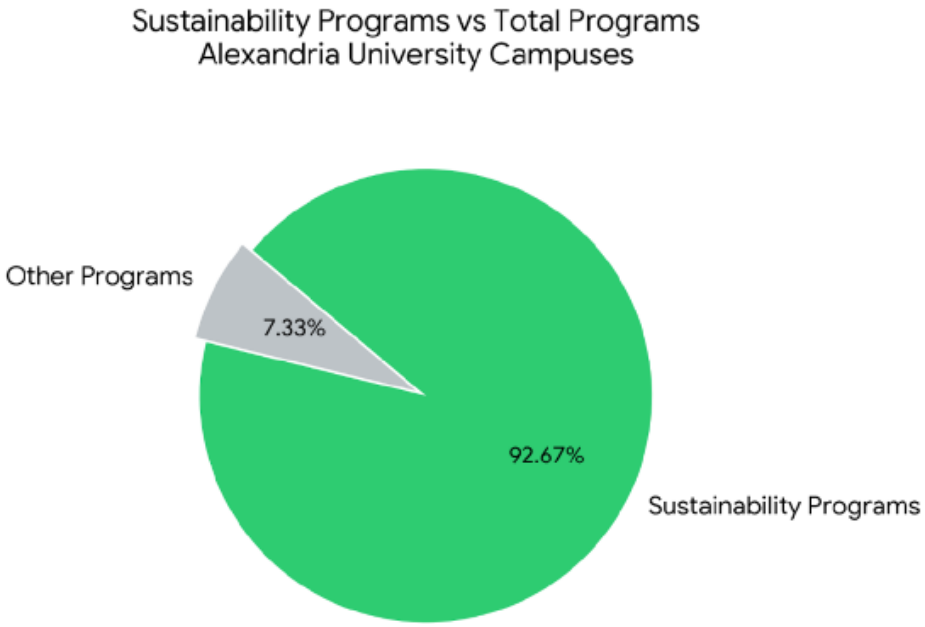


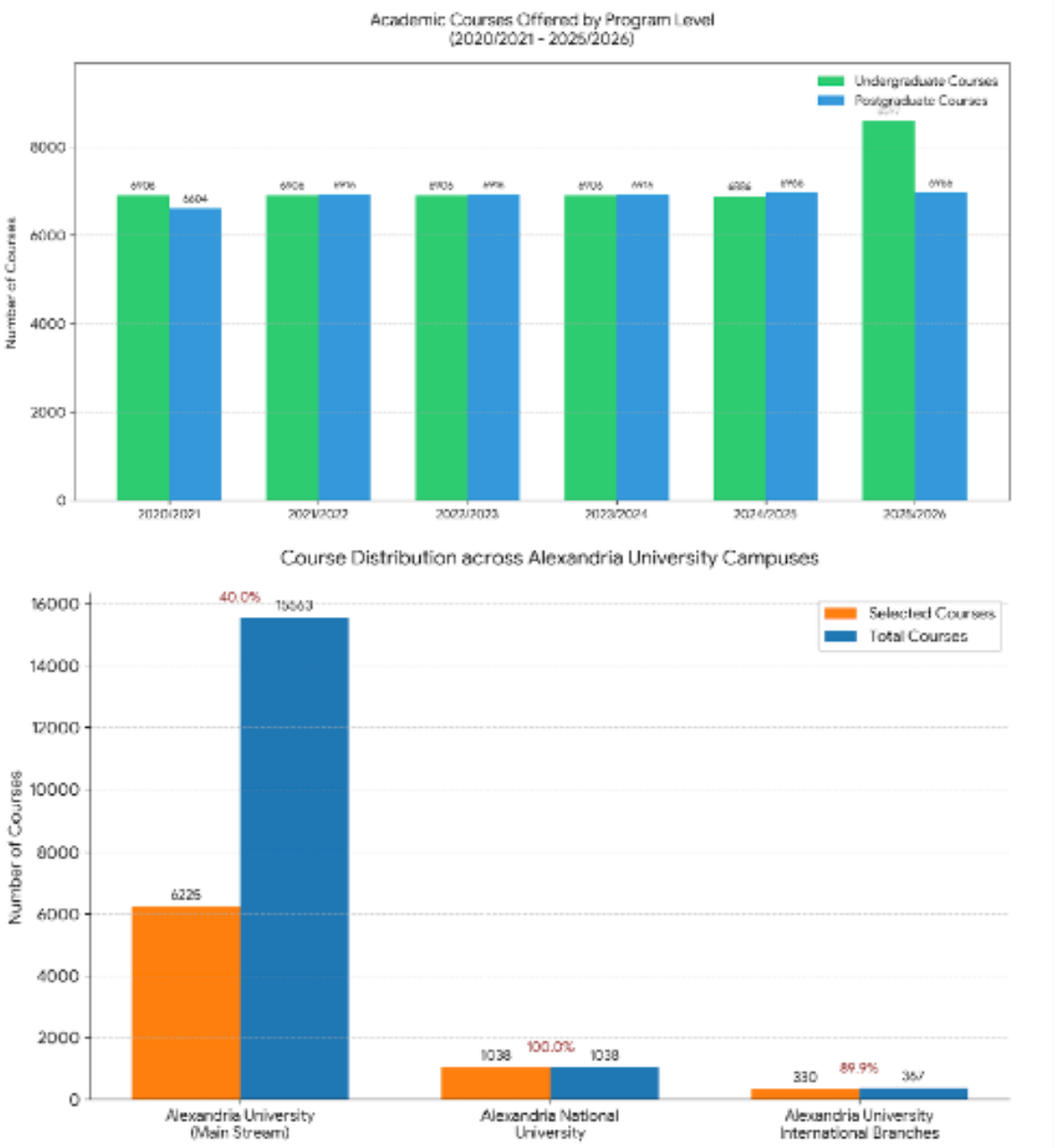




The Eco Fab is a fab lab dedicated to plastic recycling in Alexandria, Egypt and part of PECA project (Circular economy hub in alexandria).

- The University benefits from diverse funding sources, including national agencies such as the Science, Technology and Innovation Funding Authority (STDF) and the Academy of Scientific Research and Technology (ASRT), as well as international organizations including the European Union, Erasmus+, and other global research partners. Sustainable development initiatives also support researchers through publication strategy agreements, open-access assessment opportunities, and data systems published in both Arabic and English, several of which offer free solutions for policy researchers.





- Alexandria University actively empowers its students to lead sustainability initiatives that foster environmental awareness, innovation, community engagement, and social responsibility. During the reporting period, more than 30 sustainability-related activities were organized by student organizations across the University, demonstrating a vibrant culture of student participation in advancing the Sustainable Development Goals (SDGs). These activities included global climate conferences, scientific symposia, green chemistry campaigns, ecosystem awareness events, water entrepreneurship bootcamps, research and innovation frameworks, engineering competitions, sustainability workshops, environmental exhibitions, and community outreach programs.

- Student organizations such as the ACS Alexandria University Student Chapter, Society of Petroleum Engineers (SPE), Alexandria Engineering Students Union, and the Alexandria Scientific Pharmaceutical Students' Association (ASPSA) played a leading role in delivering these initiatives. Their activities promoted green chemistry, circular economy principles, SDG 13 – Climate Action, sustainable materials, water innovation, biodiversity conservation, scientific communication, entrepreneurship, and environmental education through practical workshops, public awareness campaigns, interactive exhibitions, field training, and global research collaborations.
- Alexandria University actively promotes sustainability-driven entrepreneurship through a dynamic innovation ecosystem that supported 46 sustainability-related startups during the reporting period. The University provides comprehensive incubation, mentoring, training, and commercialization support through initiatives such as the Artificial Intelligence Minds Incubator (AIM) and the Alexandria University Technology Incubator for Smart Systems (AUTISS), which foster innovative solutions in artificial intelligence, smart infrastructure, healthcare, agriculture, energy, and digital technologies. Student-led startups, including Samdha Company, develop environmentally friendly products by converting organic and agricultural waste into natural fertilizers and biodegradable materials, thereby reducing waste, supporting sustainable agriculture, and conserving water. In addition, entrepreneurship competitions such as Startup Olympics and international programs, including Bio-iChallenge and Hult Prize, encourage student teams and researchers to transform data ideas into market-ready businesses with significant environmental impact.



Alexandria University Technology Incubator for Smart Systems (AUTISS) Incubator (Faculty of Engineering, Alexandria University)



Artificial Intelligence Minds Incubator (Faculty of Engineering, Alexandria University)



Artificial Intelligence Minds Incubator (Faculty of Engineering, Alexandria University)



Samdha Company, founded by Musaad Darwish, a student in the Department of Civil and Environmental Engineering at the Faculty of Engineering





Samdha Company: The plants in the 2 photos on the left are planted in presence of natural organic fertilizers

Verified programmes and campaigns from 2025

1. "Flow and Foresight" climate workshop

18 April 2025 · Faculty of Engineering and partner venues

Alexandria University's Faculty of Engineering worked with the University of Toulon and the Barcelona Supercomputing Centre through the Pharos project. The two-day workshop examined climate change, hydrodynamic processes, marine hazards and coastal submersion risks in the Mediterranean region. It is the strongest documented 2025 match for climate-risk education and adaptation.



2. Green Universities for a Better Future

Launched 11 May 2025 · Faculty of Pharmacy

The Bibliotheca Alexandrina launched this project in cooperation with Alexandria University’s Faculty of Pharmacy, the Earth’s Climate for Sustainable Development Foundation and the Global Environment Facility Small Grants Program. Its goals include embedding sustainability in university education, developing students’ climate-action awareness and building young people's green-economy and environmental-entrepreneurship skills.



3. Green Circle environmental sustainability project

Reported October 2025 · Faculty of Pharmacy

The project promotes waste sorting and recycling, reduced energy consumption, greywater reuse, greener laboratory practices and student participation in sustainability activities. It also describes training in carbon-footprint awareness and waste management. These are practical ways to reduce environmental impacts, although they are not the same as a formal early-warning programme.



4. “Our Sea Is Clean Without Trash” and circular-economy education

Students from Alexandria schools and the French Institute took part in an Anfouchi beach cleanup, followed by demonstrations of converting plastic waste into usable materials through 3D printing at the university's Fab Lab. This is relevant to climate mitigation through waste reduction and circular-economy practices, but should be classified as a broader sustainability activity rather than a dedicated climate-risk campaign.



5. AG-WaMED: Sustainable water resources under climate change

31 August 2025 · Faculty of Agriculture

Alexandria University reported the successful completion of an STDF-funded research project investigating sustainable use of unconventional water resources under climate-change conditions in the

coastal dry valleys of Matrouh Governorate. This is relevant to adaptation, water security and reducing climate impacts, although it is a research project rather than a general student awareness campaign.



13.3.2 University Climate Action plan, shared with local government and/or local community groups

Alexandria University recognizes biodiversity conservation and urban greens as key sustainability strategy components. Aligned with SDG 13 – Climate Action, it continuously maintains land cover, forest area, soil, vegetation, crops, and plants supporting research, education, environmental protection, and social interaction. This program builds resilience, lowers our carbon footprint, and advances global climate change adaptation.

Alexandria University Climate Action plan, shared with local government and/or local community groups, establishes an integrated framework advancing SDG 13 – Climate Action and sustainability across coastal Egypt. Driven by scientific research, empirical data, measurement, monitoring, and remote sensing, our quantitative methodology uses climate models, simulation, and life cycle assessment (LCA) tools for rigorous system analysis, evaluation, and risk assessment. Through this approach, we assess energy utilization, total energy consumption, and the campus carbon footprint across buildings, infrastructure, residence characteristics, and regional transportation fleet vehicles. Replacing legacy fossil fuel sources—including coal, natural gas, and diesel fuel powering diesel engine systems in power plant facilities—the university drives a regional energy transition. Upstream production of cement, metals, materials, and chemicals releases greenhouse gas emissions (CO2 emissions / carbon emissions / gas emissions / co2 / carbon dioxide), methane, and nitrogen, increasing atmospheric concentration, accelerating global warming, and shifting air temperature. These forces threaten local ecosystems, land cover, land, soil, vegetation, forest area, steppes, wetlands, rivers, lakes, glaciers, groundwater, and water resources along Alexandria's vulnerable coast and ocean and sea, endangering biodiversity, native species, crops (Zea mays, rice), and total water supply while worsening drought, floods, and hot temperature extremes.

To counter these causes and complex dynamics, our joint strategy deploys clean technology, targeted solutions, and strict energy conservation. We expand renewable energy via solar energy, solar power, wind power, and renewable energy source capacity for power generation; accelerate solar energy conversion and electric vehicle (EV) mobility; utilize biofuel and hydrogen; and process municipal waste via recycling, gasification, biomass, and reforming reactions. Engineered carbon capture—via adsorption, absorption, membrane systems, gas separation, and injection or storage in structural basins—complements natural carbon sequestration, urban greens, and environmental protection to enhance air quality and air pollution control. Guided by costs and cost analysis, cost-benefit analysis, and carbon markets, this plan optimizes investment, unlocks economic benefits, and minimizes systemic risk under environmental uncertainty. Ultimately, this unified program offers a scalable model driving sustainable economic growth, building climate resilience, and protecting planet Earth (planet) for the global human population across developing countries and nations like the United States and China.

Climate change is a major environmental challenge affecting Alexandria because of its Mediterranean coastal location, urban development, industrial activities and dependence on natural resources.

The main climate challenges include rising temperatures, sea-level rise, coastal erosion, flooding, air pollution, greenhouse gas emissions, water scarcity and ecosystem degradation.

Alexandria University has an important role in supporting sustainable development through scientific research, environmental policies, renewable-energy projects, carbon-footprint assessment and cooperation with local government and community stakeholders.

In January 2025, the Alexandria Green City Action Plan (GCAP) was published as a strategic framework for developing a more sustainable and climate-resilient city.

The plan identifies Alexandria University as a key knowledge partner for climate-change and land-use actions.

- **Alexandria Green City Action Plan – January 2025**

  The Alexandria Green City Action Plan was developed under the EBRD Green Cities Programme, with support from the European Bank for Reconstruction and Development and the Austrian Federal Ministry of Finance.

  The plan was prepared in cooperation with Alexandria Governorate and relevant governmental and technical stakeholders.

  Its main objectives include:

  - Reducing greenhouse gas emissions.
  - Improving environmental protection and air quality.
  - Strengthening climate adaptation and coastal resilience.
  - Improving energy efficiency and renewable-energy utilization.
  - Protecting water resources and ecosystems.
  - Developing sustainable urban infrastructure.
  - Improving climate-risk management and early-warning systems.

- Encouraging community participation in sustainable development.

The plan provides a framework for coordinating environmental policies, investment projects and climate-related actions across Alexandria.

- **Collaboration Between Alexandria University and Local Government**

  The Alexandria Green City Action Plan identifies Alexandria University as a key knowledge partner for all climate-change and land-use actions.

  This creates an important relationship between academic research and local government decision-making.

  The university can contribute through:

  1. Scientific research and climate modelling.
  2. Analysis of greenhouse gas emissions and carbon footprints.
  3. Environmental impact assessment.
  4. Climate-risk and vulnerability assessment.
  5. Research on coastal protection and adaptation.
  6. Renewable-energy and energy-efficiency technologies.
  7. Monitoring environmental conditions and climate-related risks.
  8. Technical recommendations for sustainable urban planning.

  The plan also identifies the Alexandria Governorate, Ministry of Local Development, Egypt Meteorological Department and other public authorities as relevant stakeholders.

- **Climate Action Priorities in Alexandria**

  Carbon Emissions and Greenhouse Gas Reduction

  The city plan addresses greenhouse gas emissions through sustainable energy, improved transportation, energy-efficient buildings and better waste management.

  Alexandria University also reports progress in reducing its institutional carbon footprint.

  According to its 2024–2025 Sustainability Report:

  - Carbon footprint in 2020/2021: 7,541.33 tonnes CO_2e.
  - Carbon footprint in 2024/2025: 3,040.60 tonnes CO_2e.
  - Reported reduction: approximately 59.7%.

These figures provide evidence of the university's contribution to carbon-emission reduction through energy-efficiency improvements and renewable-energy measures.

Renewable Energy and Energy Efficiency

The Green City Action Plan promotes:

- Solar photovoltaic installations.
- Renewable-energy production.
- Energy-efficient buildings.
- Smart electricity distribution.
- Energy monitoring and optimization.
- Reduced dependence on fossil fuels.

The plan also includes a case study of the SOLE energy rehabilitation project at Alexandria University's Faculty of Engineering.

This project involves cooperation between the Alexandria Chamber of Commerce and the Confederation of Egyptian European Business Associations to improve the building's energy performance through photovoltaic technology.

Climate Adaptation and Coastal Protection

Alexandria is vulnerable to climate-related coastal hazards, including sea-level rise, storm surges, coastal erosion and flooding.

The Green City Action Plan includes a coastal protection action designed to reduce damage to coastal areas and important infrastructure.

Proposed approaches include:

- Coastal protection infrastructure.
- Nature-based solutions.
- Improved land-use planning.
- Flood-risk assessment.
- Protection of vulnerable urban areas.
- Climate-resilient infrastructure.

Alexandria University can contribute scientific expertise and research to support these adaptation measures.

Flood Risk and Early-Warning Systems

The plan includes an important action entitled:

CR3 – Early Warning System and Local Preparedness Plan.

This action recognizes the need to strengthen the existing local preparedness plan by integrating climate-related hazards and a multi-hazard early-warning system.

The proposed approach includes:

- Reviewing existing emergency plans.
- Identifying climate-related hazards.
- Strengthening alert systems.
- Improving local preparedness.
- Supporting coordination between government agencies and technical institutions.
- Developing an operational early-warning system.

The Alexandria Governorate, Egypt Meteorological Department and Alexandria University are identified as relevant partners.

Water Resources and Environmental Protection

The Green City Action Plan also addresses water management and environmental sustainability.

Its priorities include:

- Improving wastewater treatment.
- Reducing water pollution.
- Protecting rivers, lakes and coastal ecosystems.
- Improving drainage systems.
- Developing water-reuse opportunities.
- Protecting natural resources.
- Reducing environmental pressures from industrial activities.

These measures contribute to climate resilience and sustainable urban development.

Transportation and Sustainable Urban Development

The plan identifies transportation as an important contributor to urban emissions.

Proposed approaches include:

- Improving public transportation.
- Supporting electric vehicles.
- Developing bus rapid transit corridors.
- Promoting energy-efficient transportation.
- Improving walking and cycling infrastructure.
- Reducing traffic congestion and air pollution.

These measures support lower carbon emissions and improved urban environmental quality.

Waste Management and Circular Economy

The city plan recognizes the importance of waste management in reducing greenhouse gas emissions.

Its proposed actions include:

- Increasing recycling.
- Reducing waste sent to landfills.
- Promoting waste separation.
- Improving waste-treatment facilities.
- Exploring waste-to-energy opportunities.
- Reducing methane emissions from landfill operations.
- Encouraging community participation in waste reduction.

- **University Coordination with Local Stakeholders in 2025**

  On 16 January 2025, Alexandria University's Community Service and Environmental Development Council discussed establishing a committee to rationalize electricity consumption across the university's faculties and institutes.

  The initiative was aligned with Egypt's sustainable development strategy and Egypt Vision 2030.

  This activity provides evidence of university-level institutional coordination on energy conservation and environmental sustainability.

  The university's wider relationship with local development stakeholders is also reflected in the Green City Action Plan, which identifies the university as a knowledge partner.

- **Stakeholder Engagement and Community Participation**

The Alexandria Green City Action Plan was developed through a stakeholder-engagement process.

The plan documents a stakeholder meeting held in January 2024 involving 39 participants, with an online and offline survey involving 32 participants. These consultations informed the prioritization of the city's environmental challenges.

The plan identifies climate adaptation and resilience, water quality and availability, greenhouse gas emissions and air quality as important environmental priorities.

Community participation is also incorporated into proposed urban development, green infrastructure and environmental management actions.

Alexandria University can strengthen these partnerships by:

- Sharing scientific research with Alexandria Governorate.
- Providing technical advice on climate-risk assessment.
- Organizing joint climate-awareness events.
- Supporting local environmental initiatives.
- Cooperating with community organizations.
- Publishing climate-related research and recommendations.
- Participating in monitoring and evaluating climate-action projects.

- Alexandria University has established a comprehensive program of 26 projects promoting renewable energy, energy efficiency, climate change mitigation, and sustainable resource management. Aligned with SDG 13 – Climate Action, these initiatives integrate education, research, infrastructure, and social interaction through renewable energy centers, solar power and wind power systems, green building technology, biofuel research, and circular economy projects. The University operates centers across Agriculture, Science, and Engineering, where hybrid solar–wind systems and solar energy conversion (including BIPV) support campus operations, power generation, and applied study. Specialized postgraduate degrees focus on climate change, sustainability, water resources, and the blue economy via international partnerships. Campus sustainability initiatives—including water and plastic recycling, energy-efficient buildings, solar stations, and waste processing—demonstrate our commitment to reducing CO2 emissions / carbon emissions, improving energy utilization, and protecting the environment. Supported by monitoring, data analysis, and cost-benefit analysis, this framework mitigates risk under environmental uncertainty, lowers our carbon footprint, strengthens regional resilience, and prepares graduates to solve global greenhouse gas challenges for planet Earth (planet) across developing countries and global nations.



Car pooling application for smartphones - Green Cycle project in the Faculty of Pharmacy (Alexandria University, Egypt)

- The University's commitment to waste reduction extends beyond campus operations through research, technology, and social interaction. Alexandria University established the PECA Fab Lab for recycling plastic into new materials and product lines using digital manufacturing, while researchers drive biofuel and chemical reforming reactions to convert used cooking oil into green solutions. Community action—including beach-cleaning, environmental protection campaigns, and national partnerships—promotes sustainability, lowers our carbon footprint, and advances SDG 13 – Climate Action for our shared environment.



- The University's Central Laboratory performs chemical and physical analysis of water quality using standard methodology, ensuring effective environmental protection and monitoring to safeguard surrounding coastal ecosystem and ocean and sea environments. Community action including coast cleanup campaigns, marine conservation, and awareness program initiatives strengthens Alexandria University's contribution to protecting aquatic water resources and advancing SDG 13 – Climate Action.

Central Water Laboratory – Alexandria University



Official university evidence – 2025

Alexandria University Centre of Excellence for Water Laboratory, accredited for chemical and physical water-quality testing.

Students cleaning Ras El-Tin Beach



25 October 2025

Alexandria University students collecting plastic bottles and solid waste to protect marine organisms and the coastal environment.

Marine pollution awareness and beach-cleaning campaigns



2025

Local beach-cleaning and environmental awareness campaigns addressing plastic pollution and threats to marine biodiversity.

Water-quality testing and scientific laboratory equipment



Laboratory analysis of water samples using scientific equipment to assess physical and chemical water-quality parameters.

- Alexandria University actively empowers students to lead sustainability action that fosters environmental awareness, innovation, and social interaction. During the reporting period, over 30 SDG 13 – Climate Action program activities were organized, demonstrating student contribution to sustainable development. Initiatives included international conferences, green chemistry campaigns, climate awareness events, water resources entrepreneurship bootcamps, research competitions, and environmental protection workshops. These efforts advance education, lower our carbon footprint, and strengthen community resilience across global nations.



Water Entrepreneurship Training Programme – Youth in Water: Shaping the Future
15 May 2025
Students and academic representatives participating in an entrepreneurship programme organized in cooperation with the European Union.



Soil and Water: The Source of Life – World Soil Day

7 December 2025

Students and researchers participating in scientific lectures and student project competitions about soil and water sustainability.



Student Smart Waste Management Competition

22 December 2025

Students developing innovative solutions for university waste management.



Student sustainability and environmental engagement

Reporting period: 2024–2025

University-wide sustainability activities included workshops, awareness campaigns and student engagement.

13.3.3 University participates in co-operative planning for climate change disasters, that may include the displacement of people both within a country and across borders, working with government

As a leading coastal institution along the Mediterranean, Alexandria University occupies a critical position in addressing climate risks, sea-level rise, and coastal vulnerability. Recognizing that climate extremes trigger human movement, the University works directly with local governance, national Egyptian ministries (including the Ministry of Environment and Ministry of Water Resources and Irrigation), and regional stakeholders to develop integrated response strategies, policy framework models, and long-term climate change adaptation measures.

Climate change is increasing the risk of natural disasters in coastal cities, particularly through sea-level rise, coastal erosion, extreme rainfall, flooding and increasing temperatures. Alexandria is particularly vulnerable because of its Mediterranean coastal location, high population density, industrial development and exposure to coastal hazards. Severe climate-related disasters can damage residential areas, infrastructure, transportation networks, water supplies and essential public services. In extreme situations, these impacts may force people to leave their homes temporarily or permanently.

Population displacement may occur within Egypt, particularly from vulnerable coastal and low-lying areas to safer locations. More severe regional climate disasters may also contribute to cross-border displacement and migration pressures. Alexandria University can contribute to climate disaster preparedness through scientific research, risk assessment, early-warning development, emergency planning and cooperation with local and national government institutions.

The Alexandria Green City Action Plan (GCAP), published in January 2025, represents an important framework for cooperation between Alexandria Governorate, technical institutions and other stakeholders. The plan was developed under the European Bank for Reconstruction and Development (EBRD) Green Cities Programme. Alexandria University is identified as a key knowledge partner for climate-change and land-use actions.

The plan addresses:

1. Climate-risk assessment.
2. Coastal flooding and sea-level rise.
3. Extreme rainfall and urban flooding.
4. Early-warning systems.
5. Emergency preparedness.
6. Vulnerable populations.
7. Sustainable infrastructure.
8. Climate adaptation and resilience.

Early Warning System and Local Preparedness Plan

One of the most relevant actions is CR3, which proposes updating Alexandria's existing local preparedness plan to address climate-related hazards.
The proposed activities include:

- Reviewing existing emergency-management plans.
- Identifying gaps in climate-risk preparedness.
- Assessing the needs of vulnerable populations.
- Strengthening communication channels.
- Coordinating with the Egyptian Meteorological Department.
- Assessing requirements for a multi-hazard early-warning system.
- Improving local emergency response.

Alexandria Governorate, the Egyptian Meteorological Department and Alexandria University are identified as implementation partners. The action specifically emphasizes accessible communication for persons with disabilities, women, older people and other vulnerable groups.

Cooperative Planning for Climate-Related Disasters and Displacement

Climate-related disasters can result in temporary evacuation, loss of housing, economic disruption and population displacement.
For Alexandria, the most relevant potential displacement scenarios include:

- **Coastal Flooding and Sea-Level Rise**

Rising sea levels and coastal flooding may affect residential areas, infrastructure, commercial activities and essential services.
Potential consequences include:

- Damage to homes and buildings.
- Temporary evacuation of vulnerable neighbourhoods.
- Loss of livelihoods.
- Disruption of transportation and public services.
- Relocation from highly exposed coastal areas.

The Green City Action Plan addresses coastal protection and improved urban resilience.

- **Extreme Rainfall and Urban Flooding**

Heavy rainfall can overwhelm drainage systems and affect low-lying neighbourhoods.
Preparedness measures should include:

- Flood-risk mapping.
- Emergency evacuation planning.
- Safe temporary accommodation.
- Public warning communication.
- Protection of hospitals and essential facilities.
- Coordination between local authorities and emergency services.

- **Heatwaves and Water Scarcity**

Increasing temperatures and water shortages may affect vulnerable communities, particularly older people, children and low-income households.

Potential responses include:

- Heatwave awareness programmes.
- Public health preparedness.
- Water-resource management.
- Emergency assistance for vulnerable households.
- Climate-resilient infrastructure.

- **Internal Population Displacement**

Internal displacement refers to people being forced to leave their homes but remaining within the borders of their own country.

In Alexandria, severe coastal flooding or other climate-related disasters could require temporary relocation of residents to safer areas.

Potential planning contributions from Alexandria University include:

- Scientific identification of vulnerable neighbourhoods.
- Population vulnerability assessments.
- Mapping of evacuation routes.
- Research on the availability of essential services.
- Assessment of temporary accommodation requirements.
- Studies of the social and economic effects of displacement.

- **Cross-Border Displacement and Migration**

Severe climate disasters in neighbouring or other countries may increase migration and humanitarian pressures.

Cross-border displacement involves people moving from one country to another.

Potential planning considerations include:

- Cooperation with national migration and humanitarian authorities.
- Protection of vulnerable displaced populations.
- Access to healthcare, education and water.
- Coordination with international humanitarian organizations.
- Assessment of environmental and social pressures on host communities.

Evidence limitation: The reviewed Alexandria University and Governorate documentation does not establish a specific university-led cross-border refugee relocation programme. Cross-border displacement is therefore included as a relevant disaster-planning consideration, not as an already implemented university project.

Consortium for Alexandria – Government and International Cooperation (2026)

On 24–26 March 2026, the United Nations Office for Disaster Risk Reduction (UNDRR), in cooperation with the Egyptian Cabinet and Alexandria Governorate, launched the Consortium for Alexandria.

The launch brought together more than 60 participants representing:

- National and local government.
- United Nations organizations.

- International and local partners.
- Diplomatic missions.
- Technical experts.
- Specialists and other stakeholders.

The consortium aims to strengthen Alexandria's resilience against climate change and natural disasters.

The discussions addressed:

- Rising sea levels.
- Increased rainfall and storms.
- Flooding and coastal hazards.
- Risk-analysis mapping.
- Early-warning systems.
- Infrastructure resilience.
- Scientific research.
- Community preparedness.
- Public participation.

The consortium provides a cooperative platform for bringing together government, technical institutions, civil society and international partners. It is relevant to Alexandria University's role as a scientific and knowledge partner.

Flow and Foresight – Alexandria University, 18 April 2025



Alexandria University President and Faculty of Engineering representatives. Deputy Governor of Alexandria attended. Climate change, coastal flooding and marine disaster risks. International cooperation with University of Toulon and Barcelona supercomputing Centre.

Alexandria University – Crisis and Disaster Management Unit, 17 November 2025



University faculty members and students. Risk identification and prevention. Emergency preparedness and safety awareness.

Alexandria University – Community Service and Environmental Development Council, 19 November 2025



University leadership and faculty representatives. Risk assessment and crisis-management planning. Safety policies and training initiatives.

Alexandria University – Towards a Safe Environment Initiative, 19 November 2025



University professors and student representatives. Civil-society participation. Environmental protection and community safety.

Advanced Disaster Modeling & Risk Assessment

- Data-Driven Analysis: Utilizing remote sensing, GIS tools, and advanced climate models, university researchers conduct continuous monitoring and simulation of sea-level rise, extreme storm surges, and coastal erosion along Alexandria's coast.
- Vulnerability Mapping: Researchers perform comprehensive risk assessment to identify high-risk zones where extreme weather events—such as severe floods or coastal inundation—could force the displacement of local populations both regionally and across national borders.
- Integrated Indicators: Empirical measurement and quantitative data analysis assess environmental stress factors, including saltwater intrusion into coastal groundwater, degradation of soil quality, and impact on agricultural crops (e.g., Zea mays, rice).

Governmental Policy & Strategic Response Protocols

- Joint Decision Making: Through institutional social interaction and formal advisory committees, Alexandria University collaborates with government bodies to shape Egyptian environmental policy and regional emergency management frameworks.
- Displacement & Migration Planning: University legal, urban planning, and social research teams work alongside government agencies to formulate policy recommendations regarding internal human displacement and cross-border climate migration under SDG 13 – Climate Action.
- Resilience & Infrastructure Adaptation: Academic teams evaluate coastal residence characteristics and urban infrastructure to advise municipal authorities on resilient

building designs, protective breakwaters, and sustainable water supply management during extreme events.

Resource Security, Infrastructure & Environmental Protection

- Water & Energy Resilience: To support communities during climate disruptions, joint projects focus on protecting municipal water resources (lakes, rivers, wetlands) and securing reliable energy utilization.
- Clean Energy Integration: The University promotes regional energy transition by integrating decentralized renewable energy (such as solar energy, solar power, and wind power) to ensure uninterrupted power for emergency shelters, health facilities, and critical buildings.
- Ecosystem-Based Adaptation: University agricultural and biological scientists work with local communities to restore coastal greens, manage land cover, and protect local biodiversity and native species, creating natural buffers against climate disasters.

13.3.4 University informs and support local or regional government in local climate change disaster/risk early warning and monitoring

Alexandria University plays an important scientific and technical role in supporting local government in addressing climate-change disasters and environmental risks. Alexandria is particularly vulnerable to climate change because of its Mediterranean coastal location, high population density, urban development and exposure to extreme rainfall, flooding, sea-level rise, coastal erosion and increasing temperatures. These environmental changes affect infrastructure, buildings, roads, water resources, ecosystems, agriculture and public safety.

The framework integrates climate change mechanisms into mitigation strategies, capacity building initiatives, and regional oversight frameworks. Adaptation and management measures are periodically evaluated to reduce environmental risks, lower greenhouse gas emissions, and ensure sustainability standards. Alex University Sustainability Office coordinates climate change adaptation and implementation across the region. The project promotes sustainability dynamics, improves energy efficiency, develops environmental policy, monitors emission reduction performance, supports innovation in renewable energy and solar technologies, strengthens capacity, and advances carbon neutrality principles. Environmental governance is reinforced through regional frameworks and institutional strategy to ensure broad implementation and monitoring.

Through its Engineering Centre, Faculty of Engineering, environmental research facilities and Community Service and Environmental Development Sector, Alexandria University provides scientific knowledge and technical assistance to support local climate adaptation and disaster-risk reduction.

The university's activities contribute to SDG 13 by strengthening climate-risk assessment, rainfall management, environmental monitoring, engineering solutions and cooperation with government authorities.

There are two important initiatives:

- A cooperation protocol between Alexandria University and Alexandria Governorate to develop a nine-stage torrential-rain management system, including an early-warning system, using university scientific research and its Technology Park. This was announced in 2023, with the programme intended to finish by the end of 2024.
- The January 2025 Alexandria Green City Action Plan, which identifies Alexandria University, the Governorate and the Egyptian Meteorological Department as partners in reviewing local preparedness and assessing the requirements for a climate-related early-warning system.

Documented activities and university-government cooperation

Integrated Rainwater Management Strategy

One of Alexandria University's most important contributions is its participation in the Integrated Strategy Project for Rainwater Management in Alexandria Governorate. The project addresses the increasing risks associated with heavy rainfall, winter storms and urban flooding. The university's Engineering Centre signed a cooperation protocol with the Holding Company for Drinking Water and Wastewater.

Under this agreement, the Engineering Centre provides:

- Engineering consultancy.
- Technical designs for rainwater-management infrastructure.
- Preparation of tender documents.
- Supervision of project implementation.
- Scientific and engineering recommendations.
- Support for climate adaptation and flood-risk reduction.

The project is being implemented under government direction and cooperation with Alexandria Governorate and relevant water and sanitation authorities. The strategy aims to separate parts of the rainwater drainage network from the sewage network, improve drainage capacity and reduce flooding in vulnerable urban areas.

Rainfall Monitoring and Scientific Analysis

Alexandria University has documented the use of remote-sensing technology and satellite information in its rainwater-management research. The university's earlier technical documentation identifies the following satellite and meteorological data sources:

- NASA Tropical Rainfall Measuring Mission (TRMM).
- NASA Global Precipitation Measurement (GPM).
- NOAA.
- National Centers for Environmental Information (NCEI).

These data sources support rainfall assessment and the analysis of precipitation patterns.
The information can help researchers and government authorities understand:

1. Rainfall distribution.
2. Seasonal rainfall variation.
3. Heavy precipitation events.
4. Areas vulnerable to water accumulation.
5. Potential pressure on drainage infrastructure.
6. Future rainfall-management requirements.

This approach supports evidence-based planning and the development of more effective climate-risk management strategies.

University Plan for the Rainy Season and Storms

On 22 December 2024, Alexandria University's Community Service and Environmental Development Council reviewed the university's plan to confront the rainy season and storms. The university instructed its faculties and institutes to complete preventive preparations, including:

- Inspecting roofs and buildings.
- Checking rainwater drainage systems.
- Maintaining rain gutters and drainage channels.
- Preventing rainwater accumulation.
- Inspecting electrical installations.
- Completing maintenance work.
- Protecting university facilities and their occupants.

On 23 December 2024, the council directed the activation of the General Committee supervising the university's rainy-season and storm preparedness plan. These measures demonstrate institutional preparedness, risk prevention and monitoring of university infrastructure during extreme weather conditions.



Alexandria University's Engineering Centre signed a cooperation protocol with the Holding Company for Drinking Water and Wastewater.

The university's responsibilities included:

- Providing engineering consultancy.
- Completing designs for rainwater-management projects.
- Preparing tender documents.
- Supervising project implementation.
- Supporting solutions to reduce the impacts of climate change and heavy rainfall.

The project was commissioned within the framework of government efforts to improve Alexandria's rainwater drainage system.

University review of the Integrated Rainwater Management Strategy



Alexandria University's Community Service and Environmental Development Council reviewed the Integrated Strategy Project for Rainwater Management within Alexandria Governorate.
The presentation included:

- Factors increasing rainfall-related risks.
- The project's implementation status.
- Proposed locations for implementation.
- Cooperation protocols with water and sanitation authorities.
- Scientific and engineering solutions for managing rainfall.

Official 2025 climate-risk and early-warning planning

January 2025 – official government plan



The Alexandria Green City Action Plan identifies Alexandria University as a key knowledge partner for climate-change and land-use actions.
The proposed work includes:

- Reviewing existing emergency and preparedness plans.

- Identifying climate-related risks and gaps.
- Coordinating with the Egyptian Meteorological Department.
- Assessing early-warning requirements.
- Improving communication with vulnerable communities.
- Updating local preparedness plans.

The proposed implementation partners are Alexandria Governorate, the Egyptian Meteorological Department and Alexandria University.



Alexandria's rainfall and urban flooding risks, not a photograph of a university monitoring operation.

Academic report document

Alexandria is a coastal city exposed to several climate-related hazards, including heavy rainfall, urban flooding, sea-level rise, coastal erosion and extreme temperatures. These environmental changes create risks for residents, infrastructure, water resources, transportation systems and economic activities. Alexandria University contributes scientific and technical expertise to local government through its Engineering Centre, research activities, environmental studies and cooperation with public authorities. Its contribution includes engineering consultancy, rainfall-management planning, climate-risk assessment and technical support for disaster preparedness.

Cooperation Between Alexandria University and Government Authorities

- **Climate-Change Disaster Risk and Early Warning**

Alexandria Green City Action Plan – January 2025

The Alexandria Green City Action Plan was published in January 2025 under the European Bank for Reconstruction and Development Green Cities Programme. Alexandria University is identified as a key knowledge partner for climate-change and land-use actions.
The plan includes Action CR3:

Early Warning System and Local Preparedness Plan.

The proposed activities include:

1. Reviewing the existing local preparedness plan.
2. Identifying climate-related hazards.
3. Assessing gaps in emergency communication.
4. Coordinating with the Egyptian Meteorological Department.
5. Identifying the requirements for an early-warning system.
6. Improving preparedness for extreme weather events.
7. Providing accessible warnings for vulnerable groups.

The proposed implementation partners are Alexandria Governorate, the Egyptian Meteorological Department and Alexandria University.

Climate Monitoring and Risk Assessment

The university can support local government through:

- Analysis of rainfall and meteorological information.
- Engineering assessment of drainage infrastructure.
- Identification of flood-prone locations.
- Scientific research on coastal flooding.
- Environmental and hydrological studies.
- Assessment of climate-related infrastructure vulnerability.
- Evaluation of adaptation measures.

These activities support evidence-based decision-making and climate resilience.

Evidence note: The rainwater-management cooperation dates from 2023. The 2025 Green City Action Plan provides the more recent evidence of the university's role in climate-risk and early-warning planning. Proposed early-warning activities should not be represented as a fully operational system without further implementation records.

– Signing of the rainwater-management cooperation protocol



– University Council reviewing the rainwater strategy



– Government stakeholder planning meeting



Alexandria University provides scientific and engineering expertise to support Alexandria Governorate in integrated rainwater management, climate-risk assessment and the development of local early-warning and disaster-preparedness plans.

Climate Disaster Risk Assessment and Environmental Monitoring

Alexandria University contributes to environmental monitoring through research and technical assessments.

Important monitoring areas include:

1. Flooding and Rainwater Management

Research and engineering assessments support the identification of areas vulnerable to flooding and the development of drainage solutions.

2. Coastal Vulnerability

The Faculty of Science conducts research and environmental impact assessments relating to shoreline erosion and coastal environmental change.

3. Water Resources

University laboratories conduct physical, chemical and biological assessments of water quality, supporting the monitoring of environmental conditions.

4. Ecosystem Protection

Research on coastal ecosystems, marine biodiversity and pollution contributes to the understanding of climate impacts on the Mediterranean environment.

5. Climate and Atmospheric Conditions

Meteorological information, rainfall data and satellite observations provide a scientific basis for climate-risk analysis and future planning.

Mahmoudiyah Axis Project and Climate Adaptation

The Mahmoudiyah Axis project provides an important example of urban development and environmental improvement associated with Alexandria's wider water-management strategy. Alexandria University's documentation includes actual before-and-after photographs of the project. The project demonstrates the relationship between urban infrastructure, water management, environmental protection and sustainable development.

Relevant benefits include:

- Improved waterway conditions.
- Better urban infrastructure.
- Improved water-resource management.
- Reduced environmental pressure.
- Opportunities for improved drainage and urban resilience.

Supporting Climate-Related Decision-Making by Government

Alexandria University can provide local government with technical knowledge and research in several areas.

Government need	**University contribution**
Rainfall analysis	Remote sensing and satellite data
Flood-risk assessment	Engineering and hydrological research
Early-warning planning	Scientific expertise and climate-risk assessment
Drainage infrastructure	Engineering design and technical supervision
Coastal protection	Shoreline and environmental research
Water monitoring	Physical and chemical water analysis
Climate models	Research and environmental data analysis
Vulnerability assessment	Identification of exposed areas and infrastructure
Emergency preparedness	Institutional planning and risk prevention
Environmental policy	Scientific recommendations and technical evidence

Contribution to SDG 13 – Climate Action

The university's activities support the following SDG 13 priorities:

- Strengthening resilience and adaptive capacity to climate-related hazards and natural disasters.
- Integrating climate-change measures into policies, strategies and planning.
- Improving education, awareness and institutional capacity on climate mitigation, adaptation and early warning.

The Integrated Rainwater Management Strategy, the university's rainy-season preparedness plan and the 2025 Green City Action Plan provide complementary evidence of these contributions.

Additional Relevant Climate and Environmental Keywords

The activities are relevant to the following scientific and environmental concepts:

Climate and atmosphere: Climate change, global warming, greenhouse effect, carbon dioxide, atmospheric temperature, precipitation, extreme weather, climate variability and greenhouse gas emissions.

Disaster risk: Floods, heavy rainfall, coastal vulnerability, risk assessment, early warning, monitoring, prediction, climate models, emergency response and resilience.

Water and ecosystems: Water resources, groundwater, water supply, rivers, lakes, oceans and seas, coastal ecosystems, biodiversity, wetlands and environmental protection.

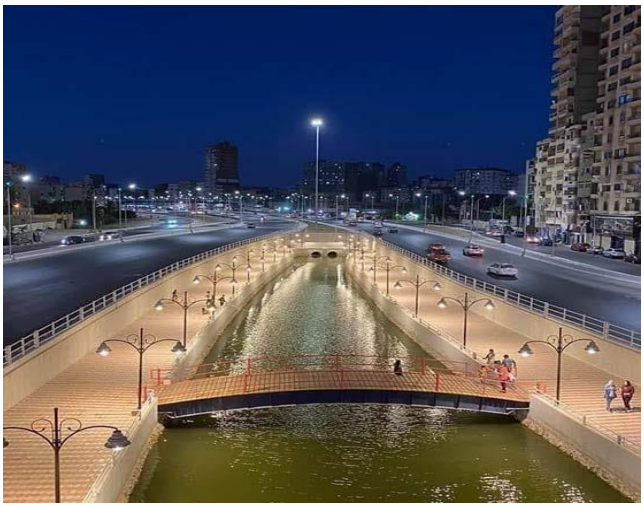
Technology and methodology: Remote sensing, satellite data, GIS, climate modelling, measurement, data analysis, simulation, monitoring systems and engineering technology.

Sustainable development: Renewable energy, energy efficiency, carbon footprint, emissions reduction, environmental policy, sustainability, investment, cost-benefit analysis and sustainable infrastructure.

Mahmoudiyah Axis – before and after



Before



After

Before-and-after photographic documentation of the Mahmoudiyah Axis project, included in Alexandria University's sustainability evidence.

Coastal environmental research



Alexandria University researchers conducting environmental assessments of coastal erosion and shoreline vulnerability.

13.3.5 University collaborates with NGOs on climate adaptation

Climate change represents a major environmental and socioeconomic challenge for coastal cities around the world. Alexandria, located on Egypt's Mediterranean coast, is particularly vulnerable to climate-related risks, including sea-level rise, coastal erosion, extreme weather events, water stress, and flooding.

Alexandria University has demonstrated the value of cooperation between academic institutions and civil society in advancing environmental sustainability.

The Green Universities for a Better Future project provides a particularly relevant example of this approach. Through cooperation with Our Earth Climate for Sustainable Development Foundation, Bibliotheca Alexandrina, and the GEF Small Grants Programme, the university has supported environmental awareness, green education, and the transformation of the Faculty of Pharmacy into a more environmentally sustainable institution.

The Green Circle initiative further illustrates how environmental responsibility can be integrated into everyday university activities.

However, Alexandria's coastal vulnerability means that sustainability efforts should continue to develop toward more comprehensive climate adaptation programmes.

Strengthening partnerships with NGOs, expanding research collaboration, involving local communities, and developing measurable adaptation projects can help Alexandria University become an even stronger contributor to climate resilience in Alexandria and the wider Mediterranean region.

Ultimately, university–NGO partnerships provide an important foundation for connecting scientific knowledge with practical environmental action.

Addressing these challenges requires cooperation among universities, government institutions, civil society organizations, and local communities.

Alexandria University has an important role in this process through scientific research, environmental education, community service, and partnerships with organizations working toward sustainable development.

One particularly relevant example is the university's collaboration with the **Our Earth Climate for Sustainable Development Foundation**, the Bibliotheca Alexandrina, and the Global Environment Facility Small Grants Programme (GEF/SGP) through the project *Green Universities for a Better Future*.

Climate Change Challenges in Alexandria
Alexandria's coastal location makes climate adaptation an important priority.
The city faces several interconnected environmental challenges:

- **Sea-level rise:** Increasing sea levels create long-term risks for coastal infrastructure, settlements, and ecosystems.
- **Coastal erosion:** Changes in coastal processes can threaten beaches and protective natural systems.
- **Urban flooding:** Heavy rainfall and pressure on drainage infrastructure can disrupt transportation and public services.
- **Water management:** Increasing pressure on freshwater resources makes conservation and efficient water use essential.
- **Environmental degradation:** Pollution, waste generation, and ecosystem deterioration can increase the vulnerability of local communities.

These challenges demonstrate the importance of combining scientific knowledge with community participation and practical environmental initiatives. Alexandria University contributes by producing research, educating students, supporting local decision-makers, and cooperating with NGOs to develop effective adaptation measures.

Alexandria University's Collaboration with NGOs

Alexandria University recognizes the importance of partnerships in achieving sustainable development and addressing climate change.

One important documented partnership involves the **Our Earth Climate for Sustainable Development Foundation**.

The collaboration is part of the project entitled:

Green Universities for a Better Future: Transforming the Faculty of Pharmacy at Alexandria University into an Eco-Friendly Green Faculty.

The initiative was implemented through cooperation between:

1. Alexandria University's Faculty of Pharmacy.
2. Our Earth Climate for Sustainable Development Foundation.
3. Bibliotheca Alexandrina.
4. Global Environment Facility Small Grants Programme.

The project combines academic expertise, civil society participation, environmental awareness, and financial support for sustainability activities.

According to the Global Environment Facility's Small Grants Programme, the cooperation agreement aimed to reduce the Faculty of Pharmacy's carbon footprint, introduce green economy and environmental entrepreneurship concepts into academic programmes, and encourage students to participate in sustainability initiatives.

The foundation also organized an awareness workshop at Bibliotheca Alexandrina, where participants discussed the faculty's carbon footprint assessment and opportunities to develop practical environmental interventions.

The Green Universities for a Better Future Project

The Green Universities for a Better Future project represents an important example of cooperation between a university and a civil society foundation.

Launched in May 2025, the project sought to transform Alexandria University's Faculty of Pharmacy into a model environmentally friendly faculty.

The project was designed to integrate sustainability into university education and encourage students and academic staff to participate in climate action.

Its main objectives included:

- Reducing the environmental footprint of university facilities.
- Promoting energy and water conservation.
- Introducing green economy concepts into higher education.
- Encouraging environmental entrepreneurship.
- Increasing student participation in environmental activities.
- Developing environmental awareness and sustainable practices.

An important part of the project was the assessment of the Faculty of Pharmacy's carbon footprint. This assessment provided a scientific basis for identifying priorities and planning future environmental interventions.

The project concluded in May 2026, with a closing ceremony at Bibliotheca Alexandrina. University representatives highlighted the importance of cooperation between academic institutions, civil society, and supporting organizations.

The university also indicated its intention to expand the experience to other faculties.



The Green Circle Initiative at the Faculty of Pharmacy

The Green Circle initiative is another important component of the Faculty of Pharmacy's environmental sustainability efforts.

According to Alexandria University's May 2026 announcement, the initiative began in October 2022 and gradually developed into a broader sustainability model.

It emphasizes environmental responsibility, conservation, and behavioral change within the university community.

The initiative illustrates how university departments can translate environmental objectives into practical activities.

Its relevance to climate adaptation includes:

- Encouraging responsible use of natural resources.
- Supporting more sustainable waste-management practices.
- Promoting environmental awareness among students.
- Encouraging water conservation and efficient resource management.
- Developing a culture of environmental responsibility.

The initiative demonstrates that climate action is not limited to large infrastructure projects. Changes in everyday institutional practices can also contribute to environmental resilience.



University–Community Environmental Collaboration





November 26,2025: Vice President of Alexandria University Receives the Dean of the Faculty of Science at the University of Waterloo to Enhance Academic and Research Collaboration. The two sides discussed opportunities for collaboration in several fields, including medicine and dentistry, artificial intelligence, marine sciences, marine environment, climate change, and aquatic biology. They also explored cooperation between business acceleration centers, particularly the Velocity Center at the University of Waterloo and the Alexandria University Technology Park, with the aim of supporting students and researchers in developing startup ideas and transforming them into successful, scalable ventures.





May 13,2025: The Alexandria EU 4 Water-Preneurs Bootcamp kicked off today in collaboration with Alexandria University, where young participants focused on water challenges and discussed various topics, including:

- 🔷Global trends in the water sector
- 🔷Climate adaptation and resilient water solutions
- 🔷Entrepreneurial mindset and innovation
- 🔷Circular water economy & non-conventional water resources
- 🔷The role of AI, tech, and digital tools in water management




January 21,2024: Egyptian Pioneers and Scholars Program Delegation Visits Alexandria University. the cooperation and joint coordination between Alexandria University and the Egyptian Pioneers and Scholars Program at the bachelor's level, and expressed her aspiration to develop this cooperation at the postgraduate level through grants provided by the United States Agency for International Development (USAID) and working to form scientific schools, support innovations and patents, and exchange opinions, ideas, and experiences in the fields of climate change and sustainable development.





June 14,2025: Empowering and increasing the collaboration opportunities for maintaining our region creative, sustainable, green, and resilient between north and south of the Mediterranean was the main aim of the Erasmus+ week for professionals held by EMUNI University. All the contributors across the Mediterranean, Egypt, Slovenia, Palestine, Tunisia, Morocco, Algeria, Albania, Serbia, Italy, Spain, and Turkey discussed the opportunities and challenges and the urgent need for increasing the collaboration opportunities between the two sides of the Mediterranean through joint education programs, knowledge transfer, research and innovation, and entrepreneurship to create integrated strategies that can benefit the whole region. One example of this new emerging collaboration across the Mediterranean countries is the agreement between Alexandria University, Egypt and EMUNI University, Slovenia.





December 24,2025: Within the framework of Alexandria University's commitment to supporting sustainability, innovation, and linking scientific research to development priorities, the University has launched the AGROW-HUB project, funded by the European Union. The project aims to promote sustainable solutions for agricultural waste management and transform it into value-added products, thereby supporting the circular bio-economy and strengthening academic and industrial partnerships at both the regional and international levels.

- **The Role of NGOs in Climate Adaptation**
  Non-governmental organizations can strengthen the capacity of universities to address climate change.
  Their contributions include:
  Community engagement: NGOs help universities communicate environmental information to residents and local communities.

  Environmental education: They can organize workshops, campaigns, and training activities for students and young people.

  Project implementation: NGOs can help translate research findings into practical environmental initiatives.

  Funding and partnerships: Civil society organizations can connect academic institutions with national and international funding opportunities.

  Local knowledge: NGOs can help identify community needs and environmental priorities that may not be fully captured by academic research.

  The partnership between Alexandria University and Our Earth Climate for Sustainable Development Foundation demonstrates how these roles can complement university expertise.

- **Recommendations for Strengthening Climate Adaptation Partnerships**
  Building on the documented experience, Alexandria University could further develop its collaboration with NGOs through the following recommendations.
  Coastal Resilience Projects

Establish collaborative research and community programmes addressing coastal flooding, erosion, and sea-level rise.

Water Conservation

Expand water-efficiency initiatives, rainwater harvesting studies, and appropriate wastewater reuse projects across university facilities.

Student and Youth Engagement

Develop joint training programmes with NGOs to prepare students to participate in climate adaptation projects and environmental volunteering.

Climate Awareness Campaigns

Organize public seminars, workshops, and community campaigns explaining climate risks and practical adaptation measures.

Research and Knowledge Exchange

Encourage interdisciplinary cooperation among university researchers, environmental organizations, local authorities, and community representatives.

Monitoring and Evaluation

Develop measurable indicators to evaluate the effectiveness of environmental initiatives, including water savings, waste reduction, student participation, and community engagement.

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

Alexandria University's sustainability documentation identifies a carbon-reduction target covering Scope 1 and Scope 2 emissions by at least 2050. There is an important academic distinction: 2050 is the reported target horizon for Scope 1 and 2 reductions. It should not automatically be described as a verified commitment to eliminate all Scope 1, 2 and 3 emissions.

carbon-footprint (tonnes of CO_2 equivalent) = 3,040.60 (2024–2025 academic year)



Faculty of Pharmacy Green Cycle project award ceremony



University solar photovoltaic installation

ALEXANDRIA UNIVERSITY'S ROADMAP TOWARD CARBON NEUTRALITY BY 2050

Institutional Carbon Reduction Target, Greenhouse Gas Accounting, and Sustainability Progress

Alexandria University has established a long-term direction toward carbon reduction and carbon neutrality, with 2050 identified in its published sustainability documentation as the target horizon for reducing Scope 1 and Scope 2 emissions.

The university has been monitoring its carbon footprint since the 2018/2019 academic year. Its sustainability programme includes renewable energy deployment, energy-efficiency improvements, green-campus initiatives, environmental awareness, and carbon-footprint assessments.

According to the university's 2024/2025 sustainability report, its institutional carbon footprint decreased from 7,541.33 tonnes of CO_2 equivalent (tCO_2e) in 2020/2021 to 3,040.60 tCO_2e in 2024/2025, representing a reduction of approximately 59.7%.

The university's published sustainability portal also identifies a document concerning its target date for becoming carbon neutral according to the Greenhouse Gas Protocols and a separate document concerning carbon-reduction targets covering Scope 1 and Scope 2 emissions by at least 2050.

This report examines the 2050 target, the university's emissions performance, the relevance of the Greenhouse Gas Protocol, and the measures required to achieve a credible net-zero transition.

Alexandria University's Carbon Neutrality Target: 2050 is the target horizon identified in Alexandria University's published carbon-reduction documentation for Scope 1 and Scope 2 emissions. This should not be interpreted as independent verification that all Scope 1, 2, and 3 emissions will reach zero by that date.

The publicly available evidence reviewed for this report supports the 2050 target horizon, particularly for Scope 1 and Scope 2. The full scope and exact residual-emissions criteria should be confirmed against the university's underlying target document.

The Greenhouse Gas Protocol and Its Application

The Greenhouse Gas Protocol is an internationally recognized framework for measuring and reporting greenhouse gas emissions from organizations.

It provides a consistent approach for identifying emission sources, establishing organizational boundaries, calculating emissions, and monitoring progress.

For Alexandria University, this framework is important because the university operates multiple faculties, research institutes, administrative buildings, laboratories, and other facilities.

The GHG Protocol categorizes organizational emissions into three principal scopes.

Scope 1: Direct Emissions

Scope 1 includes emissions from sources owned or controlled by the university.

Examples include:

- Fuel combustion in university-owned boilers and generators.
- Fuel consumption by university-owned vehicles.
- Direct emissions from refrigeration and air-conditioning equipment.
- Other direct greenhouse gas emissions from university operations.

Reducing these emissions requires improved equipment efficiency, vehicle management, refrigerant control, and cleaner fuel alternatives.

Scope 2: Indirect Energy Emissions

Scope 2 covers indirect emissions associated with purchased electricity, steam, heating, and cooling consumed by the university.

For Alexandria University, electricity consumption in classrooms, laboratories, administrative buildings, hospitals, and research facilities represents an important area for emissions reduction.

Possible measures include:

- Installing solar photovoltaic systems.
- Improving lighting efficiency.
- Upgrading air-conditioning systems.
- Improving building insulation and energy management.
- Monitoring electricity consumption across university facilities.

Scope 3: Other Indirect Emissions

Scope 3 includes other indirect emissions throughout the university's value chain.

Examples include:

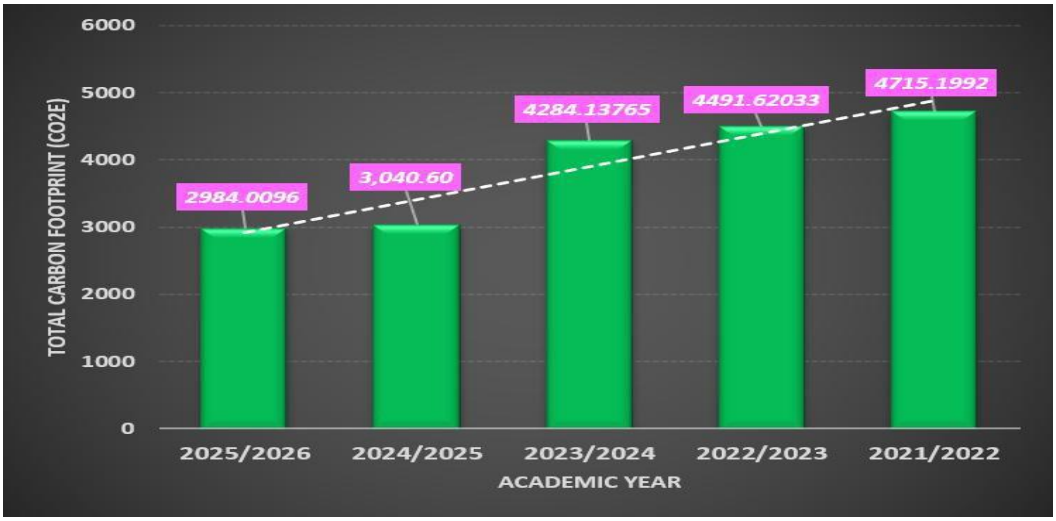
- Student and employee commuting.
- Business travel and air transportation.
- Waste generation and disposal.
- Purchased goods and services.
- Water supply and wastewater treatment.
- Construction and procurement activities.

A comprehensive institutional net-zero strategy should address these emissions as well, even when the university's published reduction target specifically focuses on Scopes 1 and 2.

- **Alexandria University's Carbon Footprint Performance**

  Alexandria University has published carbon-footprint assessments covering multiple academic years. The reported figures demonstrate a substantial downward trend.

Academic year	Carbon footprint (tCO_2e)
2020/2021	**7,541.33**
2021/2022	**4,715.20**
2022/2023	**4,491.62**
2023/2024	**4,284.14**
2024/2025	**3,040.60**



The reported reduction between 2020/2021 and 2024/2025 is approximately 59.7%.

This improvement reflects the university's reported progress in energy efficiency, renewable electricity, and sustainability management.

However, the figures should be interpreted with reference to the reporting boundaries and calculation methods used in each academic year. A reduction in total reported emissions does not by itself establish that the institution has achieved net zero.

- **Renewable Energy and Carbon Reduction Initiatives**

  Alexandria University has developed several initiatives supporting its transition toward a lower-carbon campus.

  Solar Energy Installations

  The university has documented renewable energy facilities at the Faculty of Agriculture, Abis Campus, and its main university building.

  Its sustainability documentation also records a 220-kilowatt solar photovoltaic installation on the rooftop of the Mechanical Engineering Department at the Faculty of Engineering.

  Solar energy can reduce Scope 2 emissions by replacing electricity purchased from carbon-intensive sources.

  Energy Efficiency

  The university has reported improvements in electricity and natural gas consumption.

  Its 2024/2025 sustainability reporting identifies a 6.42% decrease in electricity consumption compared with the previous reporting year and a 70% reduction in natural gas usage.

  These measures can help reduce both direct and indirect greenhouse gas emissions.

  Green Campus Initiatives

  The Faculty of Pharmacy's Green Cycle initiative provides an example of integrating sustainability into daily university activities.

  The initiative promotes shared transportation and reduced individual vehicle use.

The university has also participated in green-campus initiatives, environmental education, and projects supporting sustainable resource management.

Sustainability Office and Renewable Energy Unit

On 19 March 2026, Alexandria University announced the establishment of a Sustainability Office and a Renewable Energy Unit.

These institutional structures are intended to strengthen environmental policies, promote clean technologies, expand renewable energy use, and coordinate sustainability activities across the university.

They provide an important organizational foundation for implementing the university's long-term carbon-reduction objectives.

Renewable Energy Sources in Campus: 1,228,291.2 kWh/year

Renewable energy sources and technologies supporting energy generation and combined heat applications include:

1) **Solar Thermal Systems:** Solar collectors generate renewable thermal energy to support heating and hot water demands and complement building energy systems.
2) **Wind Energy:** Wind turbines convert wind energy into renewable electricity to support campus operations and reduce dependence on conventional energy sources.
3) **Biodiesel Production:** Biodiesel derived from biological feedstocks such as plant oils, used cooking oil, and other renewable organic materials serves as a cleaner alternative fuel for energy generation and operational activities.
4) **Green Hydrogen:** Hydrogen produced through water electrolysis using renewable electricity (e.g., solar or wind power) serves as a clean energy carrier that can support electricity generation, thermal applications, and future low-carbon energy systems, including CHP applications where implemented.
5) **Biomass Energy:** Biomass utilization includes advanced conversion technologies such as carbonization, torrefaction, gasification, pyrolysis, and biochar production, contributing to renewable energy generation and efficient resource utilization.
6) **Waste-to-Energy Systems:** Organic or biodegradable waste is converted into useful energy, with CHP applications enabling simultaneous production of electricity and recoverable heat.
7) **Together, these renewable energy technologies contribute to increasing renewable energy production, improving energy efficiency, reducing greenhouse gas emissions, and supporting sustainable campus development and smart building implementation.**

	
Automatically Controlled Biodiesel Production Unit. (Faculty of Engineering, Alexandria University)	Activated carbon cloth from biomass fibrous resources (Faculty of Engineering, Alexandria University)
	
Design and Fabrication of Biodiesel Burner test rig. (Faculty of Engineering, Alexandria University)	Green Hydrogen/Diesel Dual-Fuel Retrofit: A Scalable Pathway to Industrial Decarbonization (Faculty of Engineering, Alexandria University)
	
Design of Integrated Augmented Vertical Axis Wind Turbine (VAWT) With Solar Energy System for High Rise Urban Applications (Faculty of Engineering, Alexandria University)	Experimental and Simulation Study of Natural Gas–Hydrogen/Diesel RCCI for Engine Decarbonization (Faculty of Engineering, Alexandria University)



Solar Energy Center at the Faculty of Agriculture (Alexandria University)



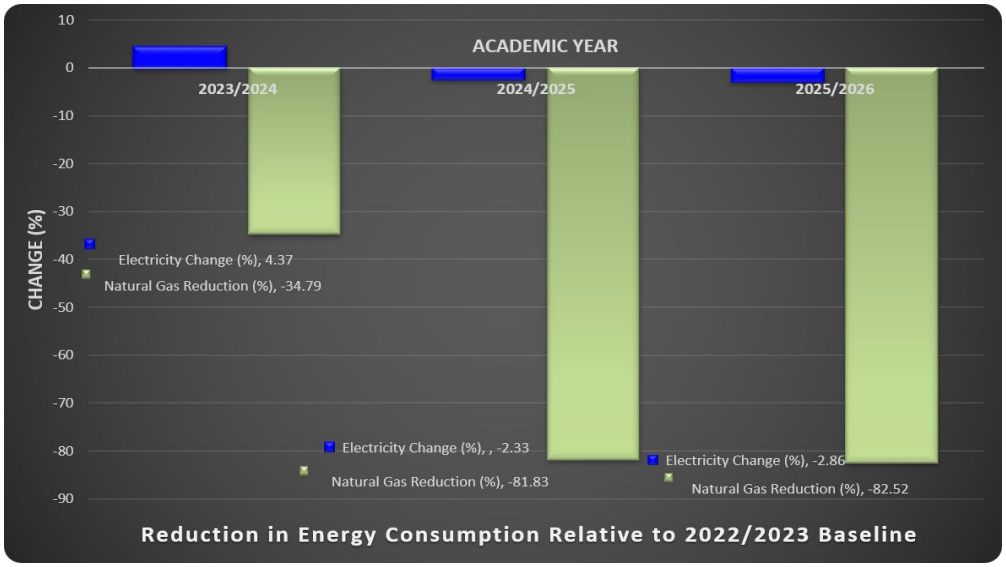
Windmill and Solar Panels (Solar Energy Center at the Faculty of Agriculture - Alexandria University)

- Alexandria University has developed a comprehensive framework of 26 innovative projects and programs that promote renewable energy, energy efficiency, climate change mitigation, and sustainable resource management. These initiatives integrate education, research, infrastructure, and community engagement through renewable energy centers, solar and wind power systems, green building technologies, biofuel research, circular economy projects, and international academic partnerships. The University operates renewable energy centers at the Faculty of Agriculture, Faculty of Science, and Faculty of Engineering, where hybrid solar-wind systems, photovoltaic installations, and building-integrated photovoltaic technologies support both campus operations and applied research. In addition, Alexandria University offers specialized postgraduate programs in climate change, sustainable fisheries, natural resource sustainability, and the blue economy through Erasmus+ and other international collaborations. Campus sustainability projects, including the Green Cycle initiative, greywater recycling, energy-efficient buildings, solar power stations, and plastic recycling laboratories, further demonstrate the University's commitment to reducing carbon emissions, improving resource efficiency, and preparing graduates to address global environmental challenges.



Car pooling application for smartphones - Green Cycle project in the Faculty of Pharmacy (Alexandria University, Egypt)

- Alexandria University continues to enhance energy efficiency through targeted energy management initiatives and infrastructure upgrades. Compared with the 2022/2023 baseline, natural gas consumption decreased significantly by 34.79% in 2023/2024, 81.83% in 2024/2025, and 82.52% in 2025/2026. Electricity consumption also declined by 2.33% in 2024/2025 and 2.86% in 2025/2026, following a temporary increase of 4.37% in 2023/2024. These results demonstrate the University's ongoing commitment to reducing energy consumption, improving operational efficiency, and lowering greenhouse gas emissions in support of the Sustainable Development Goals and Egypt's Vision 2030.



- The University has established 22 sustainable transportation initiatives designed to reduce private vehicle use and greenhouse gas emissions. These include shuttle services, carpooling programs, bicycle parking facilities, pedestrian-friendly campus design, awareness campaigns, sustainable mobility competitions, smart parking management, and incentives encouraging environmentally responsible travel. Together, these initiatives help decrease traffic congestion, improve campus safety, and enhance environmental quality.

- **Proposed Roadmap Toward 2050**

  To strengthen the implementation of its published target horizon, Alexandria University should maintain a measurable, university-wide carbon-reduction roadmap.

  The following stages are recommendations rather than confirmed university deadlines.

  2026–2030: Measurement and Governance

  - Establish a consistent university-wide GHG inventory.
  - Confirm the organizational and operational boundaries.
  - Document Scope 1, Scope 2, and relevant Scope 3 emissions.
  - Establish a verified emissions baseline.
  - Publish annual carbon-reduction progress reports.
  - Strengthen the role of the Sustainability Office.

  2031–2040: Accelerated Decarbonization

  - Expand solar energy installations.
  - Improve energy efficiency across faculties.
  - Electrify suitable university vehicles.
  - Improve refrigerant management.
  - Introduce sustainable procurement practices.
  - Reduce waste and transportation-related emissions.

  2041–2050: Deep Emissions Reduction

  - Further reduce remaining fossil-fuel consumption.
  - Expand renewable electricity procurement.
  - Improve energy management across all university facilities.
  - Address remaining indirect emissions.
  - Independently verify the institutional GHG inventory.
  - Demonstrate compliance with the university's approved net-zero criteria.

  The 2050 milestone should be supported by annual progress indicators and transparent reporting.