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Practices Towards an Effective Response to Climate and Energy Challenges in The Al-Muthanna University Campus

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Abstract. Regarding the UN reports, Climate change adaptation and mitigation stands for the most difficult challenge for the current and subsequent years in the world, in addition to the particular case of Iraqi cities, especially with the dry, hot climate and Power generation problems. Al-Muthanna University, during the last five years, focused on using the essential tools depending on NBS for saving energy (using daylight, rainwater, and natural materials) and also using innovative solutions (led light, sensors, solar panels, remote sensing) for reducing energy consumption in the Campus, Greenhouse gas emission the University reduce it by reducing the energy consumption itself, encouraging staff to use Liquid Gas Fuel Automotive, increase the green area, cycling. Therefore, the approximate use of energy-efficient applicants (particularly LED lamps and laptops) is around 75%. It is also good to mention that there is a total area of smart buildings of 82150 m2 across all campuses of Al-Muthanna University. In addition, the total Carbon footprint in 2021 equals 90.83 metric tons.

Keyword:
Sustainable Energy Campus, Climate Change Adaptation, Mitigation, CO_2 Emission.

1. Introduction

The notion of sustainability, which highlights having to safeguard the earth's resources and assure their availability for the generations to come, has received substantial attention in academic and policy circles as a crucial strategy for preserving the planet's long-term the world [1], As Leal Filho note [2], Sustainability is an important idea that may drive our efforts to create an ecologically, socially, and economically secure world.

Sustainability is the key to our solar system's operation; human actions are having a negative impact on natural life, therefore it's time to keep an eye on ourselves. The next paragraph examines Al -Muthanna University's experience with sustainability to be among the world's efforts to improve the environment and cooperate with others to combat global warming.

A broad range of activities have taken place in city of Samawa, the premier city of Al - Muthanna province in Iraq, where Al -Muthanna Institute is found. The educational organization was set up as a public college in 2007. It has faculties in a variety of fields, including medical, science, agriculture education, and engineering. Al - Muthanna University, one of Iraq's higher education schools, has set short and long - term goals for implementing sustainability on its campus and in the vicinity. Many efforts have been made, with one of their main aims being to foster research. The province is distinguished by its celestial body and climatic qualities.

Al-Muthanna University in Iraq have planned to adopt a set of policies and initiatives that work to implement the sustainability procedures and enhance the environment on short and long term. These policies work on reducing GGE (greenhouse gas emissions) which includes and not limited to reducing fossil fuels. The initiative of using cycling inside the campus instead of cars, expanding green spaces are part of the MU approaches for sustainability.

This paper will explore the MU approaches for sustainability which align with the UN goals and other international higher education institutes. This will consider three main axes: promoting renewable energy, smart buildings, and educating the community on sustainable practices.

2. Points of Results and Discussions

2.1. Renewable Energy

MU has made great steps in engaging clean energy techniques in its campus. This can be found in employment of several procedures and techniques to receive help from natural resources and mitigate them,

Adoption of multiple methods and workflows to harness natural assets and reduce their negative affects is a developing trend among practitioners and scholars. interested in sustainable development [3][4]. Such initiatives include, among others, the use of green energy, energy -efficient architecture, and treating sewage, all of which may considerably help to lowering carbon footprints and increasing environmental sustainability [5] [6]. concluding that a combination of passive and active RST can effectively reduce the energy consumption of buildings while also supplying sufficient natural daylight, The university conducted the following steps as part of its strategy to engage renewable energy:

- Roof skylight methods (RST) were used by the institution to create a long-term enhancement to its fresh construction. RST was thought to be another form of natural light since it emits up to three times the light as a comparable-sized regular window.

Roof skylight methods (RST) have been included into the general university's revamped structures as a means of boosting sustainability and improving the internal environment, [7] thereby conforming to the rising trend of educational institutions using green buildings [8].

This technique so saves energy on heating and in cooling with the university specific design (double pane roof skylight is implemented and directed to northern exposure) so less need for a HVAC system. Figure 1 in the following shows the skylight technique in one MU campus building as shown in Figure 1.

Figure 1. Shows the Skylight in the Faculty of Education

- The second technique that was implemented towards sustainable campus goal in MU university is using solar cells which is assumed as environmentally friendly technique, that is categorized as an excellent renewable energy source, Solar cells have been accepted as an ecologically beneficial approach and an outstanding renewable energy source and may help modern institutions and communities around them to be more sustainable [9] [10].

  Solar cells are regarded as a greener near and an outstanding renewable energy source and may help modern institutions and the surrounding areas to be more sustainable [11] [12]. Due to the specificity of the Al-Muthanna province weather, the solar cells technique plays a significant role in achieving green development energy results. It works side by side with the national electricity firms to meet the campus demand of generated electricity. According to some university analyzed data, which confirms that one third of the electricity demand of the new campus buildings is met by engaging the solar technique. Moreover, it has determined the benefits of engaging the solar energy applications in sustainable development. In conclusion, the step of using solar energy technique is drawn up in the university strategy about the energy sector and presents

the university vision of future development in this domain. as shown in Fig (2), the photo shows the solar cells implementation in one of the newest buildings in MU campus.

Figure 2. Shows the completion of the first stage of solar cells in the Faculty of Principle Education in MU campus.

- The third technique that was implemented by MU is double glazed technique for windows. The MU was making a move in the right direction when engaged double glazed technique in the new campus' buildings, Double-glazed windows are an a collective a sustainability approach employed by modern colleges boost energy efficiency and reduce carbon emissions, making them an essential component in developing sustainable communities on campus [13] [14].Double-glazed windows are made up of two panes of glass dividing be a lack of air or inert gas layer, along with which enhances thermal insulation and minimizes heat loss, reducing the need for cooling and heating equipment [15]. This method is a smart way to save energy while adding to the sustainability in general of college buildings [16].

  Double Glazed consists of two glass-layers of glass with filling gas trapped in between them. It helps in reducing carbon dioxide emission. Furthermore, its ability to be recycled can be highlighted and its inherent strength and stability, making it a workable choice for Iraqi hard weather even in summer as this technique works in deflecting heat from the outside. The technique also characterized offering excellent energy efficiency with low U-values sometimes. reaching as low as 1.0 W/m2K, this can enhance thermal efficiency. The following photo shows the front façade of one of the newly building in MU campus as shown in Figure 3.

Figure 3. Shows the Double-glazed Technique in on of MU Campus Buildings Façade

2.2. Smart Buildings Approach

The smart buildings concept, which integrates refined technology and systems to maximize energy usage and occupant comfort, has grown in importance as a method for developing communities that are stronger and modern-day campuses [17] Smart buildings may react to changing outside conditions and tenant preferences in real time by leveraging sensors [18], analysis of data, and automation, decreasing energy waste and boosting energy efficiency [19] [20] .This method can also help set up resilient urban infrastructure and improve the general durability of the built environment [21] [22].

Smartness is making any object work efficiently. It's known that constructions demand high energy to be operated. However, consuming more energy, causes destruction on the environment. It was agreed by many known international firms that in most cases, more resources are supplied than what's necessary. In addition to being wasteful, this is also unethical. Fortunately, smart buildings offer a viable solution to increased energy demands. The MU digital infrastructure is undergoing building human capabilities and digital management systems with advanced features to track the energy consumptions. The strategy of adopting smartness in the university will help in reducing human errors which deplete energy resources.

2.3. Solar orientation through architectural design

BIM, or building data modeling, has been highlighted as a significant method for perfecting energy effectiveness and environmentally friendly in current construction design [23] [24]. Architects and designers may study and improve the outdoor energy performance of projects at an early design stage by incorporating solar data and powerful simulation tools onto a BIM platform, resulting in lower - cost building layouts, glass combinations, and shading systems [25] [26]. This method is likely to decrease energy usage and greenhouse gases while increasing the quality of the interior environment and occupant comfort [27] [28].

2.4. Human Sustainable Practices

An essential element will be addressed in this paper, what so called “behavior change for sustainability”. This works on changing the buildings’ occupants such as students, employees, and other staff. The university tends to gradually reduce the CO2 emissions by adopting new approach to spread the culture of using smart devices to reduce exhaustive energy resources usage. In an initiative, a group of students from Electronics and communication department in engineering faculty worked on transform a smart classroom. A collaboration between staff and students was taken place to complete this task. The smart classroom was started by a simple idea to find a tool that can teach students rationalization n of energy consumption. So, efforts are going to employ. natural resources instead of lightning system and started to automate all electrical devices. The following photos shows how students work in automating the lightning and HAVC systems. It was noted that this action resulted in efficient electricity consumption as shown in Figure 4.

Figure 4. Shows the double-glazed technique in on of MU campus buildings façade.

Additionally, the university works hard to collaborate with relevant corporations or partners to integrate sustainability into its administrative and academic operations. Overall, Al-Muthanna University may be working towards a more sustainable future through various institutional and individual efforts. Moreover, MU supported student-led initiatives such as community change behavior programs, which can be held in special campaigns, and considered research projects that challenge sustainability issues in the region.

2.5. Energy-efficient appliances

Several studies have shown that energy -efficient appliances have the potential to considerably cut energy consumption and related costs, as well as raise general energy efficiency and sustainability [15]. AL-Muthanna University started form 2020 a sustainability steps towards better educational community by changing all electrical machines from normal types to a more efficient ones which re duce the amount of power by 40% of total usage, where this step is so important to reduce the power for operate the overall university

compound it has opened the eyes of the academic teachers and students for going step further more which is building efficient lap appliances & devices that are already more efficient and also recycle the old or broken parts throw filament extruders especially those plastic ones into new spare parts or melding it into new parts for restoring or building new lap appliances & devices where this process has made the college of engineering for an example getting its needs faster by 50% which made the educational process become more sustainable and much applicable as shown in Figure 5.

Figure 5. Shows the double-glazed technique in on of MU campus buildings façade.

3. Conclusion

It is abundantly clear that Al-Muthanna University's administration's tireless efforts have made sustainability a guiding principle for the institution, that the application of environmental sustainability has thus far succeeded in achieving a viable academic community, that the transition to green universities really necessitates taking serious, simple steps toward the use of reliability, and that a sustainable change will be easier with the help of the sustainability, and that the use of the procedures that make the sustainable encounter real, entertaining, and clear in the setting of university and with a focused educational atmosphere would make the sustainable transition simpler.

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