University : Al-Mustaqbal University (formerly name: Al-Mustaqbal University College)
Country : Iraq
Web Address : https://uomus.edu.iq/Home/IndexEn

6.5.4: Sustainable water extraction on campus Year: in place by 2025: Where water is extracted (for example from aquifers, lakes or rivers) utilise sustainable water extraction technologies on associated university grounds on and off campus.

Link to the public evidence:
https://sustainability.uomus.edu.iq/SDG_Hub/Goals/6

1- **Smart Irrigation and Sustainable Agriculture Project**

A) Project Background and Introduction

Smart irrigation is an innovative approach to agriculture that combines modern technology with sustainable water management. Unlike conventional irrigation methods, which often supply water according to fixed schedules, smart irrigation systems rely on real-time environmental data to determine when and how much water plants need. This approach helps improve agricultural efficiency, preserve water resources, and maintain healthy plant growth.

Al-Mustaqbal University is interested in promoting sustainable agricultural practices through the adoption of modern irrigation technologies and efficient water-use strategies. The implementation of smart irrigation provides an opportunity to manage campus green areas and agricultural activities more effectively by reducing unnecessary water use and improving irrigation performance.

The proposed system uses intelligent sensors and automated control technologies to monitor soil moisture and regulate water delivery according to the actual needs of plants. By integrating electronic control units with remote monitoring applications, the system can reduce water losses, limit unnecessary irrigation, and minimize the need for continuous manual supervision.

This initiative supports the university's commitment to environmental sustainability and contributes to the United Nations Sustainable Development Goals, particularly SDG 6 (Clean Water and Sanitation), SDG 2 (Zero Hunger), and SDG 12 (Responsible Consumption and Production).

B) Main Objectives of the Project

The project aims to achieve the following objectives:

- Improve irrigation efficiency: Supply plants with water according to their actual moisture requirements.
- Reduce water losses: Prevent excessive irrigation and unnecessary water consumption.
- Introduce automation: Operate the irrigation process automatically using electronic sensors and control systems.
- Enable remote operation: Provide users with the ability to monitor and manage irrigation through smartphones or computers.
- Reduce operational costs: Minimize manual intervention and improve the efficiency of water and energy use.
- Support sustainable agriculture: Encourage the application of modern agricultural technologies within the university environment.
- Enhance water conservation awareness: Demonstrate the importance of responsible water management through practical technological applications.

C) System Design and Working Mechanism

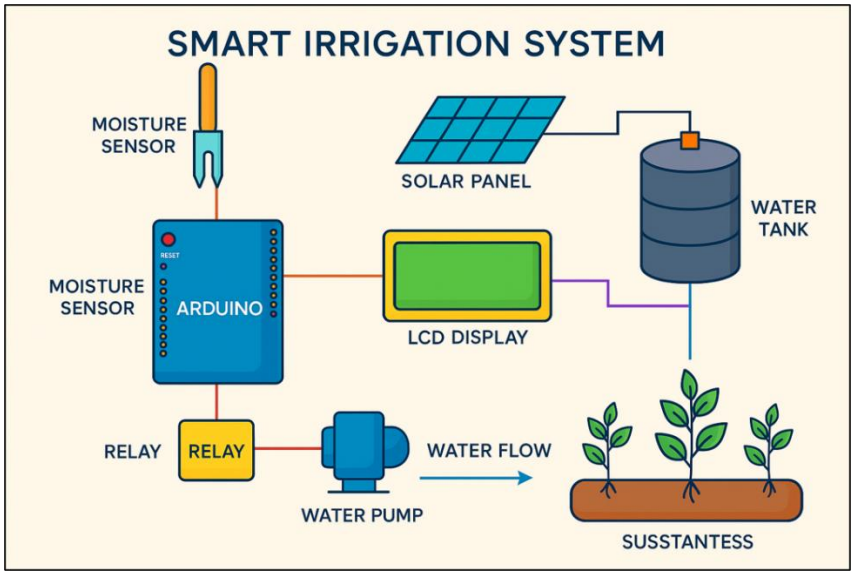
The project is based on an automated irrigation mechanism that combines soil moisture sensing, electronic control, and a controlled water distribution network.

An Arduino microcontroller serves as the main control unit, receiving information from soil moisture sensors installed near plant roots. These sensors continuously measure the moisture level in the soil and transmit the readings to the controller.

When the measured moisture level falls below a predefined threshold, the controller activates a water pump or an electrically operated valve, allowing water to flow through the irrigation pipes towards the plants. Once the required moisture level is reached, the system automatically stops the water supply.

Furthermore, the system can be connected to an Internet of Things (IoT) platform, such as the Blynk application, allowing users to monitor soil conditions, check system performance, and control irrigation remotely using mobile phones or computers.

This combination of automatic control and remote accessibility provides a practical solution for improving irrigation management, reducing water consumption, and supporting more sustainable agricultural operations.



2- Hydroponic Farming Project

The hydroponic farming project occupies an area of approximately 50 square meters and consists of seven growing panels (water pipes). Each panel is equipped with specially designed openings to accommodate planting cups filled with a suitable growing medium. These cups contain holes that allow plant roots to extend through and access the nutrient-rich water circulating inside the pipes.

Each pipe is designed to accommodate seven plants, while the system supports a total of approximately 70 seedlings. It operates through a water recycling and reuse mechanism, minimizing water consumption and promoting sustainable agricultural practices.

Project Benefits

- Enhanced Productivity: Maximizes agricultural production within limited spaces through efficient growing techniques.

- Water Conservation: Reduces water consumption through a recirculating system that collects and reuses water.

- Local Economic Impact: Contributes to strengthening the local economy by supporting agricultural activities and creating potential employment opportunities.

- Sustainable Agriculture: Promotes resource efficiency and environmentally friendly agricultural practices.





3-Rainwater Harvesting and Sustainable Water Management

A) Introduction

Rainwater harvesting is an effective method of conserving water resources by collecting and storing rainfall for future use. The collected water can be reused for several purposes, including garden irrigation, agricultural activities, and toilet flushing, reducing dependence on conventional water supplies.

At Al-Mustaqbal University, the collection and storage of rainwater contribute to sustainable water management and support the university's environmental initiatives. Regional climate data indicate that annual rainfall reached approximately 113 mm in 2025, highlighting the potential to utilize available rainwater as an additional water source as shown in figure below. This initiative supports the United Nations Sustainable Development Goals, particularly SDG 6 (Clean Water and Sanitation) and SDG 12 (Responsible Consumption and Production).

Year	Hottest day	Coldest day	Annual mean	Rainfall	Hot days	Frost days
2025	50.9 °C 28 July 2025	-0.6 °C 25 February 2025	26.5 °C	113 mm	230	1
2024	50.8 °C 22 June 2024	1.6 °C 17 December 2024	26.7 °C	121 mm	204	0
2023	50.7 °C 13 August 2023	3.3 °C 18 February 2023	26.6 °C	158 mm	221	0
2022	50.9 °C 4 August 2022	-1.3 °C 19 January 2022	26.5 °C	61 mm	216	1

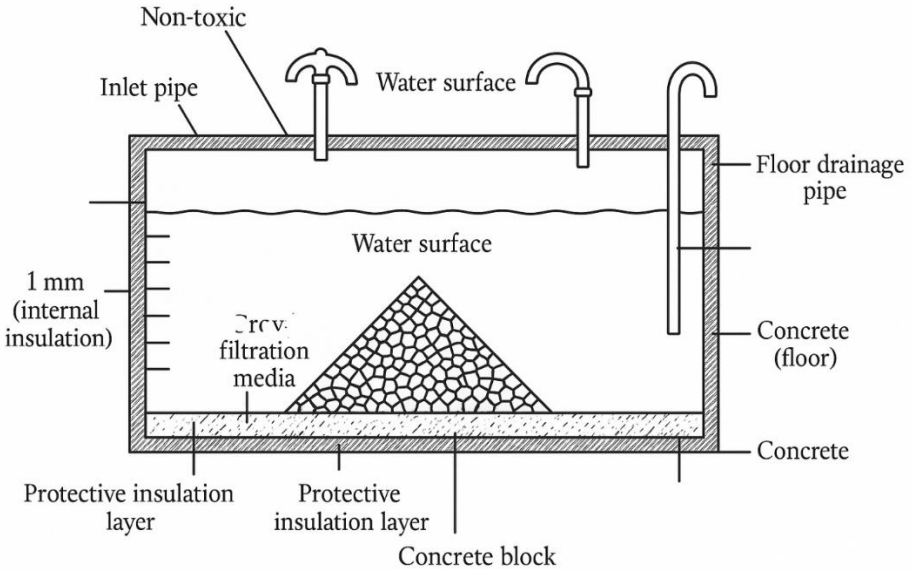
Figure : Annual rainfall at the Babylon government years(2022-2025).
https://climatememory.com/en/climate/iraq/hillah

B) Project Objectives

- Collect and store rainwater for future use.
- Reduce dependence on conventional water sources.
- Reuse harvested water for irrigation and other non-potable purposes.
- Minimize water waste and improve resource efficiency.
- Promote sustainable water management across the university.

C) Rainwater Collection and Storage System

The system collects rainfall from building rooftops through gutters and drainage pipes. The collected water passes through filtration units to remove leaves, dust, and other impurities before being transferred to a dedicated storage tank. Stored water can then be distributed through pumps and pipes for irrigating green spaces, watering plants, and toilet flushing. This system provides an alternative water source, reduces freshwater demand, and promotes more sustainable water consumption across the university.

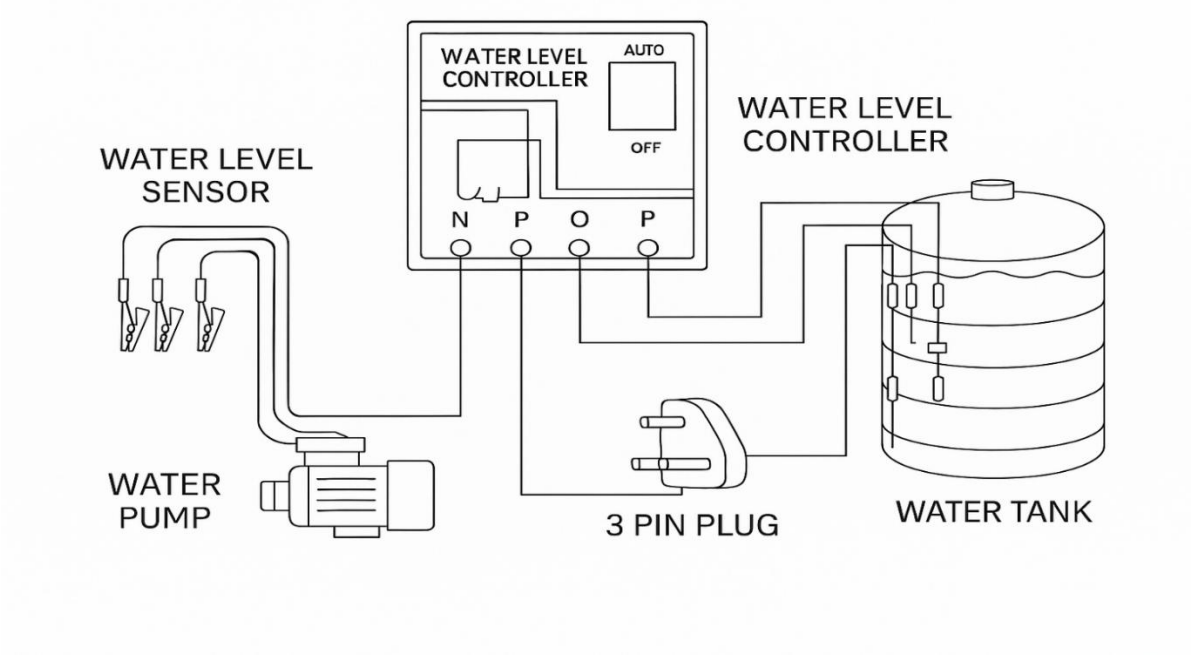


Schematic diagram of rainwater storage at Al-Mustaqbal University

4- Environmentally friendly pumping station:

Al-Mustaqbal University has introduced energy-efficient pumping systems with adjustable flow rates to improve water extraction while reducing energy consumption. These pumps are powered by solar panels, supporting the university's transition towards renewable energy.

Additionally, the water distribution network has been enhanced with electronic control valves installed along the pipelines, allowing accurate regulation of water flow and more efficient water distribution across campus facilities. These measures reflect the university's commitment to energy efficiency, water conservation, and sustainable resource management (Figure 8).



The water pumping and storage system used at the university.