



الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يُونَيْتِي اِسْلَامٌ اِنْتَارَا اِيْجَسَا مِلْدِيْسِيَا
Garden of Knowledge and Virtue

UNGS 1201

Sustainable Development: Issues, Policies AND Practices

Project Title:

Proposal to Install Solar Power Panels at the top of respective Mahallah's Roof.

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Group Members:

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Background:

For our course with the title of ‘Sustainable Development: Issues, Policies AND Practices’, we were tasked with conducting an observation on our campus or our surrounding community to identify an area for a development. Hence, we decided to choose the premise for our observation to be the campus of International Islamic University Malaysia, specifically the ‘Mahallah’ area. At first we inspected the areas around our mahallah to find areas in which improvement is needed as well as distributed survey questions to the tenants of the Mahallah that revolved around the main question of what is the most important aspect in the Mahallah. In which, to our surprise, most answered Wi-Fi (68.6%), followed by the toilet (15.7%), the water dispenser (7.8%) and the fire extinguisher (2.9%) (*detailed analysis and survey form as per appendix 1*).

This case is true because the situation of the modern mahallah in IIUM is different from the previous decade. The Mahallahs in the IIUM now are equipped with modems that allow students to access the internet through the use of Wi-Fi. With the condition that we are living in right now during the Covid-19 era, Wi-Fi is proven to be the most valuable asset being that classes are conducted online and any form of communications with the lecturers require students to be able to access the Wi-Fi. Hence, proving our survey results that states that Wi-Fi is the most essential aspect in the Mahallah. Without it, conducting our most important priorities as students which is studying would be almost impossible as even our education scriptures like textbooks and lecture notes are given online. We also asked the tenants of IIUM’s Mahallah in which, “would they be able to live without the 'most important aspect in the Mahallah' should it one day be absent?”. This resulted in a majority answering ‘No’ (79.4%) showing that these

aspects in Mahallah which is in this case, the Wi-Fi is very essential and could be detrimental to students should it be absent. (*detailed analysis and survey form as per appendix 2*).

Therefore, we decided to move in this direction. After conducting a brainstorming session with our groupmates, we decided to make a plan that involves making the Wi-Fi available 24/7 by making a proposal to install solar panels on the roof of every Mahallah in order to power the Wi-Fi modems. Through this, should even the mahallah buildings experience a power shortage, the Wi-Fi modem will still be up and running as well as providing internet access to students. Hence, this ultimately allows them to study and attend classes consistently. This proposal is also in line with the SDG agenda which we will elaborate further in the ‘significance’ section. When we decided to do this, we conducted a research online to see whether this idea was feasible or not. In our research, we stumbled upon a video of a person applying this concept to power a Wi-Fi modem.¹ He conducted tests to see how much watts and number of solar panels needed to power it and he came to a conclusion that 3 solar panels with the dimension of 20.5 x 14 inches is enough (*example on solar panel as per appendix 4*). These solar panels work when exposed to sunlight, and the photovoltaic cells in a solar panel receive energy which they absorb and transfer the absorbed energy to the semiconductor which helps create an electric field which in turn delivers voltage and current to the modem. These Voltage and current combine to deliver power.² These solar panels are not so good in powering the whole building as it requires a lot of power but are very efficient in powering things that require low energy consumption and are not that big. Hence, fitting the bill of powering the Wi-Fi modem even when the main power is offline.

¹ <https://www.youtube.com/watch?v=Tdsf-W6D2L8>

² Mini solar panel: Ideal power source for small devices/portable appliances. (2019, May 20). The Economic Times.

<https://economictimes.indiatimes.com/small-biz/productline/power-generation/mini-solar-panel-ideal-power-source-for-small-devices/portable-appliances/articleshow/69412749.cms?from=mdr>

Objectives of this project

As an institution that prides itself in advocating for sustainable development, education equality and combating climate change, it is essential that we propose this idea. The implementation of mini solar panels on the roofs of Mahallahs carries a number of important objectives. Those objectives are as follows:

1. To provide an innovative and environmentally-friendly source of internet coverage for IIUM students in their respective Mahallahs
2. To ensure a fair coverage of stable internet to every student at every location in the Mahallah area
3. To encourage practice of using renewable energy sources in campus premises which is aligned with the 7th Sustainable Development Goal (SDG) which is affordable and clean energy
4. To make IIUM a pioneer of green and sustainable innovation
5. To promote the implementation of innovative infrastructure and quality machinery in campus premises

Significance of project

This project is going to make us one step closer to achieving the 7th SDG goal which is Affordable and clean energy. This SDG goal is one of the hardest to achieve as most people nowadays still rely on the unsustainable energy sources such as fuel/petroleum and so on. This is because they lack knowledge about the effects of using those kinds of energy sources. Did you know? 60% of the greenhouse gases emissions are mainly produced from energy. This makes

clean energy a very needed element as it is the main contributor to climate change. In 2015, more than 20% of energy was generated through renewable sources. In 2017, The renewable energy sector has employed around 10.3 Million people. This shows that the sector is getting bigger causing more people to be aware of the idea.

Because solar panels can help generate clean energy and at the same time prevents the production of greenhouse gases, this will help the world achieve SDG goal 13 which is climate action. As you know before, energy generates a big chunk of the total greenhouse effect. When we achieve 100% of our energy to be sourced by renewable energy, greenhouse gases will be very much lesser than what we have before. Greenhouse gases are a good thing, but when the world has too much greenhouse gas, it will cause global warming as greenhouse gases function as a gas that can absorb infrared radiation, thereby trapping and holding heat in the world's atmosphere. By increasing the heat in the atmosphere. Greenhouse gases are responsible for the making of greenhouse effect, which leads to global warming. Greenhouse gases contribute 53% of the level of global warming as of 2020. So we have to lessen greenhouse gases by a bigger margin and that is why renewable energy is a very much needed element in the world. In 2019, a gross total of 36.8 Billion metric tons of Carbon Dioxide was being produced which is the biggest contributor to global warming throughout the decade, from 2010-2019, according to an estimate from the Global Carbon Project, an academic consortium. That decade also has recorded some of the highest numbers of temperature of the world in many different places. So it is by far the hottest decade that has ever been recorded.

If we have solar panels in IIUM student residency which will be able to produce a lot of energy within a day. This will drop the cost of generating energy, drop the emissions of greenhouse gases that IIUM produces and it will be good for the long run as we can get energy

easily during the day due to the fact that in Malaysia, the sun is always up and can make the solar panels be used constantly. Although, the initial cost of doing this project is a lot but when we think about the longevity of advantages for IIUM and the world itself, it is definitely worth it. Solar panels are also good to create a sustainable source of energy to the students that are studying in the residency. Especially nowadays during the pandemic, where everything is done online. The Internet is a necessity to everyone whether they are studying or working.

The Main Challenges That We Face Are :-

1) Lack of funding

Among the main challenges of our proposal of installing solar panels on the rooftop of Mahallah is the funding. When installing the solar panels, the cost of installation, cost of fixing the solar panel to the roof as well as other costs are incurred. In addition, the solar panels also require regular maintenance every now and then which also results in cost being incurred. Should the proposal of the solar panels be accepted, the management may include the cost of the solar panels as well as the maintenance costs in the student's fees.

Although the costs incurred are not that high, it causes additional costs for students to be incurred. Not all students come from wealthy families, although students from wealthy families will not notice the increase in their fees, unfortunate students will, and this will burden them more. Furthermore, due to this Covid-19 situation, more and more workers are being laid off, causing an all-time high rate of unemployment, some of the IIUM student's families may be affected by this and this could cause problems for them. Hence, funding is one of the main problems that can hinder this proposal from being a reality.

2) Output of solar panels is affected by natural phenomenon

Solar panels function by absorbing sunlight and convert them into electrical energy through the use of their photovoltaic cells. Hence, they are really dependent on the sunlight. However, during cloudy days the energy can still be collected but the amount is not as significant as it will be during sunny days. But should there be a rain occurrence, it is actually beneficial to the solar power system as it serves to wash away dirt and debris, essentially giving your panels a good cleaning now and then. Just like cloud cover limits exposure, pollen, bird droppings, and leaves that cover your panels limit the amount of sunlight that's getting through for conversion. Fortunately, rain serves to wash it all away.³

Furthermore, the solar panels are also heavily affected by temperature. Contrary to beliefs that the higher the temperature, the more efficient the power output of the panels, high temperatures actually lower the output of the panels as a result of a phenomena known as a voltage drop.⁴ This is because power is the product of voltage and current and higher temperature increases the current but decreases the electrons in the solar cell.

Finally, the most prominent factor in the generation of solar energy is the natural phenomenon known as nighttime. It is a known fact the sun is absent during nighttime, hence this will hinder the output of the solar panels, should the solar panels not generate enough output for the Wi-Fi modem, therefore the purpose of this proposal will be all but naught. Thus recommendations to counter these challenges must be made.

³ How does the weather affect solar panel efficiency? (2018, March 28). 1876 Energy: #1 Solar Energy and Solar Panel Installations in Texas & California. <https://www.1876energy.com/how-does-the-weather-affect-solar-panel-efficiency/>

⁴ How does the weather affect solar panel efficiency? (2018, March 28). 1876 Energy: #1 Solar Energy and Solar Panel Installations in Texas & California. <https://www.1876energy.com/how-does-the-weather-affect-solar-panel-efficiency/>

3) Delicate and old construction of the mahallah rooftop

The delicate and old construction of the mahallah rooftop may not be suitable for the installation of solar panels. The IIUM campus was built in 1983 and has been occupied for 37 years, so there are many old buildings on Gombak campus, including mahallah. Due to this, the rooftop design may not be compatible and the worn out materials which have been used for many years would not endure the weight of solar panels. *(Picture as per appendix 5)* Some rooftops are damaged and need to be repaired or replaced before the installation of solar panels can be done. Thus, there will be more additional costs incurred.

4) Can be easily damaged

Solar panels are very fragile and easily damaged. NREL study (“Photovoltaic Degradation Rates—An Analytical Review”) found that solar panels degrade about 0.5% to 3% each year, barring any equipment issues.⁵ According to NREL, modules can fail because of unavoidable elements like thermal cycling, damp heat, humidity freeze and UV exposure. All of these aspects happen because companies that are manufacturing these solar panels are trying to lower cost. Because of this, the quality is sacrificed. Hence to avoid this, an initiative must be taken to purchase the right solar panels.

5) Solar panels are exposed to wild animals

⁵ Pickereel, K. (2017, June 5). What causes solar panel degradation?
<https://www.solarpowerworldonline.com/2017/06/causes-solar-panel-degradation/#:~:text=According%20to%20NREL%2C%20modules%20can,encapsulants%20and%20corrosion%20of%20cells>

As we are informed from the first day in IIUM campus, our university is famous for its wild animals scurrying around the area especially in mahallah. The location of the university that is surrounded by a thick forest is one of the factors to the presence of wild animals. These wild animals include monkeys, komodo lizards, and flamingo birds. The thing to be concerned about is that animals that are capable of climbing to the rooftop will increase the risks of solar panels being damaged. Animals that are agile and have the ability to fly for example monkeys, storks, or birds are a big threat that can affect the lifespan of solar panels. The nature of the solar panels being fragile and can easily be damaged, adds fuel to the fire since these animals are curious in nature and can be exceptionally aggressive especially the monkeys. The cost of repairing solar panels is expensive, therefore it is not efficient to just ignore this problem.

Recommendation

a) Conduct a fund-raiser

Our recommendation, to combat the challenge of lack of funding is to conduct a fund-raiser that will be able to generate money to fund the solar panel proposal. We suggest that the fund-raiser be directed towards parents. We can bring forth an argument that states that Wi-Fi has become a necessity for students nowadays especially in this Covid-19 pandemic where online classes have become more prominent. Through this fund-raiser, we can bring forth the argument that parents can help their children by providing a consistent accessible internet during blackouts in their mahallah to aid them in their studies. In addition, the survey result shows that even the students are willing to fund this project with a majority vote of 'yes' (84.3%), which will cause them to persuade their parents to support our fund-raiser as well. (*detailed analysis and survey form as per appendix 3*).

Furthermore, we suggest a proposal to acquire incentives from the government. To acquire these incentives, a proposal can be sent to the government to help fund this initiative by bringing forth the argument that this will greatly help students achieve the SDG goal of quality education as they will be able to fulfill the indicator of participating in formal education. Malaysia offers a wide range of attractive investment incentives to attract investors ranging from tax exemptions and allowance to grant. Solar panels are considered a long-term investment where the installation of these panels will appreciate the value of the building. In addition, specific grants and incentives are also provided to support innovation, strategically important projects and the industry. Researchers of IIUM are encouraged to aid research to innovate the use of solar panels to the next level thus creating a new revolution towards efficient use of energy. These researches are highly recommended by the government and can easily be funded.

b) Use a solar panel with a battery

Many solar panels are not equipped with their own storage. To counter the problem of the solar panel being dependent on the natural phenomenon. We suggest the use of a solar panel that is equipped with a built-in battery. The typical solar energy system includes solar panels, an inverter, equipment to mount the panels on your roof, and a performance monitoring system that tracks electricity production. The solar panels collect energy from the sun and turn it into electricity, which is passed through the inverter and converted into a form that you can use to power our devices and home.⁶

⁶ How is solar energy stored in 2019? (n.d.). Get competing solar quotes online | EnergySage. <https://www.energysage.com/solar/solar-energy-storage/how-do-solar-batteries-work/>

Solar batteries work by storing energy produced by your solar panels for later use.⁷ If we install a built-in solar battery as part of our solar panel system, we are able to store excess solar electricity instead of sending it back to the grid. If the solar panels are producing more electricity than the modems need, the excess energy goes towards charging the battery. Later, when the solar panels aren't producing electricity especially during night time, the energy that is stored earlier in the battery can be drawn out for night use.

c) Rooftop assessment

Re-roofing is one of the most expensive projects that could be a burden to the management of the university. While some roofs cannot avoid being replaced once the time comes, a majority of them can still have their lifespan be extended. Although, the delicate and old roofs of the mahallah building may not be suitable to withstand the weight of solar panels and are potent to further accidents in the future, fortunately, we think that most of the mahallah's roofs damage that can be lead to it being replaced can easily be prevented with care and procedures.

The thing to do is, to maintain the gutters. Clean and functional gutters will reduce the risks of roof leaks and other damage to the roofing system while extending its lifespan. This is because gutters are used to catch debris and leaves, and lead water away from the roof and foundation that simultaneously prevent water problems later on. Hence, to reduce stacks of leaves and debris, extended branches that may disrupt the functionality of solar panels should be trimmed constantly. It is advisable to keep tree branches 10 feet away from the roof for proper usability.

⁷ How is solar energy stored in 2019? (n.d.). Get competing solar quotes online | EnergySage. <https://www.energysage.com/solar/solar-energy-storage/how-do-solar-batteries-work/>

Furthermore, the best way to increase the roof's lifespan is to have a professional inspect the roof annually. Roof inspections allow us to understand the current condition of the roof, catching a whiff of the minor roof problems before they become a major issue that would increase the risks of degradation. It is crucial to get inspections from a professional since they are equipped with sufficient knowledge and are able to provide tips and tricks on how to keep the longevity of roofs.

- d) Purchase a high quality solar panel that can withstand degradation with insurance/takaful protection

Among the factors that constitutes whether the solar panel is of high quality or low quality is the materials that panels are made up of. To avoid degradation, we must purchase solar panels that have thicker panels. What usually causes degradation is that companies use thinner panels to reduce the thickness of their frames which uses aluminium. As natural phenomenon occurs, the frames will bend and bent frames can strain the whole panel, and it can be especially bad as panels get thinner and less mechanically robust.

In addition, as companies decrease their costs, they may turn to ultra-thin solar cells that use less silicon. Thinner solar panels are more flexible and not as rigid as older module models, which makes installation a delicate process.⁸ When the installers are carrying these solar panels, they may damage them. This is because when they carry the solar panels, the flexing and bouncing up and down can take a real toll and lead to microcracks in the cells. Hence, purchasing solar panels with these traits can heavily damage them.

⁸ Pickerel, K. (2017, June 5). What causes solar panel degradation?
<https://www.solarpowerworldonline.com/2017/06/causes-solar-panel-degradation/#:~:text=According%20to%20NREL%2C%20modules%20can,encapsulants%20and%20corrosion%20of%20cells>

In order to combat the problem of degradation, we need to conduct smart buying to purchase the solar panel offered by companies at the best quality. This is because not all new technologies are bad, nor are all modules destined for failure. Hence, using trusted products and installing them with care will ensure a solar system will perform at its best—with no more than 3% power loss each year.⁹

Finally, The purchase of solar panels can also be inclusive of insurance/takaful coverage against theft, damage due to catastrophic events such as disaster or damage.

e) Solar panels protection

Animals can damage panels in a number of ways. They can scratch them up, weaken the roof structure, and eat through wiring. Some animals can cause corrosion to the panels or their structures with their waste. The best way to counter these problems is to install animal guards to protect the solar panels. Animal guards are special grates that are installed around the solar panels to prevent animals from nesting and feces.

Some of the services offered by companies who run animal guards businesses are critter guards. Birds often build up flammable substances such as branches underneath solar panels for a nesting place. An open gap between the roof and solar panels allows birds to build their nest since it is cozy and warm. Critter guard is a durable netting that covers the open gap with high quality metal strip screening that can be attached along the sides of rooftop panels. Besides, it also blocks leaves and debris from piling up under the panels and near the wiring system, hence, preventing a potential fire hazard.

⁹ Pickereel, K. (2017, June 5). What causes solar panel degradation?
<https://www.solarpowerworldonline.com/2017/06/causes-solar-panel-degradation/#:~:text=According%20to%20NREL%2C%20modules%20can,encapsulants%20and%20corrosion%20of%20cells>

Furthermore, the use of metal ties to hold the solar panel's cables prevents the wires from being chewed off by animals like monkeys and squirrels. In addition, metal ties will also prevent any animal fatality since they are more likely to be electrocuted by the electrical failures from chewing on the wires. In addition, if we tilt the solar panels so that it follows the downward sloping shape of the roof, this will prevent animals from sitting on it in any manner possible, and will cause them to slip downwards. Even though the installation of animal guards might be slightly costly, through using these extra steps in order to sustain these solar panels, it will be worth it in the long run the university can prevent the ever consistent repair costs that will be a burden from time to time. Plus the lifespan of solar panels can be improved for future proofing.

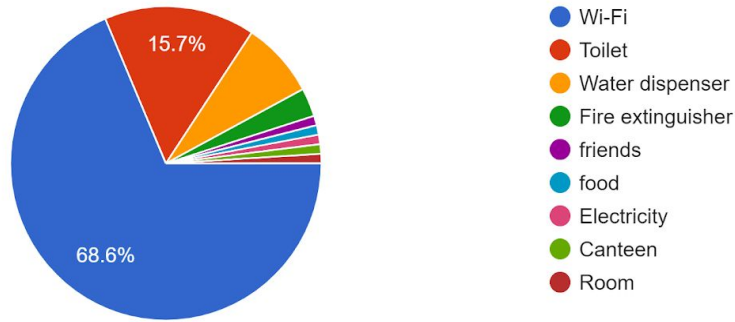
Conclusion:

In conclusion, we think that our idea for the proposal of solar panels on the roof of each mahallah is feasible enough to be implemented and executed. As we have brought forth the objectives and significance of our proposal that aims to make the world which is in this case our university life better through achieving the SDG Goals. As we know 5 P's of the SDGs are related with the five necessities of the Maqasid Shariah. So if we plan and propose ideas that help contribute to the SDGs we are actually committing ibadah at the same time by adhering to the Maqasid Shariah which is to protect the rights and remove harm. In addition, we also presented the challenges that may affect our proposal but we also provided the recommendations and suggestions to counter these challenges. So we think that we have fulfilled the most important criterion in order to make our proposal a reality. We really hope that our proposal will be considered by any management of the university as we hope to strive towards achieving the SDGs as well as make the world a better place.

Appendices:

Appendix 1:

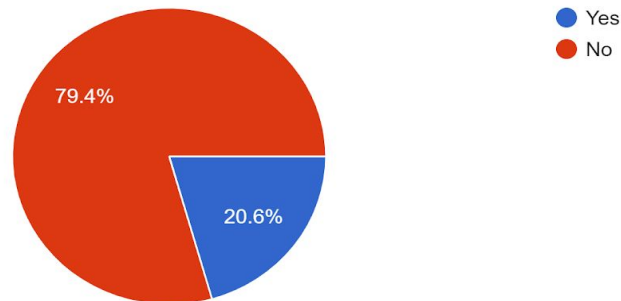
What is the most important aspect in the Mahallah
102 responses



Total Respondents: 102
Wi-Fi: 68.6%, Toilet: 15.7%, Water Dispenser 7.8%, Fire extinguisher: 2.9%, Friends: 1%, Food: 1%, Electricity: 1%, Canteen 1%, Room: 1%

Appendix 2:

Do you think you can live without the 'most important aspect in the Mahallah as above' should it one day be absent?
102 responses

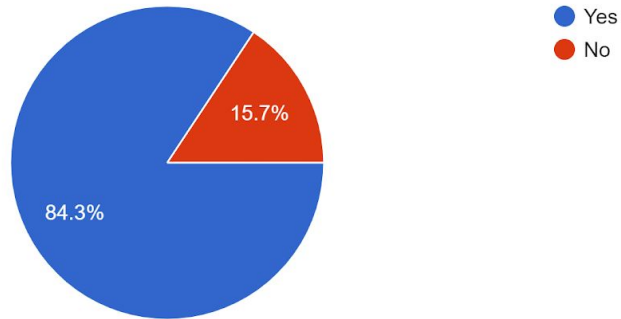


Total Respondents: 102
Yes: 20.6%, No: 79.4%

Appendix 3

Should a sustainable effort be done to SUSTAIN and MAINTAIN your most important aspect in the Mahallah, would you be able to invest your funds in it?

102 responses



Total Respondents: 102
Yes: 84.3%, No: 15.7%

Appendix 4:



Description: 20.5x 14 inches solar panel

Appendix 5:



Description: IIUM's Mahallah Al-Faruq Blok D Panoramic View

Reference Page:

- 1) How does the weather affect solar panel efficiency? (2018, March 28). 1876 Energy: #1 Solar Energy and Solar Panel Installations in Texas & California. <https://www.1876energy.com/how-does-the-weather-affect-solar-panel-efficiency/>
- 2) How is solar energy stored in 2019? (n.d.). Get competing solar quotes online | EnergySage. <https://www.energysage.com/solar/solar-energy-storage/how-do-solar-batteries-work/>
- 3) Mini solar panel: Ideal power source for small devices/portable appliances. (2019, May 20). The Economic Times. <https://economictimes.indiatimes.com/small-biz/productline/power-generation/mini-solar-panel-ideal-power-source-for-small-devices/portable-appliances/articleshow/69412749.cms?from=mdr>
- 4) Pickerel, K. (2017, June 5). What causes solar panel degradation? <https://www.solarpowerworldonline.com/2017/06/causes-solar-panel-degradation/#:~:text=According%20to%20NREL%2C%20modules%20can,encapsulants%20and%20corrosion%20of%20cells>
- 5) Retrived from: <https://www.youtube.com/watch?v=Tdsf-W6D2L8>