

Welcome to the third edition of the Institute of Energy Policy and Research (IEPRe) Newsletter which covers news and updates for the months July to September 2021. Please do keep in touch with us at IEPRe@uniten.edu.my.

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- Live webinar: Strategic Energy Transition Towards Carbon Neutrality under The Impact of Covid-19: Lessons From Japan
- 2030 Target of Attaining Carbon Neutrality in Malaysia: A Perspective of the Energy Sustainability in the Twelfth Malaysia

Perspective

- Circular Economy and Waste Management
- How to Gauge the Decarbonization Effect of Individual Energy Efficiency Initiatives in Malaysia?

Others

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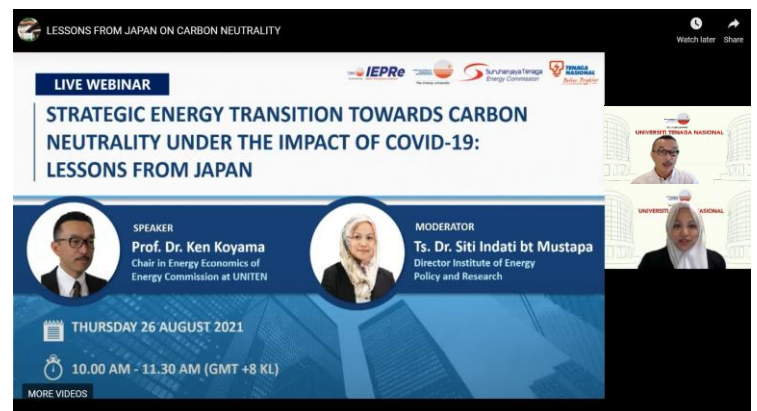
Thursday, 26th August 2021 – The fifth live webinar series entitled ‘Strategic Energy Transition Towards Carbon Neutrality Under the Impact of Covid-19: Lessons from Japan’ was organized by the Institute of Energy Policy and Research (IEPRe), under the auspices of the Chair of Energy Economics of Energy Commission at Universiti Tenaga Nasional (UNITEN). The live webinar featuring the Chair of Energy Economics, Professor Dr. Ken Koyama was moderated by the Director of IEPRe, Ts. Dr. Siti Indati Mustapa.

Professor Dr. Ken Koyama initiated his presentation by highlighting the factors affecting the global energy landscape including the COVID-19 pandemic, the new US administration and the emerging US-China “cold-war” which produces uncertainty and volatility in the global energy market. Furthermore, the global energy landscape is also affected by the global waves of carbon neutrality targets led by the European Union, followed by China, Japan and the United States. Professor Dr. Ken Koyama stated that advanced and innovative technology will play the principal role in enhancing energy security and preventing climate change. Professor Dr. Ken Koyama indicated that the Net Zero Emission Report produced by the IEA was on generated by the backcasting method, suggesting that by 2050 all nations will achieve net-zero emissions.

Subsequently, the speaker elaborated on Japan’s Strategic Energy Plan (SEP) focusing on its specific targets which are to achieve carbon neutrality in 2050 and to reduce 46% of Japan’s greenhouse gas emissions in 2030 while emphasizing the 3E+S concept (energy security, environmental protection, economic efficiency, and safety) and utilizing innovative technologies. Professor Dr. Ken Koyama reiterated the importance of energy efficiency, renewable energy resources, electrification with zero-emission and innovative technologies such as hydrogen energy and carbon capture, utilization and storage (CCUS) to achieve carbon neutrality. Professor Dr. Ken Koyama emphasized technological development, infrastructure improvement, cost reduction and international

Live Webinar: Strategic Energy Transition Towards Carbon Neutrality under The Impact of Covid-19: Lessons from Japan

By Dr Norsyahida Mohammad



cooperation as crucial requirements to achieve carbon neutrality goals. At the end of the webinar, the moderator highlighted some key takeaways for Malaysia which included the roles of medium and long-term energy transition measures, consistent policies and adequate digital infrastructures in achieving ambitious targets of carbon neutrality. The moderator reiterated that the motivation towards carbon neutrality should be shared across all stakeholders comprising the government, industries and the community to ensure concrete action that could be embarked upon. The 90-minute live webinar was attended by 95 participants from various organizations within and outside Malaysia.

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2030 Target of Attaining Carbon Neutrality in Malaysia: A Perspective of the Energy Sustainability in the Twelfth Malaysia Plan

By Dr. Ayodele Bamidele Victor & Dr. Saraswathy Kasavan



#KELUARGA MALAYSIA

Three-quarters of today's greenhouse gas emissions come from the energy sector, and addressing this issue is possibly the most challenging problem humanity has ever confronted. Decreasing global carbon dioxide (CO₂) emissions to zero by 2050 is in line with attempts to keep the average global temperature increase to 1.5 °C in the long run. It necessitates a radical rethink of how we generate, move and consume energy. Despite the rising political consensus that the world can make progress toward net-zero emissions by 2050, little is known about the specific changes needed to get there. Much is still needed to be done within the Malaysian context to make the goal of attaining carbon neutrality a reality because countries' situations vary widely and their ability to make required reforms varies greatly.

An overview of the Eleventh Malaysia Plan on Carbon Neutrality and Energy Sustainability

Energy supply remained stable even as demand rose in the Eleventh Plan. Various measures were made to ensure the energy sector's long-term viability through resource diversification, including increased investment in new infrastructure and improved technologies. A series of steps were implemented in the Eleventh Malaysia Plan to keep up with the rising energy demand. The use of cleaner fuels was advocated to reduce greenhouse gas emissions and reduce carbon emissions. Biodiesel blends with 10% palm methyl ester (PME) were launched in 2019 for the transportation sector, while those with 7% PME were introduced in 2019 for industries. The government approved the Euro 4M for RON95 fuel with higher quality in 2020 to reduce pollution. With an installed capacity of 7,995 MW, renewable energy (RE) accounted for 22.4% of power output generated in 2020. Large Solar Scale (LSS) and Net Energy Metering (NEM), introduced in 2016, together channeled 856 MW of renewable energy to the grid. NEM. On the other hand, it permits consumers to sell excess solar photovoltaic (PV) electricity to utility companies, whereas LSS concentrates on business RE generators. The Energy Efficiency and Conservation Bill (EE&C) was introduced in 2020 to regulate electricity and thermal energy use. Initiatives such as EE labelling and the National Building Energy Intensity Standard extension have bolstered the EE drive. Moreover, until 2020, an additional 49,415 rural houses (98%) have access to electricity supply under the Rural Electricity Supply Programme (BELB).

Achieving Carbon Neutrality and Energy Sustainability in the Twelfth Malaysia Plan

Malaysia's path to net-zero emissions by 2030 as outlined in the Twelfth Malaysia Plan necessitates the significant strengthening of energy and climate policy to be successfully implemented. Around 70% of global CO₂ emissions are now covered by countries that have pledged to achieve net-zero emissions in the last year. As a result, this is a significant improvement. However, the majority of pledges have yet to be accompanied by concrete, short-term actions. Furthermore, even if all pledges are kept, global CO₂ emissions in 2050 are expected to be around 22 billion tonnes. If the current trend continues, we can expect a 2.1 °C rise in global temperatures by 2100. The Covid-19 crisis lowered global emissions in 2020, but those emissions are already rising as economies recover. Continued inaction will make achieving net-zero by 2050 impossible. Energy sustainability will be emphasized in the Twelfth Plan to maintain energy supply and security while also creating new economic opportunities. Improved institutional and regulatory frameworks will be implemented as a result of these efforts. The oil, gas and power ecosystems will be strengthened by implementing a comprehensive national energy policy.

The key elements in the actualization of the Twelfth Malaysia Plan for carbon neutrality and energy sustainability are depicted in Figure 1. Two important initiatives will be implemented to address the cross-sectoral energy problems, (1) the design of a comprehensive single energy policy and (2) the establishment of a systematic communication plan. Consolidating existing energy-related policies will be a vital objective of the new strategy. Better engagement and effective energy sector reform will be made possible with a more organized communication approach. Current energy policies will be consolidated and integrated to create a long-term, comprehensive single energy policy. As a result of this policy, numerous difficulties in energy-

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consuming industries will be addressed, and global trends on energy transition will respond. Future energy growth prospects will be examined under this plan, focusing on clean and sustainable energy sources like hydrogen. With this new energy, Malaysia would be able to map out a long-term low-carbon energy sector goal. All aspects of the energy industry and environmental sustainability will also benefit from the new policy's implementation. In addition, a comprehensive communication plan can create collaboration with stakeholders to successfully implement energy industry reforms and increase awareness of the rationale for market liberalization.

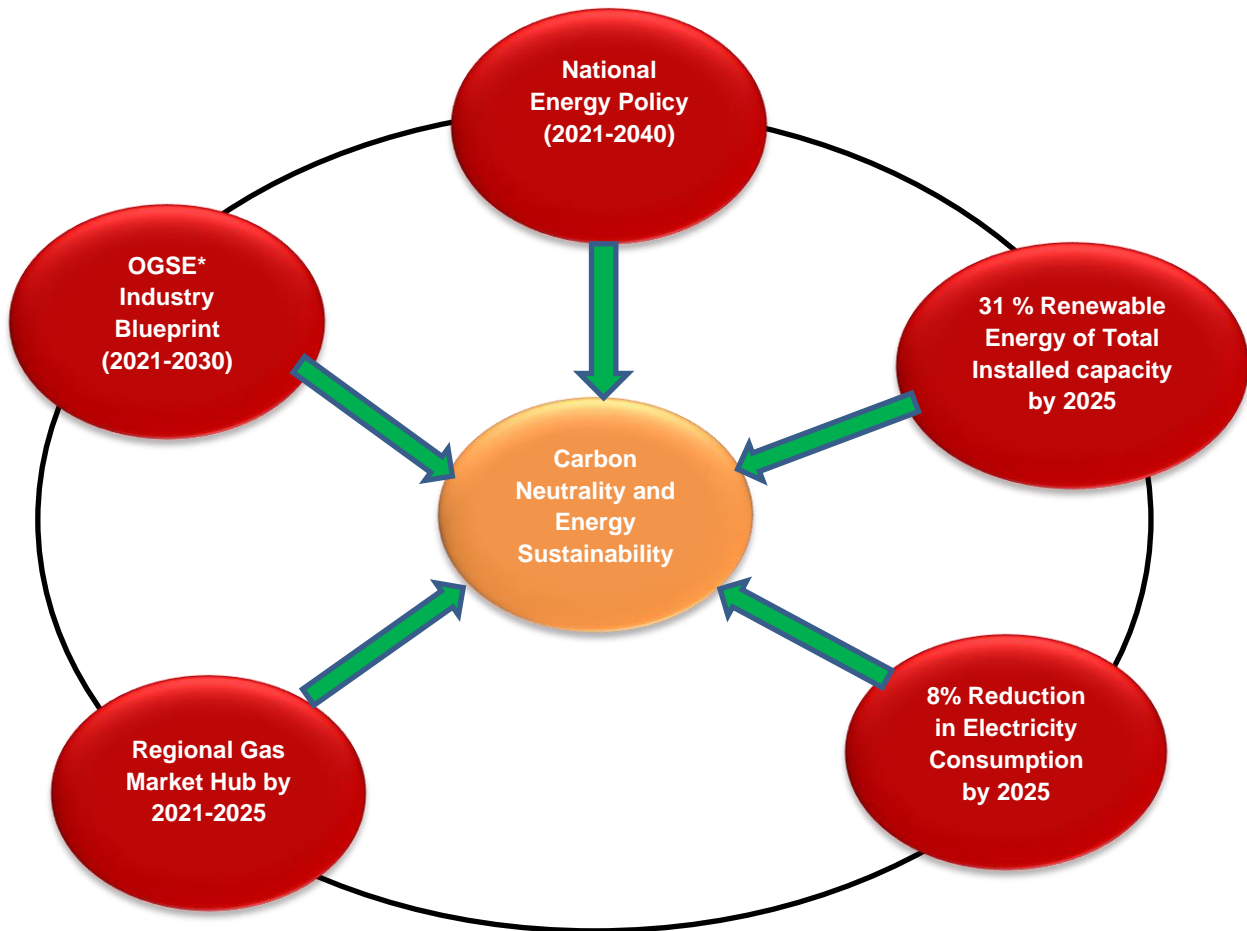


Figure 1: Twelfth Malaysia Plan on Carbon Neutrality and Energy Sustainability
 *Oil and Gas Services and Equipment

Conclusion

Energy market transformation will be prioritized through gas market liberalization and improving power supply industry resiliency to ensure it is future proof in the Twelfth Malaysia Plan. As a result of the new policy's implementation, the energy sector and environmental and energy sustainability will benefit in every way.

Bibliography

1. Twelfth Malaysia Plan 2021-2025, a prosperous, inclusive, sustainable Malaysia.
2. International Energy Agency (2021). Net Zero by 2050: A road map for Global Energy Sector

Perspective: Circular Economy and Waste Management

By. Dr. Wan Noordiana Wan Hanafi

Raw materials are becoming increasingly difficult to obtain. Although about 10% of materials are recycled after they are used, the amount of waste continues to grow. Consumer preferences are changing, industrial expansion is taking place and cities are expanding which is exacerbating the problem. Additionally, many developing countries and emerging economies do not properly dispose of waste which has negative consequences for people, the environment and the climate. Environmental pollution has a negative impact on biodiversity and poses a threat to long-term development around the planet.

The circular economy provides potential solutions to this problem. Using the circular economy paradigm, we have a fresh window of opportunity for innovation and synergy between natural ecosystems and enterprises, as well as between our everyday lives and waste management. The circular economy takes into account production processes and defines methods for reusing, repairing and recycling products in order to increase the amount of environmentally friendly manufacturing and consumption. In addition to reducing waste, this method conserves energy and aids in the prevention of irreversible damage to the environment, including climate change and biodiversity declines, as well as air, soil and water pollution due to resource consumption at rates that exceed the Earth's ability to replenish them.

As a means of mitigating the potential environmental consequences, it is vital to reduce waste generation and to promote the utilisation of products, materials and resources that will remain in the economy for the longest period of time. A significant shift from the conventional, linear economic model, which is built on the take-make-consume-throw away pattern, is being made here. To function effectively, this concept is reliant on massive quantities of inexpensive, readily available materials and energy.

As shown in the illustration below, a circular economy model, at its foundation, is based on the concept of designing waste "out of existence". Actually, the circular economy is built on the premise that there is no such thing as waste in the first place. The items are built to last (using high-quality materials) and optimised for a cycle of disassembly and reuse which makes them easier to handle, transform and renew as the needs arise.



In the end, these short product cycles distinguish the circular economy model from other models such as disposal and recycling which both waste significant quantities of embedded energy and labour. The ultimate goal is to maintain and increase natural capital by controlling finite stocks and balancing renewable resource flows. This can be accomplished through a variety of strategies.

What are the advantages of adopting a circular economy?

1. It reduces the consumption of non-renewable resources.

Currently, more than ever, we continue to utilise non-renewable resources — such as oil and metal ores — as if we have an infinite supply of these materials. This practice cannot be sustained indefinitely. In a circular economy, actions such as repurposing materials and renovating old products (rather than tossing them away) are the rule rather than the exception. As a result, we utilise fewer non-renewable resources than we would otherwise. True circular economies will produce zero waste which means that nothing will be thrown away. Essentially, it is a more efficient way of utilising the resources that we now have.

2. It reduces carbon emissions

Since the entire model of the circular economy is based on the sustainable management of materials, it will assist in the reduction of carbon emissions. Materials are managed more efficiently in a circular economy thanks to the reuse of products and materials, the encouragement of the use of renewable resources, the maintenance of sustainability practices and other measures.

3. It strives for zero waste

One of the fundamentals of a circular economy is the repurposing of resources and goods which eventually leads to a zero waste model. Zero waste means fewer plastics in our seas, less rubbish in our oceans and fewer landfills, all of which are good things. It also means that there is less of a need to mine finite resources because we are repurposing them rather than mining them. However, whereas many environmental models need reduction in order to achieve zero waste, the circular economy model supports growth in order to achieve zero waste. As a result, it is a perfect aim for industry, individuals and governments alike as it allows them to achieve much-needed environmental goals at the same time.

4. It provides benefits for consumers

A circular economy, in addition to providing environmental benefits, also gives other benefits to the customer. It prohibits behaviours such as planned obsolescence as a result of the reuse of materials and this means that your products will last for an extended period of time. It also promises a rise in discretionary income because it encourages habits such as purchasing second-hand products, leasing or renting instead of purchasing, and other more cost-effective alternatives to ownership. Another significant benefit for consumers is the creation of new jobs. To develop a circular economy, numerous new industries will need to emerge in order to achieve success. As a result, there will be a large number of new employment opportunities available. A major cause of concern around the world is that certain environmental measures may result in the loss of particular economic prospects such as coal mining or other jobs that rely on non-renewable resources.

5. It provides new chances for businesses

Businesses can reap a variety of benefits from the circular economy model as well. Along with the increase in work opportunities described above, there is an increase in business opportunities (such as refurbishing old items, collecting used resources like clothing or electronics, and so on). Moreover, existing businesses will benefit from a more reliable supply of resources because we will be reusing the resources that we already have rather than relying on limited resources. This has the potential to lower the cost of materials, allowing businesses to operate more efficiently. Additionally, consumer loyalty may be improved as a result of the approach. The majority of today's consumers want to support businesses that share their values and environmental activities are among the most important ideals for them. By embracing a more environmentally conscious company approach you may be able to expand your customer base and acquire more devoted customers.

Achieving a circular economy is not an easy undertaking; it will necessitate a concerted global effort on the part of individuals, organisations and governments in order to be successful. However, given all of the advantages of this approach, there is simply no reason why we shouldn't begin moving toward it immediately.

Perspective: How to Gauge the Decarbonization Effect of Individual Energy Efficiency Initiatives in Malaysia?

By Ts. Dr. Amar Hisham Jaafar

Decarbonization reduces carbon dioxide emissions (CO₂) using low carbon power sources and achieves a lower output of greenhouse gasses into the atmosphere. It can also be considered as reducing carbon intensity by lowering the amount of greenhouse gas emissions produced by the burning of fossil fuels. There are three pillars of decarbonization: electrification, decarbonization of electricity and energy efficiency, which interconnect and support each other. From the perspective of the individual domestic consumer, the decarbonization effect, resulting from energy-saving behaviour or efficient appliances will reduce the amount of energy as well as the electricity cost usage. For instance, using efficient electrical appliances with 5-Star Rated Appliances reduces demand, which benefits the environment by reducing carbon emissions.

This article shows how to calculate the decarbonization effects from energy savings.

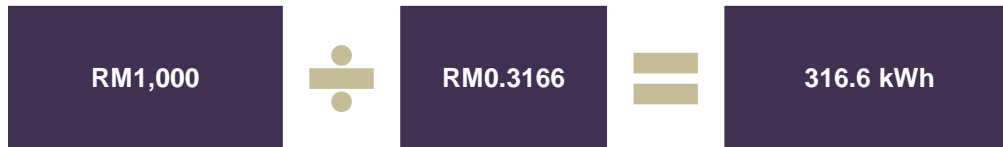


How to calculate the CO2 emission reduction form electricity saving cost?

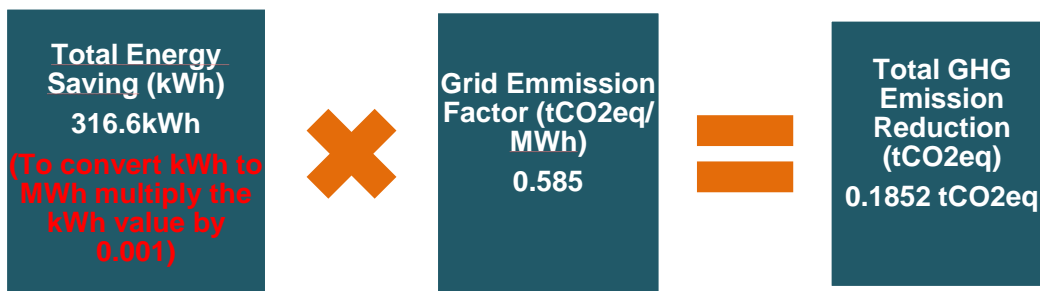
Let's say the cost saving of one year after the usage of 5-Star Rated Air-conditioner is RM 1000 in one year. First, need to convert the monetary impact into kWh, the following equation can be used:



By applying the above formula, and by assuming the average electricity tariff in TNB is 31.66 cent/kWh, the total energy saving in kWh is 316.6 kWh per year.



To convert the total energy savings in kWh to the Total GHG Emission Reduction, we need to multiply it with emission factor. In the case of electricity, the emission factor for grid electricity can be used. The Grid Emission Factor refers to the CO2 emission factor (tCO2/MWh) associated with each unit of electricity provided by an electricity system. The Grid Emission Factors allow organizations and individuals to calculate GHG emissions resulting from a range of activities, including energy use (Malaysian Green Technology Corporation, 2017). The Grid Emission Factor of Peninsular Malaysia in 2017 was 0.585 tCO2/MWh according to the Malaysia Green Technology Corporation¹. The below formula can be used to calculate the Total GHG Emission Reduction.



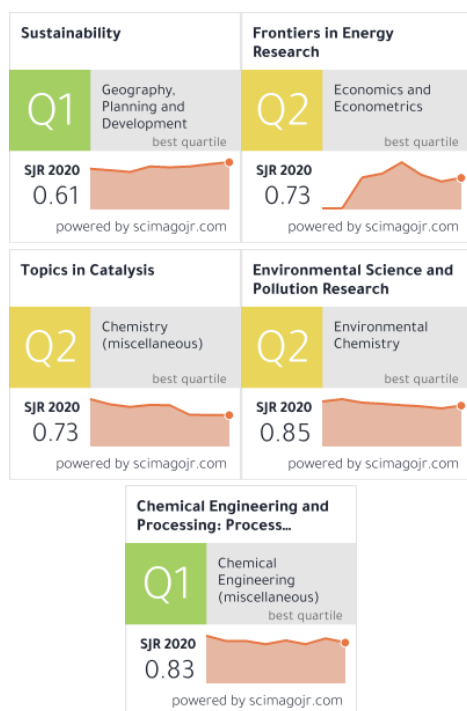
By using the above formula, the Total GHG Emission Reduction, or the decarbonization effect, is 0.1852 tCO2eq or equal to 185.2 kg/CO2eq.

From the calculation, if we managed to save RM 1000 per year by using efficient electrical appliances with 5-Star Rated Appliances, we can reduce total GHG emission to 185.2 kg/CO2eq per year. Let's imagine if the current number of individual domestic customers in Malaysia is 8,257,592; if every individual can reduce their electricity bill by RM 1000.00 per year, we can decarbonize our GHG emissions from energy generation to 1.53 MtCO2eq per year. In 2016, the total CO2 emission produced by electricity generation activities in Malaysia's energy industry was 103.39 MtCO2eq. If all individual domestic customers can save RM 1000.00 per year due to energy efficiency efforts, we can decarbonize around 1.5 percent of the total GHG emissions. Although it is a very small number, after 10 years we could decarbonize around 15 percent of total GHG emissions from our electricity generation sector. So let us save our planet by being an energy efficient person!

¹ 2017 CDM Electricity Baseline for Malaysia. Malaysian Green Technology Corporation. <https://www.mgtc.gov.my/wp-content/uploads/2019/12/2017-CDM-Electricity-Baseline-Final-Report-Publication-Version.pdf>

PUBLICATION HIGHLIGHTS

Congratulations to all our researchers and their teams for getting their work published in the WoS and SCOPUS reputable journals in the third quarter of 2021. The published articles from our researchers focused on various themes related to waste, CO₂ conversion, the transition towards sustainable energy systems, economics and management in the following journals:



Carbon dioxide reforming of methane over Ni-based catalysts: Modeling the effect of process parameters of greenhouse gases conversion using supervised machine learning algorithms.

Ayodele, B. V., Alsaffar, M. A., Mustapa, S. I., Kanthasamy, R., Wongsakulphasatch, S., & Cheng, C. K. (2021). *Chemical Engineering and Processing-Process Intensification*, 108484.

<https://doi.org/10.1016/j.cep.2021.108484>

This study model the effect of process parameters on the conversion of carbon dioxide (CO₂) and methane (CH₄) during reforming reaction over Nickel (Ni) catalysts by using the multilayer perceptron (MLP) and nonlinear auto-regressive exogenous (NARX) neural network models.

A Review of Climate Economic Models in Malaysia.

Rao, Thirupathi, and Siti Indati Mustapa. *Sustainability* 13, no. 1 (2021): 325.

<https://doi.org/10.3390/su13010325>

This paper presents a review of literature on the development of climate economy models in Malaysia from 1988 to 2020.

Carbon Emission and Optimization of Energy for Sustainable Development: Rethinking the Possibility.

Idowu, S. S., Mustapa, S. I., & Joshua, S. (2021). *Front. Energy Res*, 8, 592506.

<https://doi.org/10.3389/fenrg.2020.592506>

This paper investigates to project the viability of gas energy with a minimum deleterious impact on nature and humanity.

Radial Basis Function Neural Network Model Prediction of Thermo-catalytic Carbon Dioxide Oxidative Coupling of Methane to C₂-hydrocarbon.

Ayodele, B. V., Mustapa, S. I., Witoon, T., Kanthasamy, R., Zwawi, M., & Owabor, C. N. (2021). *Topics in Catalysis*, 64(5), 328-337.

<https://doi.org/10.1007/s11244-020-01401-0>

This study employs the Radial Basis Function artificial neural network for modeling the prediction of thermo-catalytic CO₂ oxidative coupling of methane to C₂-hydrocarbons.

A critical analysis of modification effects on nanostructured TiO₂-based photocatalysts for hydrogen production.

Ayodele, B. V., Mustapa, S. I., Alsaffar, M. A., Vo, D. V. N., & Abdullah, S. (2021). *Nanostructured Photocatalysts* (pp. 541-559). Elsevier.

<https://doi.org/10.1016/B978-0-12-823007-7.00018-3>

This paper presents an analysis of selected literature on the modification effect on nanostructure TiO₂-based photocatalysts used for hydrogen production.

Global trends in textile waste research from 2005 to 2020 using bibliometric analysis.

Kasavan, Saraswathy, Sumiani Yusoff, Ng Chee Guan, Nur Shakirah Kamarul Zaman, and Mohd Fadhli Rahmat Fakri. *Environmental Science and Pollution Research* (2021): 1-15.

<https://doi.org/10.1007/s11356-021-15303-5>

This study used VOSviewer to analyse collaboration networks among authors, countries, institutions, and authors' keywords in identifying five main clusters.

The Moderating Effect of Leaders' Experience on Leadership Styles and Crisis Management in the Jordanian Hotel Sector.

Alzoubi, R.H & Jaaffar, AH (2021). *International Journal of Financial Research*. Vol. 12, No. 1; 2021 pp. 297-309

<https://doi.org/10.5430/ijfr.v12n1p297>

This article discusses on the influence of a leader's experience on the relationship between leadership styles and crisis management.

Sharing Session: Handling Manuscript from Editors' and Reviewers' Perspective

The event tagged "Let's Share with UNITEN Postdocs" took place 17th September 2021 from 10:00-11:30 am. The event had four guest speakers namely Dr. Ayodele Bamidele Victor of the Institute of Energy Policy and Research, Dr. Abbas Mohammed Ali Al-Ghaili, Dr. Savisha Mahalingam, and Dr. Gamal Abdulnaser Yahya Al-Kawal.



Topics such as, how to enhance and increase the number of potential opportunities for getting a manuscript considered for publication, handling manuscripts from the editors' and reviewers' perspective, research collaborations, how to increase the number of collaborators, research planning and how to achieve the KPI. Over 56 people were in attendance including the management team and staff

Energy FACTS

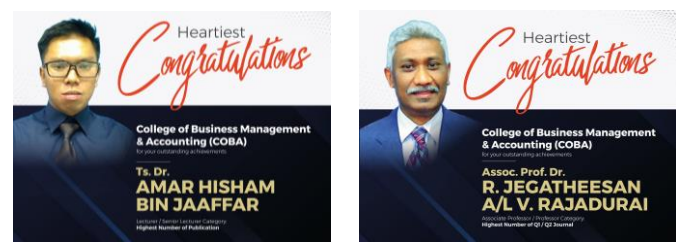
Albert Einstein was the first person to discover the photoelectric effect, which was applied to a solar cell to eventually become the foundation of solar panels. He later won a nobel prize for his efforts, which we say was well deserved!

If fully utilised, just an hours' worth of sun power, is enough to meet the energy needs of the entire planet for a year. Such a strong contender for renewable energy solutions, solar power is predicted to be the world's main energy source by 2050. In 2016, a solar powered aeroplane known as Solar Impulse 2, made a full journey around the world using nothing but sun power!

And another thing about solar power – It doesn't have to be used all at once during daylight hours. It can be stored in molten salts at more than 500 degrees. The steam produced from the salts is then used to turn turbines, to be transmitted as power for during the night!

Source: <https://www.greensquare.co.uk/blog/incredible-renewable-energy->

Congratulations to our high achievers!



On 1st October 2021, the Innovation & Research Management Centre (iRMC) organized a publication excellence award ceremony for all high-achiever UNITEN staff. We would like to congratulate two of our researchers, Ts. Dr. Amar Hisham bin Jaafar for obtaining the highest number of publications and Assoc. Prof. Dr. R. Jegatheesan s/o Rajadurai for achieving the highest number of Q1/Q2 journal in College of Business Management and Accounting (COBA) for January-June 2021. Looking forward to more achievements in the upcoming years!

You finally completed your internship!

Thank you for every efforts and the good times together. We hope that you have achieved what you had planned to achieve during this internship. IEPR would like to wish you all the best at your super exciting new job. It was indeed a great blessing to work with all of you.



Goodbye!

Coming Soon!!

INTERNATIONAL FORUM ON GLOBAL ENERGY LANDSCAPE

IFGE2021

30 NOVEMBER 2021 | 2:00PM – 5:30PM (GMT+8 KUALA LUMPUR)



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We are all hoping to the speediest recovery from the COVID-19 pandemic. Please take care, stay positive and find a way to protect your physical and mental health. It is a challenging phase for all people; however, we believe we can get through all this together.

Join Us!

IEPRE has been organizing a series of webinars on contemporary topics by prominent experts in the field of energy economics and policies. All webinars are offered at no cost. Sign-up to join our mailing list for upcoming events.

SIGN-UP



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