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.

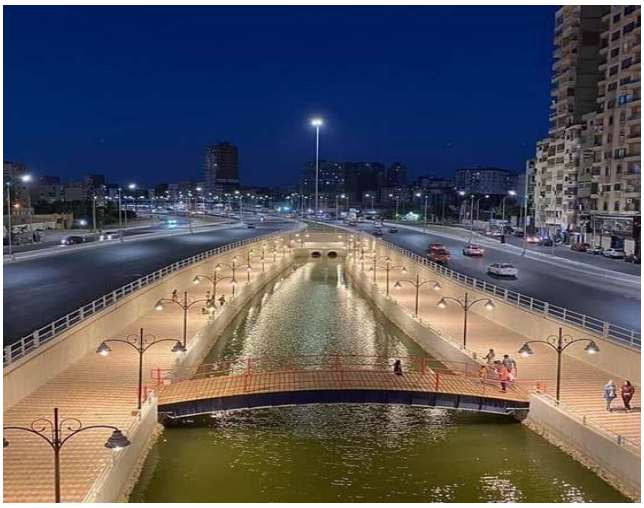
Technology and methodology: Remote sensing, satellite data, GIS, climate modelling, measurement, data analysis, simulation, monitoring systems and engineering technology.

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.