

ENHANCING ENERGY EFFICIENCY THROUGH THE INCORPORATION OF MAQASID SYARIAH KNOWLEDGE : A REVIEW

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ABSTRACT

Energy efficiency (EE) is crucial in addressing environmental issues and organisational performance. Energy awareness and knowledge is needed in promoting EE practices. This paper aims to review Maqasid Syariah (MS) knowledge in enhancing good EE practices, and the objectives are to investigate the EE awareness, knowledge and practices in Malaysia, plus to explore the importance of MS knowledge. Qualitative method was employed through literature review and narrative study. A conceptual model of the incorporation of MS knowledge into EE awareness and knowledge is introduced. This conceptual model could be implemented to develop an enhanced good EE practices among occupants.

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INTRODUCTION

The global primary energy consumption and GHG emissions have increased drastically in the last decade (Amasyali, & El-Gohary, 2016) due to several determining factors, such as population and economic growth (T. Ching Sin et al, 2011). Furthermore, GHG emissions are the leading cause of the present climate change with the advent of global warming impact and severe weather conditions (Shahidan & Shafie, 2020). Although energy is essential for economic development, the main contributor to environmental degradation and climate change is linked with energy consumption and GHG emissions (Awosusi, A.A., 2021). The building sector contributes 20 to 60% of the total global energy consumption (Pérez-Lombard et al., 2008; Zhang et al., 2015; Ma & Yu, 2020). The International Governmental Panel on Climate Change (IPCC) reported that the consistent increase in global temperature also increases the need for energy use to provide thermal comfort in buildings (Qin et al., 2007).

Energy conservation (EC) strategies must be developed to minimise energy consumption and GHG emissions. Carrico and Reimer (2011) mentioned that behavioural intervention is a critical component in the attempt to lower GHG emissions as the intervention controls consumers' energy demand. Behavioural intervention among building occupants minimises the average monthly energy consumption by 2.5%. Nonetheless, the reduction is not statistically significant (Buckey, 2020; Delmas, Fischlein, & Asensio, 2013). For instance, Orland et al. (2014) stated that energy use outside of the primary working hours declined by approximately 7% because employees are required to utilise the appliances for work-related activities and might not prefer compromising comfort to save energy (Buchanan, Russo & Anderson, 2015). Awareness and knowledge of energy use, efficiency, and conservation must be introduced and nurtured to succeed in behavioural intervention.

Executing well-designed strategies is crucial in minimising electricity usage, which lowers the electricity expenses in buildings. Effective 'Demand

Side Management' (DSM) is a strategy to reduce energy usage (Kelly, 2016; DeWaters and Powers, 2011). The DSM describes the execution of policies and approaches to reduce, control and influence energy demand (Frimpong, Okyere, Anto, 2016). Crosby and Metzger (2013) revealed that effective DSM may be accomplished in educational institutions by (i) raising awareness among the teachers, staff, and students, (ii) tracking and managing building operations, (iii) upgrading equipment, and (iv) installing energy management technologies. The first two measures are related to human behaviour, complement one another, and may be executed without requiring expenditure.

In addition, employing good EE practices and high efficiency technologies alone might not be sufficient. Minimising the impact of improper energy behaviour is crucial in maximising the potential given by more energy-efficient buildings (Energy Environmental Agency, 2013). For instance, Schools4Energy is an initiative that was designed and undertaken to improve energy efficiency in public schools while showcasing the benefits of students' commitment to the cause of energy conservation through admirable behaviour (Pietrapetrosa et al., 2021). Furthermore, by focusing on six work groups- schools, universities, information and awareness, mobile exhibition, professionals and the web- the establishment of CETREE managed to improve the role and utilisation of renewable energy and energy efficiency in creating and increasing awareness education and training programmes (Kandar et al, 2009). Thus, it is believed that Islamic concepts and MS knowledge may be helpful in enhancing the current EE awareness and knowledge to promote better EE practices.

Islam (2017) connects sustainable development with the Islamic concept and international law. Various environmental concerns have prompted extensive research examining the role of religious teachings in forming behaviour to preserve the environment. As aptly put by Islam (2017) that Islam could play a significant role in resolving issues between development and the environment. Islam provides an essential understanding of sustainable environment growth for the future of human life by outlining the importance of environmental ethics. Sarkawi et al. (2017) investigated the relationship between Maqasid Syariah and the environment, emphasising how the philosophy might be applied in environmental development. Maqasid Syariah is most crucial in setting a principle for the *maslahah*

or benefit of humankind (Azila et al., 2017). Additionally, a 12th-century theologian, Abu Hamid al-Ghazali (d.1111), was the first to formulate the concept of focusing on the five key aspects of human life: (1) protection of life, (2) protection of religion, (3) protection of intellect, (4) protection of progeny, and (5) protection of property.

This research aims to review MS knowledge in enhancing EE awareness, knowledge and practices. The two study objectives are (i) to investigate the EE awareness, knowledge and practices in Malaysia, and (ii) to explore the importance of MS knowledge to enhance good EE practices. In short, the implications are (i) to raise EE awareness, knowledge and enhance good EE practices among public as consumers to manage and control their energy consumption, and (ii) to introduce a conceptual model of the incorporation of MS knowledge into EE awareness and knowledge, which consequently enhance good EE and EC practices.

RESEARCH METHODOLOGY

This research employed the qualitative research method. A Literature review was done to investigate the EE awareness, knowledge and practices in Malaysia.

Secondly, this research conducted a narrative study on the specific Qur'anic verses to explore the importance of MS knowledge to enhance good EE practices among occupants. Thirdly, the information was then extracted and analysed through a combination of Reflexive Thematic Analysis (RTA) in social sciences and the Qur'anic Thematic Analysis (QTA) in Qur'anic sciences. The RTA and QTA are applied to present rational, cogent and coherent understanding of phenomena, culture and society, including the extraction of the sacred wisdom from a plausible event (Sahad, 2021). Then, the interpretation of the Islamic concepts along with MS knowledge regarding EE and EC based on the Qur'anic verses were discussed in the findings and discussion sections. Finally, a conceptual model of the interaction between MS knowledge and EE awareness and knowledge to promote a better EE practice was introduced.

Energy Use & Energy Demands on Occupants' Comfort and Satisfaction

Approximately 40% of the total global energy is consumed in buildings. Hassan et al. (2014) added that buildings will continue to consume more energy and increase the total global energy by 40% to 50%. Shahrul Nizam Muhammad et al. (2014) stressed that 40% of the global energy consumed in buildings contributes to a third of the GHG emissions through electricity generation and usage from fossil fuel burning. Another research outlined the issue of over 40% of carbon gases emitted into the atmosphere, polluting the environment due to existing buildings in Malaysia and the building occupants' behaviour on energy consumption (Rozana Zakaria et al., 2012).

Apart from being the main contributor of energy consumption and GHG emissions, Malaysian buildings account for 50.5% of the total electrical energy consumption that delivers thermal comfort and satisfaction to building occupants (Energy Commission, 2017). It is undeniable that a building is designed and constructed to be comfortable for its users (Nimlyat, 2018), and indoor environmental quality (IEQ), such as thermal comfort, visual comfort, acoustic comfort and most importantly, indoor air quality (Sansaniwal et al., 2021; Asadi et al., 2017); it is also linked to occupants' satisfaction with the building (Kamaruzzaman et al., 2015). Mohd Zin Kandar (2016) stated that the use of air-conditioning or any other devices or systems that cool indoor temperature produce 64% of the total electrical energy consumption in buildings and the remaining 36% is consumed for general equipment (24%) and lighting (12%).

Past studies have listed six factors that affect energy consumption in buildings: climate, building orientation, building services and energy systems, building operation and maintenance, occupants' behaviour, and indoor environment quality (Steeners & Yun, 2009; Yu et al., 2011). In contrast, inadequate IEQ may cause harm to occupants by making them uncomfortable and contributing to sick building syndrome (Kamaruzzaman et al., 2015), which will affect the occupants' performance at work (Nimlyat, 2018; Chen et al., 2020; Zhang (2019). For instance, thermal comfort is achieved by regulating these variables with the aid of HVAC (heating, ventilation and air-conditioning) systems. Thus, HVAC consumes a significant amount of energy in non-residential buildings (Franco et al.,

2021).

Additionally, artificial lighting, shading equipment and daylight accessibility are all related to visual comfort. One of the main energies and uses in buildings is lighting. Lighting consumes a quarter of all the electricity in office buildings (Loengbudnark et al., 2022). Moreover, IEQ is also connected to how much energy is consumed in buildings (Asadi et al., 2017). Therefore, most countries prioritise EE in their public agenda to protect the environment from detrimental and noxious carbon emissions.

Energy Efficiency & Human Behaviour

In order to ensure sustainability in energy supplies, Malaysian energy policies are continuously being reviewed to include the adoption of renewable energy to substitute conventional non-renewable energy resources. The EE and EC are the first measure towards an effective energy solution for long-term development. The EE and EC cofunction in each household or organisation to achieve and sustain optimal energy demand and consumption. Energy supplies can be conserved, and energy consumption can be reduced in daily routines by implementing EE through new technology installation with cost-effective energy usage (Zaid, Myeda, Mahyuddin & Sulaiman, 2014).

Herring (2006) describes EE as efforts in reducing energy supply usage whenever it is not needed, also known as EC. Meanwhile, the International Energy Agency (2014) defines EE as something that provides people with more services for the same or less amount of energy input. Additionally, the Environmental and Energy Institute defines EE as the approaches that minimise energy consumption from the manufacturing of products and services. Reshmi Banerjee (2015) explained EE as the assessment of the amount of energy required to provide the same degree of comfort, performance or convenience by a similar type of product, building or transportation using technological change.

A major influence that aids in consistently reducing energy consumption and saving energy is human behaviour (Scherbaum et al., 2008; Mustafa et al., 2014). Halfawy and Froese (2005) listed factors involving occupants' behaviour, such as preferences in opening or shutting the windows, turning

on or off the heating or cooling mechanisms, lighting and other electrical systems, and equipment. Kasavan et al. (2021) stated that a person's positive behaviour towards electricity consumption is significantly influenced by the person's positive knowledge, awareness, commitment, and attitude. Thus, awareness and attitude in EE programmes are a community effort to control rising utility costs in organisations. The programme includes focusing on lowering operating costs without expending capital costs to save energy (Mohd Zin et al., 2011).

Therefore, Islam views development to enhance both the physical and spiritual well-being of humanity. With that, Maqasid Syariah is established as one of the foundational principles of Islamic teachings, which emphasise the need to promote human well-being as the main goal as well as avert harm.

Maqasid Syariah (MS)

Maqasid Syariah principles originated during the revelations to Prophet Muhammad (PBUH) implicitly in Quran verses and as-Sunnah (Saged et al., 2017). "Verily this Quran doth guide to that which is most right (or stable), and giveth the Glas Tidings to the Believers who work deeds or righteousness, that they shall have a magnificent reward" (Surah Al-Isra', 17:9). Apart from regulations, human aims and objectives (Saged et al., 2017) that favour economic and social fairness (Dusuki, 2008) should include values, key beliefs, and doctrines (Rosly, 2010). Sarkawi et al. (2017) examined the Maqasid Syariah ideology and how the principle relates to Malaysian environmental development. Moreover, Islam established several ideas that include wisdom, justice, public interest, and creativity (Ijtihad).

The Arabic words "Maqasad" and "Maqsid", which are derived from the word "Qasada", which means "moving in a direction", are word-for-word equivalents for "Maqasid". While "Syariah" literally refers to a path or springs that supply clean water. Additionally, "Syariah" also refers to actions that Allah permits or forbids in terms of Aqidah Islamiyyah, particularly rulings made by courts and the clear and concise opinions of mazhab (Tarmizi, 2019). Sarkawi et al. (2017) define Maqasid Syariah as a deduction and a synthesis made by jurists based on Quran verses and reports from the Sunnah of Rasulullah. Meanwhile, Saged (2017) refers to Maqasid Syariah as the objectives set by the law to benefit servants (mankind).

In addition, Al-Imam As-Syatibi, recognised as the first master of this field, included a chapter on Maqasid Syariah in his book “Al-Muwafaqat fi Usul As-Syariah” (include year). Furthermore, he organised the Maqasid Syariah by including in-depth yet extensive analyses of it. However, before As-Syatibi’s work, other scholars had already studied this subject. For example, Imam Al-Haramain Al-Juwaini expressed his worries about the decline of ethics in the Muslims community in his book “Ghiyats Al-Umam fi Al-Tayyats Al-Zhulam”, which is centred on the intellectualism of Islamic scholars and politics. He asserted that creating Maqasid Syariah would be the solution to cope with those issues. However, it was his disciple, “Hujjatul Islam Al-Imam Al-Ghazali, who coined the phrase (Tarmizi L., 2019).

Furthermore, according to Yaakub & Nik Abdullah (2020), who cited Oladapo and Rahman (2016) and Ibn Ashur (2001), Islam is unique in that it establishes a framework that offers a comprehensive foundation for the social well-being of all humans within the present moment as well as in the hereafter. “The Syariah’s goal is to further the welfare of all people, which includes preserving their faith, their humanity, their intelligence, their offspring, and their money. Anything that guarantees the protection of these five is desirable and serves the public interest. Imam Ghazali (Chapra, 2000) is quoted in Dar (2004), Meera and Lalbani (2006) and Yaakub and Nik Abdullah (2020). The “Principle of Maqasid Syariah” refers to this framework in relation to Oladapo and Rahman’s 2016 research.

Integration of MS Knowledge into EE Practices

Considering that occupants’ consumption controls energy demand in buildings, employing an intervention in occupants’ behaviour is crucial to reduce energy consumption and operational costs. This can be achieved by practising EE and integrating Maqasid Syariah.

According to Al-Shuaibi (2014), assisting the public in thinking, feeling and acting in a way that ensures their success requires education. Additionally, it raises both the level of personal satisfaction and that of their community. This is because education and knowledge foster human personality, thoughts and social skills, and gear up humankind for their life experiences. The provision of education and training to construction practitioners on the concept of sustainability as well as technology are the

major success components in the enhancement of understanding and practice of green/sustainable development amongst architects and designers (Lop et al., 2016).

In Malaysia, "Green Building Index" (GBI), "GreenRE" (Green Real Estate), "Penarafan Hijau JKR" (pH JKR), "MyCrest" (Malaysian Carbon Reduction and Environmental Sustainability Tool) and "CASBEE Building" (Comprehensive Assessment System for Built Environment Efficiency) are some, to name a few, of the green assessment rating tools developed in Malaysian industries and government. These tools are meant to function as a reference and guideline to establish sustainable development. In addition, these initiatives are taken by the industry and government with the purpose of creating and raising awareness as well as encouraging sustainability among the builders and, most importantly, the public (Zainol, H. et al., 2017). With this, integrating Maqasid Syariah principles will help humankind always be aware of the energy we consume and try to reduce it. Thus, energy efficiency will be achieved successfully, and at the same time, the objectives of law that will benefit humankind, such as a cleaner and sustainable environment, can be enjoyed by future generations.

FINDINGS AND DISCUSSION

The literature review in the study provides various benefits in multiple aspects by outlining the implementation of EE and energy savings with the integration of Maqasid Syariah principles. Firstly, although adopting and installing new energy-efficient technologies might be costly, the installation could benefit everyone through financial cost savings once the initial investment cost is offset (Rahman et al., 2019). Additionally, energy consumption could be minimised by practising EE and EC that assists in preserving the environment through minimising harmful GHG emissions (Diesendorf, 2007). Furthermore, initiatives to save energy include upgrading technologies and improvements in the functionalities and maintenance (Al-Mofleh, Taib, Mujeebu & Salah, 2009).

Islam (2017) explains how sustainable development to the Islamic concepts and the international laws is related. Table 1.0 demonstrates the relevance of Islamic concepts in energy use and conservation based on

Quran verses.

Table 1. interpretation of Islamic Concepts and Conservation based on the Quranic verses

Islamic Concepts	Quran Verses	Explanation
Responsibility as caliphs on Earth	From (Surah Al-Mulk:15) - “As the creator of the universe, Allah knows His creations the best, and as for that, He brought and revealed to us Al-Quran and As-Sunnah as sources of knowledge for the humans to manage the Earth” (Surah Al-Furqan;1, Surah Yunus; 57)	The functions of each creation of Allah and the ways on how humans as the caliphs should manage the sustenance of the ecosystems.
Extravagant and corruption is prohibited	(Surah Al-A'raf: 10, Surah Al-Baqarah:60) - Although, there are limitations and purposes to it. Suppose that humans violate the limits, mankind must face the ramifications of their wrongdoings. (Surah Ar-Rum:41)	The consequences of human interference due to their reasonable or extravagant consumption have also been explained in the Quran. It is undeniable that Allah created the Earth for human sustenance.
The concept of 'Balance' (Al-Mizan)	(Surah Al-Mulk: 3) – The seven heavens that are stacked on top of one another were wonderfully crafted by Allah, joined together to form a straight level, and free from any disunity, conflict, inconsistency, deficiency, flaw, or defect.	Since the universe’s creation, Allah has maintained its balance despite the presence of a vast number of living things. This proves that equilibrium has existed and designed by Allah in the cosmos since the dawn of time. Al-Mizan in this context explicitly refers to maintaining the ecosystem/biodiversity, as Allah has established a connection through the interdependence of each living thing to preserve the equilibrium of the universe

Source: Author

The figure below outlines EE measures and the importance of EE that aligns with Maqasid Syariah principles. Figure 1.0 depicts that practising EE will benefit all humankind, other living beings, and the environment, which coincides with Maqasid Syariah principles.

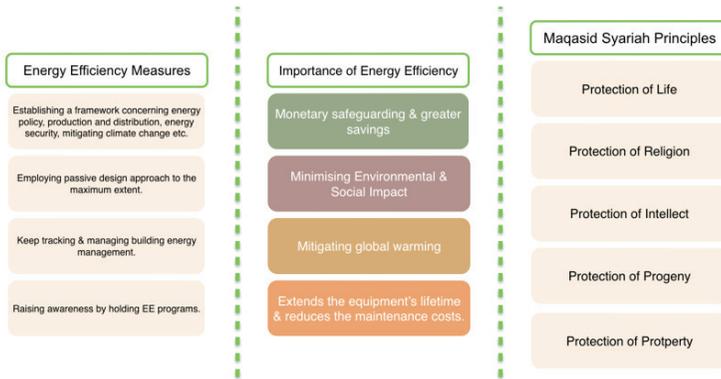


Figure 1. Similarities of Objectives between Energy Efficiency Implementation and Maqasid Syariah Principles

Source: Author

The entirety of the earth’s surface and the atmosphere are included in the Islamic perspective on the environment. Humankind has been chosen to be the caliphate of Allah, although it is thought that humans are rather prone to brutality and devastation. On the contrary, there are even more pressing issues that need to be resolved, and Allah has appointed a group of prophets and messengers, including upright people (As-Siddiqun), witnesses to the truth of Islam (As-Syuhada’), true believers of Islam (Al-Mukminin), and Islamic scholars, to serve as examples for all people in managing and governing this universe in accordance with His will (Ibn Kathir, Al-Hafiz, 1998). Al-Mizan is believed to be the structure which renders stability by being well-organised, harmonious and complementary from one living beings to another. Al-Mizan in the ecosystem is essential because it emphasises the significance of humans’ acts as His caliphates on earth. Therefore, Islam is firmly ingrained in environmental consciousness. It is about our own behaviour and how it shows up in our interactions with other beings. It is also about treating nature and other living creatures with respect.

Apart from that, Maqasid Syariah principles are essential in setting a principle for the maslahah or benefit of humankind (Azila et al., 2017). Moreover, Maqasid Syariah principles fulfil the aims and objectives of mankind that favour economic and social fairness. For example, establishing a framework on energy policy, mitigating climate change, monetary

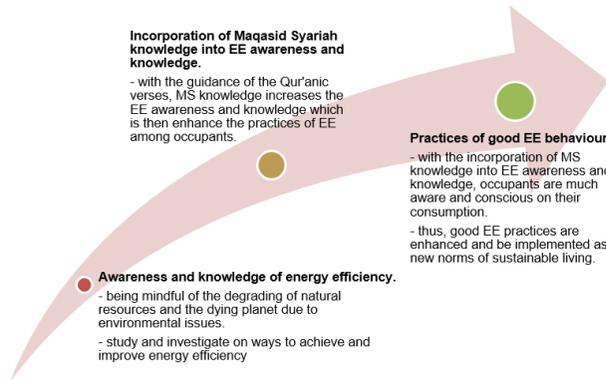
safeguarding, and more savings in monthly utility bills. Furthermore, EE minimises environmental and social impacts linked to energy production and consumption, such as air pollution, acid rain, and global warming. The EE also prevents global warming and preserves the ecosystems by lowering GHG emissions and improving EE technologies and practices. Additionally, EE increases the lifespan of equipment and lowers maintenance costs of building equipment or systems by reducing operation hours and capacity. Similarly, EE employs the passive design approach to the maximum extent, monitors and manages building energy management, and raises awareness by establishing EE programmes. This serves as a reminder that the Qur'an, the ultimate guide for humankind, has specified a set of guidelines in its verses to direct people in their efforts to preserve the environment and avoid them from wreaking havoc and destruction on the planet.

CONCLUSION

Overall, the Qur'an does not explicitly include the term "environment", but it does discuss environmental issues 155 times in various surahs, demonstrating that environmental protection is essential in Islam. In addition, Islam holds people accountable for any harm committed towards the environment since humans are appointed as the caliphates of Allah to sustain the planet. In contrast to western conceptions that view environmental protection as a reaction to foreign forces and the pursuit of particular goals, Islam views environmental protection as the only means of preserving the delicate balance of life. For instance, reciting a blessing in the morning, conserving water even at a flowing stream, forbidding extravagance, as well as discouraging sleeping late, are some of the Islamic principles that are a huge help in combatting energy use, energy efficiency, energy safeguarding and most importantly, climate change.

Apart from that, energy efficiency uses less energy to complete the same task, so energy waste can almost certainly be eliminated. This will provide us with a number of advantages in reducing the emissions of GHG, combatting climate change and global warming, including cutting consumption costs for every home and the entire economy. Based on the EE analysed from past literature (Aqli knowledge) and sources from the Quran and Hadith (Naqli), EE practices could reduce the consumption

through EE knowledge and belief (iman). Therefore, Figure 2.0 depicts a conceptual model of the incorporation of MS knowledge into EE awareness and knowledge which ultimately contributes to an enhanced of good EE practices to be implemented among occupants in everyday lives.



Generally, practices involving waste of energy is sinful. Therefore, every Muslim believer should abide by good practices and practice EE and EC. Most are occupants or home dwellers, thus practising a sustainable lifestyle is crucial to saving the Earth. Ultimately, the integration of Maqasid Syariah into EE and EC practices will reduce energy use, diminish harmful GHG emissions from threatening the environment and provide the current and future generations with a better, cleaner and greener environment, along with achieving blessings from the Almighty Creator.

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AUTHORS CONTRIBUTION

Each one of the authors for this publication has given their insightful personal and professional advice as well as their point of views. The research, data cleaning and tabulation, along with the writing, all benefited from the input received by all the authors. The final manuscript had been reviewed and approved by all authors.

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CONFLICT OF INTEREST

No author has disclosed any conflicts of interest.

REFERENCE

- Abas, Nur Afifah & Sahad, Mohd. (2021). *A Comparative Study Between Reflexive Thematic Analysis in Social Sciences and Qur'anic Thematic Analysis In Qur'anic Sciences*. 17. 1-25. 10.33102/jmq.v17i.
- Adebayo, T. S., Awosusi, A. A., Kirikkaleli, D., Akinsola, G. D., & Mwamba, M. N. (2021). Can CO₂ emissions and energy consumption determine the economic performance of South Korea? A time series analysis. *Environmental Science and Pollution Research*, 28(29), 38969–38984. <https://doi.org/10.1007/s11356-021-13498-1>
- Ahmad Sarkawi, Azila and Abdullah, Alias and Md. Dali, Norimah and Khazani, Nur Amilin (2017) The philosophy of Maqasid al-Shari'ah and its application in the built environment. *Journal of Built Environment, Technology and Engineering (JBETE)*, 2, 215-222. ISSN 0128-1003
- Al-Mofleh, A., Taib, S., Mujeebu, M. A., & Salah, W. (2009). Analysis

- of sectoral energy conservation in Malaysia. *Energy*, 34(6), 733–739. <https://doi.org/10.1016/j.energy.2008.10.005>
- Amasyali, K., & El-Gohary, N. (2016). Building Lighting Energy Consumption Prediction for Supporting *Energy Data Analytics*. *Procedia Engineering*, 145, 511–517. <https://doi.org/10.1016/j.proeng.2016.04.036>
- Asadi, I., Mahyuddin, N., Shafiqh, P. (2017). A review on indoor environmental quality (IEQ) and energy consumption in building based on occupant behaviour, *Facilities*, 35 (11/12). 684-695.
- Banerjee, R. (2015). Importance of Energy Conservation. *International Journal of Innovative Research in Advanced Engineering (IJIRAE)*, 2(4), 2349–2163.
- Buchanan, K., Russo, R., & Anderson, B. (2015). The question of energy reduction: The problem(s) with feedback. *Energy Policy*, 77, 89–96. <https://doi.org/10.1016/j.enpol.2014.12.008>.
- Buckley, P. (2020). Prices, information and nudges for residential electricity conservation: A meta-analysis. *Ecological Economics*, 172, 106635. <https://doi.org/10.1016/j.ecolecon.2020.106635>.
- Carrico, A.R., Riemer, M. (2011), Motivating energy conservation in the workplace: An evaluation of the use of group-level feedback and peer education. *Journal of Environmental Psychology*, 31(1), 1-13.
- Choong, W. W. & Mohammed Miswan, A.H. & Alias, B. (2006). Energy Conservation: A Conceptual Framework of Energy Awareness Development Process .
- Crosby, K., & Metzger, A. B. (2012). *Powering down: A toolkit for behavior-based energy conservation in k-12 schools*. US Green Building Council (USGBC), Washington DC, USA, Tech. Rep.
- Delmas, M. A., Fischlein, M., & Asensio, O. I. (2013). Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012. *Energy Policy*, 61, 729–739. <https://doi.org/10.1016/j.enpol.2013.05.109>.

- DeWaters, J. E. and Powers, S. E.(2011). Energy literacy of secondary students in New York State (USA): A measure of knowledge, affect, and behaviour in *Energy Policy*. 39(3), 1699-1710.
- Diesendorf, M., & Diesendorf, M. (2007). *Greenhouse solutions with sustainable energy*. Sydney, Australia: University of New South Wales Press.
- E. A. Frimpong, P.Y. Okyere, E. K. Anto. (2016). Assessment of Energy Wastage in Street Lighting, *Journal of Multidisciplinary Engineering Science Studies*, 2(7), 639-641,.
- Energy Commission. National Energy Balance (2017). *Suruhanjaya Tenaga (Energy Commission): Petaling Jaya, Malaysia.Environmental and Energy Study Institute (EESI)*. (n.d.). Energy Efficiency | EESI. <https://www.eesi.org/topics/energy-efficiency/description>.
- Pietrapertosa, F., Tancredi, M., Salvia, M., Proto, M., Pepe, A., Giordano, M., Afflitto, N., Sarricchio, G., Di Leo, S., Cosmi, C. (2021). An educational awareness program to reduce energy consumption in schools, *Journal of Cleaner Production*, 278, 123949. ISSN 0959-6526. <https://doi.org/10.1016/j.jclepro.2020.123949>.
- Halfawy, M., & Froese, T. (2005). Building Integrated Architecture/Engineering/Construction Systems Using Smart Objects: Methodology and Implementation, *Journal of Computing in Civil Engineering*, 19(2), 172–181. [https://doi.org/10.1061/\(asce\)0887-3801\(2005\)19:2\(172\)](https://doi.org/10.1061/(asce)0887-3801(2005)19:2(172))
- Hassan, J. S., Zin, R. M., Abd Majid, M. Z., Balubaid, S., & Hainin, M. R. (2014). Building Energy Consumption in Malaysia: An Overview. *Jurnal Teknologi*, 70(7). <https://doi.org/10.11113/jt.v70.3574>
- Herring, H. (2006). Energy efficiency—a critical view. *Energy*, 31(1), 10–20. <https://doi.org/10.1016/j.energy.2004.04.055> IEA (2014), World Energy Outlook 2014, IEA, Paris <https://www.iea.org/reports/world-energy-outlook-2014>
- IPCC. Summary for Policymakers. In Climate Change (2007). *The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.

Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M., Miller, H.L., Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA.

Islam, S.S. (2017), *Sustainable development in Islam and international law: An investigation in Qur'anic Guidance for Good Governance*. U.K: Palgrave Macmillan, Cham. p169-192.

Kamaruzzaman, S. N., Egbu C. O., Zawawi, E. M., Karim, S. B., Woon, C. J. (2015). Occupants' satisfaction toward building environmental quality: structural equation modeling approach. *Environ. Monit. Assess*, 187 (5) p. 242

Kasavan, S., Sharif Ali, S. S., & Siron, R. (2021). The Behaviour of Households Towards Electricity Consumption: A Case Study at Seremban. *PLANNING MALAYSIA*, (18). <https://doi.org/10.21837/pm.v19i18.1047>

Kelly, S. (2016). Energy Consumption in Creighton University Residence Halls: Comparing Attitudes and Behaviors in Quest. *Journal of Undergraduate Research*, 5, 51-80.

Loengbudnark, W., Khalilpour, K., Bharathy, G., Voinov, A., Thomas, L. (2022). Impact of occupant autonomy on satisfaction and building energy efficiency. *Energy and Built Environment*. ISSN 2666-1233. <https://doi.org/10.1016/j.enbenv.2022.02.007>.

Lop, N. S., Che Ahmad, A., & Nik Zulkipli, N. A. D. (2019). The Implementation Of Green Building in Malaysian Construction Industry: Determination Of Key Success Factors. *Malaysian Journal of Sustainable Environment*, 1(1), 65. <https://doi.org/10.24191/myse.v1i1.5561>

Moahmmed, C.M. & Mohammed Adham, A. (2021). *Literature Review as a Research Methodology: An overview and guidelines*.

Mohammad, S. N., Zakaria, R., Omar, W., Abd Majid, M. Z., Saleh, A. L., Mustaffar, M., Mohamad Zin, R., & Jainudin, N. A. (2014). Potential of Solar Farm Development at UTM Campus for Generating Green Energy. *Applied Mechanics and Materials*, 479–480, 553–558. <https://doi.org/10.4028/www.scientific.net/AMM.479-480.553>

doi.org/10.4028/www.scientific.net/amm.479-480.553

- Kandar, M.Z., Ahmad, M.H., Syed Ariffin, S.A.I. (2009). *Energy Conservation Program In Government Building*. Frgs Mohe Vot 78108 Research Report. <https://eprints.utm.my/id/eprint/9732/1/78108.pdf> (11092021)
- Kandar, M.Z. Stephen, N.P, Abdullah, M.G., Yakubu, A.D. (2016). A Field Study of Thermal and Visual Performance of Shelf-Shading Energy Commission Diamond Building Putrajaya, Malaysia. *Indian Journal of Science and Technology*, 9(46), page number?
- Mustafa, N. H., Husain, M. N., Aziz, M. A., Othman, M. A., & Malek, F.(2014). A survey on human behaviour towards energy efficiency for office worker in Malaysia. *Journal of Physics: Conference Series*, 495(1), 012030.
- Nimlyat, P. S. (2018). Indoor environmental quality performance and occupants' satisfaction [IEQPOS] as assessment criteria for green healthcare building rating. *Building and Environment*, 144, 598-610. ISSN 0360-1323. <https://doi.org/10.1016/j.buildenv.2018.09.003>.
- Orland, B., Ram, N., Lang, D., Houser, K., Kling, N., & Coccia, M. (2014). Saving energy in an office environment: A serious game intervention. *Energy and Buildings*, 74, 43–52. <https://doi.org/10.1016/j.enbuild.2014.01.036>.
- Pérez-Lombard, L., Ortiz, J., & Pout, C. (2008). A review on buildings energy consumption information. *Energy and Buildings*, 40(3), 394–398. <https://doi.org/10.1016/j.enbuild.2007.03.007>
- Rahman, Nurul & Kamaruzzaman, Syahrul Nizam & Akashah, Farid Wajdi. (2019). Scenario and Strategy towards Energy Efficiency in Malaysia: A Review. *MATEC Web of Conferences*. 266. 02012. 10.1051/mateconf/201926602012.
- Rosly, S. A. (2010). Shariah parameters reconsidered. *International Journal of Islamic and Middle Eastern Finance*, 3(2), 132-146.
- Saged, A. A. G., Alhaj, T. A. A., & Bi, M. Y. Z. (2017). The role of the Maqasid al-Shariah in preserving the environment. *Humanomics*,

33(2), 125-132.

Sansaniwal, S.K., Kumar, S., Jain, N., Mathur, J., Mathur, S. (2021). Towards implementing an indoor environmental quality standard in buildings: a pilot study. *Build. Serv. Eng. Res. Technol.*, 42(4). 449-483

Sarkawi, A., Abdullah, A., Dali, N.M., & Khazani, N.A. (2017). *The philosophy of Maqasid al-Shari'ah and its application in the built environment.*

Scherbaum, C.A., Popovich, P.M., & Finlinson, S. (2008). Exploring individual-level factors related to employee energy-conservation behaviour at work. *Journal of Applied Social Psychology*, 38(3), 818–835.

Shahidan, A.A., & Shafie, F.A. (2020). Urban Metabolism And Transportation Assessment Of Kuala Lumpur, Malaysia. *Planning Malaysia*, 18(13). <https://doi.org/10.21837/pm.v18i13.793>

Stemers, K., & Yun, G. Y. (2009). Household energy consumption: a study of the role of occupants. *Building Research & Information*, 37(5–6), 625–637. <https://doi.org/10.1080/09613210903186661>

Surah Al-A'raf: verse 10.

Surah Al-Baqarah: verse 60.

Surah Al-Furqan: verse 1.

Surah Al-Isra': verse 9.

Surah Al-Mulk: verse 15.

Surah Ar-Rum: verse 41.

Surah Yunus: verse 57.

T. Ching Sin et al. (2011).. “Sustainability Development through Energy Efficiency Initiatives in Malaysia”. *Paper of Green & Energy Management*:4-5, pp. 1-12.

Wajdi Dusuki, A. (2008). Banking for the poor: the role of Islamic banking in microfinance initiatives. *Humanomics*, 24(1), 49–66. <https://doi.org/10.1108/08288660810851469>

- Y. Zhang, C.Q. He, B.J. Tang, Y.M. Wei. (2015). China's energy consumption in the building sector: A life cycle approach. *Energy Build*, 94, 240-251
- Y.X. Ma, C. Yu. (2020). Impact of Meteorological Factors on High-rise Office Building Energy Consumption in Hong Kong: From a Spatiotemporal Perspective. *Energy Build.*, Article 110468.
- Yu, Z., Fung, B. C., Haghghat, F., Yoshino, H., & Morofsky, E. (2011). Asystematic procedure to study the influence of occupant behavior on building energy consumption. *Energy and Buildings*, 43(6), 1409–1417. <https://doi.org/10.1016/j.enbuild.2011.02.002>
- Zaid, S. M., Myeda, N. E., Mahyuddin, N., & Sulaiman, R. (2014). Lack of Energy Efficiency Legislation in the Malaysian Building Sector Contributes to Malaysia's Growing GHG Emissions. *E3S Web of Conferences*, 3, 01029. <https://doi.org/10.1051/e3sconf/20140301029>
- Zainol, H., Alauddin, K., & Shukri, N. (2017). The Green Building Assessment Tools For Water Efficiency Criteria In Malaysia: An Analysis. *Malaysian Journal of Sustainable Environment*, 2(1), 161. <https://doi.org/10.24191/myse.v2i1.5589>
- Zakaria, R. B., Foo, K. S., Zin, R. M., Yang, J., & Zolfagharian, S. (2012). Potential Retrofitting of Existing Campus Buildings to Green Buildings. *Applied Mechanics and Materials*, 178–181, 42–45. <https://doi.org/10.4028/www.scientific.net/amm.178-181.42>

Surat kami : 700-KPK (PRP.UP.1/20/1)

Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak



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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

“BERKHIDMAT UNTUK NEGARA”

Saya yang menjalankan amanah,

Setuju.

27.1.2023

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
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