# Times Higher Education Sustainability Impact Ratings

University: Al-Mustaqbal University

Country: Iraq

SDG 7.3: Energy use density

Tables (1) and (2) below show the new transition in (2025) into smart building that reduces the dependency on the grid by using clean energy sources (wind and solar energies).

## Table (1): *Min. at least five requirements for each building (2025)

| No. | Name | Place | Automation | | safety | | | | energy | | water | | Indoor environment | | | | lighting | | | | Building Area ($m^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | B1 | B2 | S1 | S2 | S3 | S4 | E1 | E2 | A1 | A2 | I1 | I2 | I3 | I4 | L1 | L2 | L3 | L4 | |
| 1 | AL-Mustaqbal University; Engineering Building A | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 5500 |
| 2 | AL-Mustaqbal University; Medical Building B | Babylon , Iraq | | x | x | x | x | x | | | x | | x | x | | x | x | x | x | x | 15000 |
| 3 | AL-Mustaqbal University; Administration Building c | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 2500 |
| 4 | AL-Mustaqbal University; Physical Education and Sports Sciences Building D | Babylon , Iraq | | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 3500 |
| 5 | AL-Mustaqbal University; Pharmacy Building | Babylon , Iraq | | | x | x | x | | | | x | | x | x | | | x | x | x | x | 2500 |
| 6 | AL-Mustaqbal University; Dental Building | Babylon , Iraq | | | x | x | x | | | | x | | x | x | | | x | x | x | x | 2500 |
| 7 | AL-Mustaqbal University; student club | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 3500 |
| 8 | AL-Mustaqbal University; Nursing building | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 2500 |
| 9 | Human Buildings | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 4000 |
| 10 | Security Building | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 1000 |
| 11 | University Presidency Building | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 6000 |
| 12 | Documents Building | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 1300 |
| 13 | Al Mustaqbal Energy Research Center - G | Babylon , Iraq | | x | x | x | x | | x | x | x | | x | x | | x | x | x | x | x | 900 |
| 14 | AL MUSTAQBAL AI CNTER - | Babylon , Iraq | | x | x | x | x | | x | x | x | | x | x | | x | x | x | x | x | 1500 |
| 15 | Service affairs Building – J | Babylon , Iraq | | x | x | x | x | x | | | x | | x | x | | x | x | x | x | x | 1170 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | AL HUSSAN Mosque | Babylon , Iraq | | x | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 350 |
| 17 | College of Art and Humanities | Babylon , Iraq | | x | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 18000 |
| 18 | SDG -LAB | Babylon, Iraq | | x | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 1500 |
| 19 | MUS Postgraduate Building | Babylon, Iraq | | x | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 650 |
| 20 | New Administration Building (Main internace) | Babylon, Iraq | | x | x | x | x | | x | | | x | | x | x | | x | x | x | | x | 1000 |
| | Total area of the smart buildings | | | | | | | | | | | | | | | | | | | | | 74570 |

*Please compile one row for each building (or homogeneous part of it) by ticking with a "X" for each requirement*

## Smart building implementation

***Total Building Area: 102170 $m^2$**

***Min. at least five requirements for each building (2023)**

| No. | Name | Place | Automation | | safety | | | | energy | | water | | Indoor environment | | | | lighting | | | | Building Area ($m^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | B1 | B2 | S1 | S2 | S3 | S4 | E1 | E2 | A1 | A2 | I1 | I2 | I3 | I4 | L1 | L2 | L3 | L4 | |
| 1 | AL-Mustaqbal University; Engineering Building A | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 5500 |
| 2 | AL-Mustaqbal University; Medical Building B | Babylon , Iraq | | x | x | x | x | x | | | x | | x | x | | x | x | x | x | x | 15000 |
| 3 | AL-Mustaqbal University; Administration Building c | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | x | x | 2500 |
| 4 | AL-Mustaqbal University College; Physical Education and Sports Sciences Building D | Babylon , Iraq | | x | x | x | x | | | | x | | x | x | | x | x | x | x | x | 3500 |
| 5 | AL-Mustaqbal University Pharmacy Building | Babylon , Iraq | | | x | x | x | | | | x | | x | x | | | x | x | x | x | 2500 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | AL-Mustaqbal University Dental Building | Babylon , Iraq | | | x | x | x | | | | x | | x | x | | | x | x | x | x | 2500 |
| 7 | AL-Mustaqbal University student club | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 3000 |
| 8 | AL-Mustaqbal University Nursing building | Babylon , Iraq | | x | x | x | x | | x | | x | | x | x | | x | x | x | | x | 2500 |
| | Total | | | | | | | | | | | | | | | | | | | | 37000 |

*Please compile one row for each building (or homogeneous part of it) by ticking with a "X" for each requirement*

**Smart building implementation**

***Total Building Area: 72800 $m^2$**

A simple comparison between the tables in 2025 and 2023 shows that the transition into smart building is better in 2025 if compared to 2023 due to using the new policy of Al-Mustaqbal University prepared to reduce the used energy.

Al-Mustaqbal University previously monitored total electricity consumption across the campus and all its buildings. These measurements were utilized to track electricity usage over time, enabling a thorough analysis of patterns and trends. This analysis aimed to identify opportunities for enhancing energy efficiency. To deepen the understanding of energy consumption, it's essential to consider energy density, which refers to the amount of energy consumed per unit of space or output. By calculating the energy density for various campus facilities, the university can pinpoint which areas are utilizing energy most efficiently and which are not.

A comparative analysis of energy density across different buildings would highlight discrepancies in energy use, allowing for targeted interventions. For example, facilities with high energy density but low output may indicate outdated equipment or inefficient practices. Conversely, buildings with low energy density could be optimized further to ensure maximum efficiency.

Implementing smart meters and energy management systems could provide real-time data, enabling continuous monitoring and adjustments. Additionally, engaging the university community in energy-saving initiatives can foster a culture of sustainability, leading to overall reductions in consumption.

By focusing on both total electricity usage and energy density, Al-Mustaqbal University can develop comprehensive strategies to improve energy efficiency, reduce costs, and minimize its environmental impact.

Some examples of the monitooring systems are:

1- Al-Mustaqbal University has installed smart systems as hard wares for collecting and monitoring data. For example, systems for measuring, presenting, and alarms as shown in Fig.1. In addition, smart systems for ensuring safety, alarm, and monitoring in case of fire were installed as well. These systems are globally installed in all the building of the campus. Figure 2 below shows these systems as examples:



Fig. 1 Alarm System

2- Al-Mustaqbal University has successfully installed advanced acquisition systems for monitoring carbon dioxide, oxygen levels, and energy consumption across all campus buildings, as well as in off-campus facilities owned by the university. These systems utilize Wi-Fi technology to enable real-time data collection and analysis. Through an online monitoring and control platform, the specialists efficiently track environmental parameters and energy usage, allowing for informed decision-making and timely interventions. Below are examples of the automatic acquisition and logging system used for this purpose as shown in Fig.3 and Fig.4.







Fig. 3 Acquisition systems



**LED light control**




**Sensors**




Natural light density

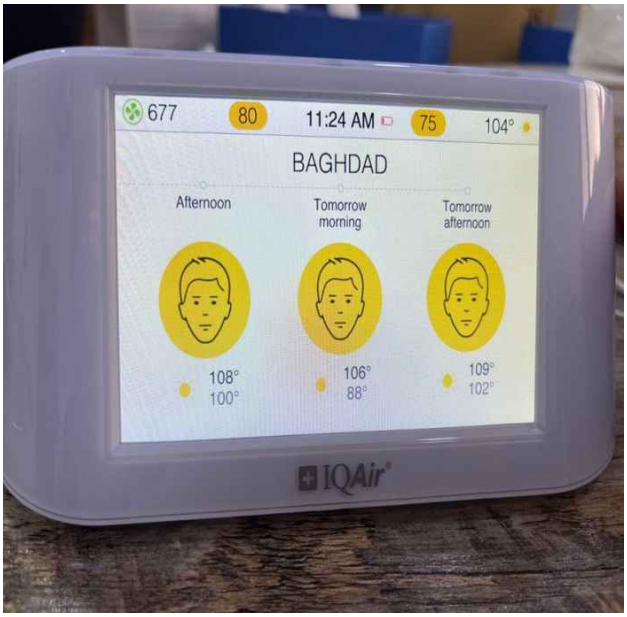


Shielding

Fig. 4 Control, sensors, and acquisition system

In additon, a new and up to date indoor and outdoor systems are installed at Al-Mustaqbal Energy Resarch Center for measuring airquality inside and outside the office. The data are being published on line for researchers and interested people. This step is important for serving the community for quantifying the environment where they live as shown below






### 3- Monitoring systems and software

Al-Mustaqbal University has executed comprehensive monitoring systems and software to manage and display data from each building on campus. These systems provide real-time insights into various environmental metrics, including carbon emissions, energy consumption, and indoor air quality. Each building is equipped with sensors that gather data, which is then transmitted to a centralized software platform. This platform offers an instinctive dashboard that permits users to easily visualize and examine the performance of individual buildings. Users can monitor and control key indicators such as energy usage patterns, temperature fluctuations, and ventilation efficiency.

The software also features customizable alerts and notifications, enabling facility managers to respond instantaneously to any irregularities or inefficiencies. By integrating these monitoring systems, the university can implement sustainability initiatives more effectively. Furthermore, the data collected supports long-term planning and decision-making, ensuring that the university meets its sustainability goals while providing a conductive learning and working environment for students and staff. Some examples of the software used for monitoring the solar energy sources for some building inside and outside the campus are shown in Fig. 5




Monitoring of Administrative building




Monitoring of Radio station 1






Monitoring of Radio station 1




Monitoring of Renewable Energy Lab.




Monitoring of Thermodynamics Lab.

Monitoring of Inverters Battery Life

Fig. 5 Examples of software used for monitoring and control systems

One sample of the measured data is explained in Fig.6. This figure shows a positive trend of reduced generator use over three years. While electricity consumption on the grid has risen significantly from 2023 to 2025 (teal line), generator usage has steadily decreased, reaching its lowest level in 2025 (brown line). The chart effectively demonstrates a successful transition toward grid power and away from generator reliance.

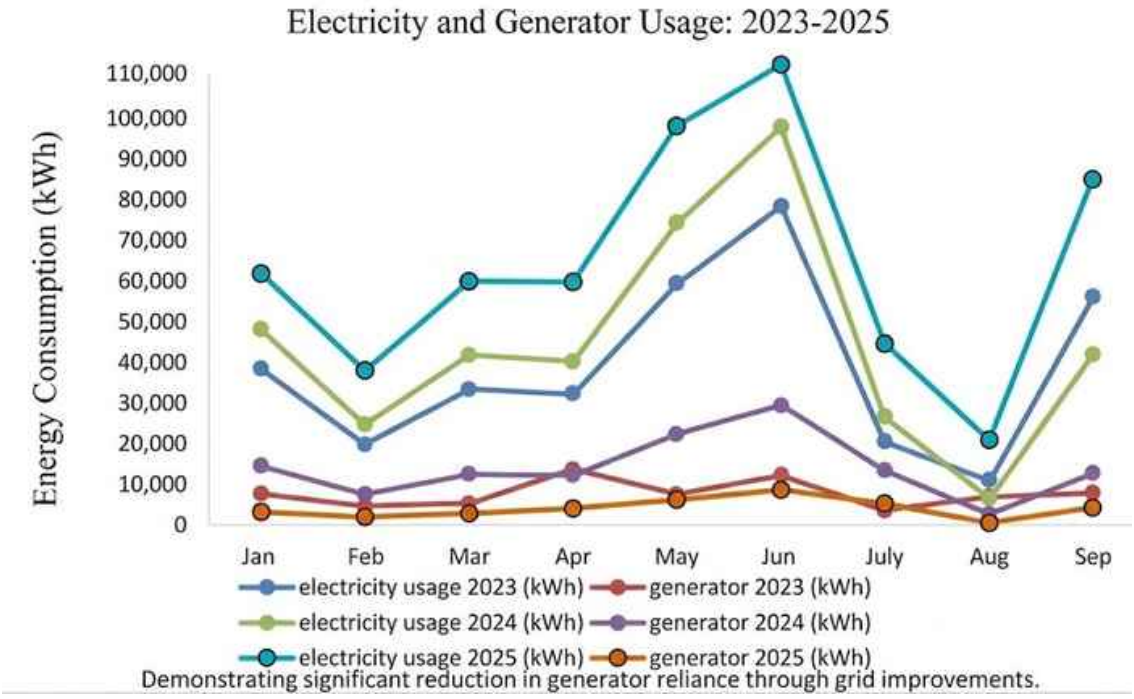



Fig. 6 shows electricity and generator usage for 2023 and 2025

In Fig. 7, electricity usage shows a clear upward trend, starting at around 172,288 kWh in 2021 and rising to nearly 278,000 kWh in 2022, likely due to expanded operations. By 2025, consumption reaches approximately 416,654 kWh. In contrast, generator consumption begins at about 68,915 kWh in 2021, increases in 2022, but then fluctuates, peaking at around 235,500 kWh in 2024 before dropping to 208,237 kWh by 2025. This decline suggests reduced reliance on the generator, possibly due to better grid access or efficiency improvements.

Notably, the growing gap between electricity usage and generator consumption indicates a shift toward greater dependence on external electricity sources, impacting energy management and costs. The stabilization of generator use reflects a move toward more sustainable practices, emphasizing effective grid electricity utilization.

Overall, these trends highlight evolving energy consumption dynamics and strategic decisions regarding energy sourcing, raising important questions about future sustainability efforts as the balance between grid reliance and generator use changes.

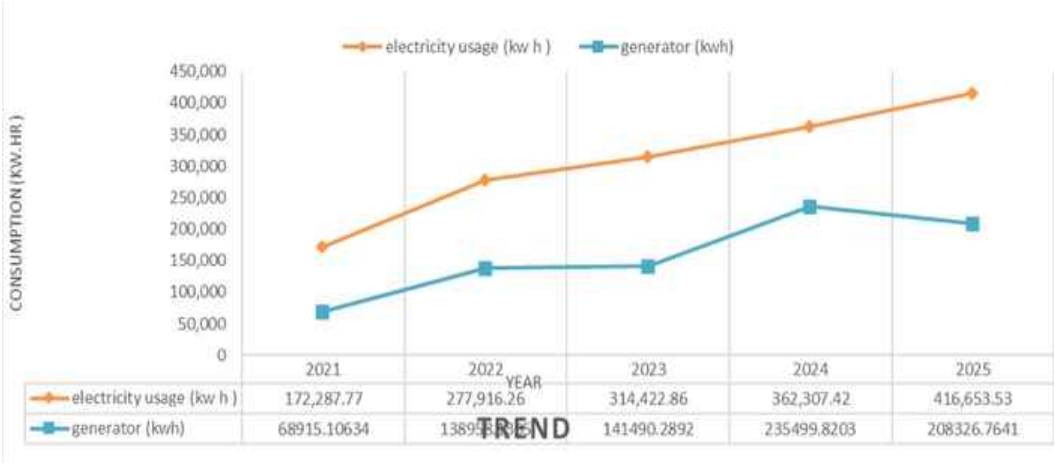



Figure 7 The trend evolution of electricity demand from (2021 to 2025)

Table 3 shows the electricity generation and usage from 2020-2025. The table shows an increasing in the electricity usage for all years. However, in 2024 the generator is smaller if compared with 2023 because of the transition policy prepared by the university toward solar and wind generation.

Table 3: The trend evolution of electricity demand from (Sep 2020 to Sep 2025)

| Year | Electricity Usage (kWh) | Generator (kWh) |
|---|---|---|
| 2021 | 172,287 | 68,915 |
| 2022 | 277,916 | 138,982 |
| 2023 | 314,422 | 141,980 |
| 2024 | 362,307 | 235,499 |
| 2025 | 416,653 | 208,326 |



Building A



Building B



Building C



Building D



Building E




Building F



College of Art and Humanities



Pharmacy Building


SDG - LAB


مختبر التنمية المستدامة
SDG-LAB
حماية الأنظمة البيئية
مكافحة التصحر
وقف تدهور الأراضي
فقدان التنوع



SDGs-Lab







Al-Hussen Mosque




Al-Mustaqbal center for Energy Research






AL-Mustaqbal Center for Artificial Intelligence




Central Club Building




Engineering Building




Sports Building




Scientific Affairs Building




Service Affairs Building

Some of the monitor and measurements system are listed in the table below.

| Felid | Requirements | Evidence |
|---|---|---|
| Automation | B2 ( APP or online service ) | |
| Safety | S1 (Intruder Alarm System( | See Fig.8 |
| | S2 ( Fire-fighting) | See Fig.9 |
| | S3 ( Video surveillance) | See Fig.10 |
| | S4( Anti-flooding) | |
| Energy | E1 (Monitoring) | See Fig.11 |
| Water | A1 (Monitoring ) | |
| Indoor environment | I1 ( Thermal comfort) | See Fig.12 |
| | I2 ) Air quality( | See Fig.13 |
| | I3 ( Real-time ) | |
| | I4 (Passive system) | See Fig.14 |
| Lighting | LEDs | See fig.15a |
| | Sensors | See fig.15b |
| | Shielding | See fig.15c |
| | Natural light | See fig.15d |


تحذير
المكان
مراقب بالكاميرات


كلية المستقبل الجامعة



Fig.8: intruder alarm system




Fig.9: Fire-fighting system








NO LINK
HIKVISION




Fig.10: Video surveillance system








Fig. 11: Automatic acquisition and logging system of energy consumption






Fig.12 Indoor environment



Fig. 13a Led light




Fig.13b Sensors




Fig.13c Natural light




Fig.13d Shielding