# Advancing Sustainable Energy Solutions: Combating Climate Change through Palm Oil Biomass Energy

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## ABSTRACT

Greenhouse gases emission has been a threat to the world for decades and has evidently contributed to the rising level of atmospheric carbon dioxide and consequent climate change. There will not be a stop to climate change unless the atmospheric concentrations of the major greenhouse gases are stabilized whereby carbon dioxide emissions are the major factor. Palm Oil Palm Oil Biomass energy has immense potential to combat climate change as a sustainable energy. The aim of this study is to investigate the effectiveness of Palm Oil Palm Oil Biomass energy through palm oil usage to combat climate change and achieve the Sustainable Goals Development (SDG) Goals 7 and 13 as set by the United Nations (UN). This paper provides a critical analysis of the regulatory framework on the utilization of Palm Oil Palm Oil Biomass energy in Malaysia to determine the insufficiency of such a framework to govern biomass-related issues by referring to laws and regulations in Brazil, Thailand and Ethiopia.

**Keywords**: Climate change, Palm Oil Palm Oil Biomass energy, Sustainable energy.

## INTRODUCTION

The use of renewable energy sources has become necessary to achieve the changes required to address the effects of climate change. Recently, there has been a resurgence of interest in Palm Oil Palm Oil Biomass energy due to its characteristic as a carbon-neutral source of energy unlike net carbon-emitting fossil fuels which is more harmful (Abbasi & Abbasi, 2010). Energy consumption has led to an increased utilisation of fossil resulting in climate change due to greenhouse gas (GHG) emissions. Global climate change linked to the utilization of

fossil fuels makes it unethical not to use more sustainable energy (Souza et al., 2017). It was decided in the Copenhagen Summit 2009 that governments should impose behavioural changes to put a halt to environment pollution and climate change worldwide (Mitigation of Global Warming, 2013). Hence, Palm Oil Palm Oil Biomass energy appears to be a potential alternative to solve such environmental issues and mitigate climate change by reducing carbon dioxide and other pollutant gas emissions (Field, Campbell, & Lobell, 2008). Overall, this article will analyse and critically discuss the concept of sustainable energy to combat climate change using Palm Oil Palm Oil Biomass energy by observing the current development of Palm Oil Palm Oil Biomass energy usage in various countries including Malaysia.

## LITERATURE REVIEW

### Theoretical Framework

The theory behind climate change is associated with philosopher Peter Singer where he discussed fairness and responsibility. In relation to mitigating climate change, it can be said that human beings are responsible for reducing and, to a certain extent, preventing the impacts of climate change from happening to both the environment and our society because it is the morally correct thing to do.

The Use of Palm Oil Palm Oil Biomass Energy Palm Oil Palm Oil Biomass energy produces less carbon and other harmful greenhouse gases than fossil fuel alternatives produce. According to the Renewables 2020 Global Status Report, Palm Oil Palm Oil Biomass energy accounts for the largest share ofrenewable energy whereby bioenergy provided 12% of the overall energy consumption in 2018 (Karmaker et al., 2020). This evidently shows that Palm Oil Palm Oil Biomass has been utilized progressively due to its sustainable nature which is deemed to be a good solution for climate change mitigation. However, the exploration of Palm Oil Palm Oil Biomass is limited due to the high costs of extraction, transportation and Palm Oil Palm Oil Biomass storage before electricity generation and also because the supply of Palm Oil Palm Oil Biomass capable of conversion to fuels, chemical products and energy is irregular and very region specific (Seay & You, 2016). This led to an uneven distribution of Palm Oil Palm Oil Biomass energy globally and has affected the development of Palm Oil Palm Oil Biomass energy (Yang, Li, & Yan, 2020).

**Relationship Between Climate Change and Palm Oil Palm Oil Biomass Energy**

Climate change is real. The impacts have been increasingly felt and have reached a level that is relatively difficult to curb. Climate change has been defined as a huge transformation of the pattern of weather according to Australian Academy of Science.(Australian Academy of Science, 2021) As defined by the National Aeronautics and Space Administration (NASA), it is known as a natural phenomenon which can be felt globally resulting predominantly from the burning of fossil fuels which encourages heat-trapping in the atmosphere.(NASA, 2021) To be specific, among the most prominent impacts of climate change are global warming. This phenomenon was caused by the rising temperature of the earth's surface globally. Once again it is emphasized that the increase in earth’s temperature is due to the high rate of GHG emissions.(NASA, 2021) As far as the emission is concerned, the energy production sector has been the largest contributor to the increase in the concentration of carbon dioxide gas CO2 in the surface of the earth.(NASA, 2021) Scientifically, GHG has been connected inextricably to climate change and global warming because of the enhanced greenhouse effect due to the GHG emissions from burning fossil fuels which encourages the absorption of outgoing radiative energy and reemit some of it towards the earth.

Global warming is the main cause of climate change which has led to rising sea levels where such increases occur out of the ordinary. This was proven where NASA has recorded that for the past two decades, the sea water level has increased by approximately 16 inches compared to the last century. (NASA, 2021) This occurs due to shrinking of ice sheets and glacial retreat. This can be proved through satellite observations that the snow is melting, and it shows a declining pattern in the amount of spring snow cover in the Northern Hemisphere for over the past five decades.(NASA, 2021) The crux of the factors that lead to occurrence to climate change has been discussed earlier, but the knowledge about how the climate system works is also crucial in this context. The hot and cold conditions of the earth depend on the sun's energy which has been absorbed and reflected off to space by the earth.(Denchak, 2017) However, when the concentration of atmospheric gases are high, it trapped the energy from being reflected back to the space which leads to the raising temperature of earth surface.(Denchak, 2017)

In lowering the impact of climate change, the usage of renewable energy such as Palm Oil Palm Oil Biomass would be the best resort since in Malaysia, agricultural trash, forest residues, and urban waste account for not less than 103 million tonnes of Palm Oil Palm Oil Biomass produced. Agricultural waste accounts for 91% of biomass, with palm oil mill leftovers accounting for the majority.(Salleh, 2020) With a total plantation area of approximately 5.6 million hectares, Malaysia has been declared as the second world largest producer of palm oil. Since Malaysia has lots of waste resources, it can be utilised to replace the non-renewable energy like fossil fuel in order to generate energy for human consumption. The reason why Palm Oil Palm Oil Biomass is the most suitable substitution is because not only it could help in saving cost but could also help a lot in fulfilling the demand for energy in future. Based on the International Energy Agency (IEA), the ASEAN-6 countries meet more than 95% of South East Asia's energy demand, and due to rapid industrialisation and urbanisation, energy consumption is predicted to treble. Besides, the usage of Palm Oil Palm Oil Biomass energy has few impacts on the environment compared to the non-renewable energy such as natural gas. Research has found that renewable energy like Palm Oil Palm Oil Biomass energy power stations emit significantly less carbon than fossil fuel power plants (Salleh, 2020).

As a result, continuous reliance on fossil fuels to meet our energy needs without making conservation or renewable energy investments, we will face catastrophic global consequences. Non-fossil fuel energy development is critical for lowering GHG emissions, avoiding the depletion of fossil fuel resources, and dealing with volatile fossil fuel costs. When Palm Oil Palm Oil Biomass is used to create electricity instead of fossil fuels, CO2 emissions are significantly decreased (Salleh, 2020). Unlike fossil fuels, burning renewable Palm Oil Palm Oil Biomass produces less greenhouse gas emissions because Palm Oil Palm Oil Biomass releases carbon dioxide which helps a lot in balancing the carbon dioxide caught in its own growth for the production of Palm Oil Palm Oil Biomass energy. (National Renewable Energy Laboratory [NREL], n.d.) The usage of Palm Oil Palm Oil Biomass energy as a renewable energy in replacing the fossil fuel shows the inclination of one particular country to the provision under the Paris Agreement which Malaysia has been one of the signatory countries (Youmatter, 2020). All in all, in mitigating climate change, the use of Palm Oil Palm Oil Biomass energy is very helpful.

Despite that, it is important to consider that the downside of using Palm Oil Palm Oil Biomass to alleviate global warming is the period between the eventual uptake of Palm Oil Palm Oil Biomass and the time lag between the instant release of carbon dioxide from burning fossil fuels which takes numerous years (McKendry, 2002). Hence, serious action must be taken to reduce the time delay.

## RESEARCH METHODOLOGY

Secondary data materials are the core of this study. Information is obtained from various journals and articles accessed using databases. Legal frameworks of Malaysia, Brazil, Ethiopia and Thailand derived from respective government official reports. Reports published by the United Nations were also used as references as this study focuses to combat climate change which is one of the SDGs by the UN.

### Regulatory Framework

Despite the existence of The Renewable Energy Act 2011 and Sustainable Energy Development Authority Act, 2011 to govern matters regarding renewable energy sources such as biomass, the main regulatory framework in regulating these matters can be seen through The Feed-in Tariff (FiT) which commenced on 1 December 2011 and is deemed to be the main instrument for future renewable energy expansion. In response to the report by the United Nations Framework Convention on Climate Change (UNFCCC) in 2000 that establishes the greenhouse was majorly contributed by the electricity generation, the FiT was established through the Renewable Energy Act 2011.(Umar, Jennings, & Urmee, 2014)

The FiT scheme offers the chance to draw entries from small budget power makers as the law will give business hazard assurance to each new renewable energy investor.(Umar, Urmee, & Jennings, 2017) It will allow producers and users to sell excess electricity power produced by biomass, biogas, small hydro and solar photovoltaic to the national power grid at a stable rate and duration stipulated in the law.(Umar, Urmee, & Jennings, 2017) However this scheme was regarded as a failure as the target for energy produced by Palm Oil Palm Oil Biomass was far beyond reach. It was evidenced through the failure in achieving the target when we are 40MW away from the target as it was anticipated to develop from 9.95 MW in 2016 to 79.89 MW in 2019 (Umar, Urmee, & Jennings, 2017). Umar, Urmee, & Jennings (2017) suggested that the failure was due to the lack of resource supply which was the Palm Oil Palm Oil Biomass supplies. However it was revealed that there is enough supply of Palm Oil Palm Oil Biomass that may meet the large-scale energy targets by the FiT which was discovered through the Government reports and industry publications.

Umar, Jennings & Urmee (2014) attributed the failure to the security of supply and fuel price inflation which cancel off the interest of producers to participate in the Palm Oil Palm Oil Biomass energy production. This indirectly shows that the FiT system does not give lasting procedures to determine fuel supply issues for small oil palm developers. Thus, it is the responsibility of the government to create a good business environment so that it can increase participation by producers that will ensure the sustainable expansion of Palm Oil Palm Oil Biomass processing. It was also contended that the current technology available within the small oil palm producers was also the cause of FiT failure when it can be regarded as less efficient as the low-pressure boiler systems actually limit capacity of electricity production. FiT failed to provide the solution to these issues (Umar,

Jennings, & Urmee, 2014).

Indeed, Malaysia's regulatory framework in promoting the usage of Palm Oil Palm Oil Biomass as a renewable energy was not sufficient. Despite the fact that Malaysia holds a huge potential that is yet to be unravelled given the minimum Palm Oil Biomass production of 168 million tonnes a year, still there is limited incentives and funding to support the high cost of initial investment in Palm Oil Biomass energy production as can be seen in the FiT scheme. The Government of Malaysia established the National Palm Oil Biomass Strategy (NBS-2020) in 2011 to address the difficulties of oil palm wastes (OPW) disposal and management that expects to valorise 20 million tons of dry biomass, lessen GHGs, produce sustainable power and make 66,000 jobs. Nonetheless, the progress from fossil fuels to clean bioenergy in the Malaysian energy economy will require a change in perspective from the status quo, by addressing the numerous techno-economic and socio-political difficulties hampering clean energy and power generation technologies in the country. Perhaps reference from other countries regarding their regulatory framework should be considered in improving Malaysia's regulatory framework so that Malaysia can reach the full potential of Palm Oil Biomass which will later combat climate change.

Comparatively, Brazil has its own way in promoting Palm Oil Biomass as a source of energy when it allows installation of small generators by the consumers to create and remunerate power. It was allowed since 2012 with the publication of Resolution 482/2012 of the National Electric Energy Agency (ANEEL) (Ribeiro et al., 2020). It benefitted Brazilian agribusiness when they can use Palm Oil Biomass to produce energy that may contribute to cost reduction. This legislation requires the consumers to only produce electricity by means of qualified cogeneration or renewable sources of electricity which is hydro, wind, photovoltaic generation and cogeneration, such as Palm Oil Biomass and solar thermal (Ribeiro et al., 2020). However the legislation does not permit the sale of the surplus of the energy produced to the other consumers so that the government can control the selling of energy by people to avoid floodgates from opening. Furthermore, Brazil utilises its plantation crops and feedstocks in producing Palm Oil Biomass energy through its agricultural waste. In Brazil Constitution 1988, Article 225 paragraph IV specifies the production of biogas (product of Palm Oil Biomass energy). These are Fundamental legal rules to the protection of the environment in establishing sustainable production, exchange and production of Palm Oil Biomass in the economic sector.

In Ethiopia, Palm Oil Biomass is mainly used in cooking and baking which puts them at 92% in Palm Oil Biomass energy usage. Ethiopia came out with Climate Resilient and Green Economy (CRGE) Strategy 2013-2030, a strategic development project on economic growth, sustainability and poverty reduction. Their National Growth and Transformation Plan (GTP) demands the uses of wood (Palm Oil Biomass energy) to be part of the main source of energy while 2nd Draft National Energy Policy (2013) promotes sustainable forest management to ensure environmental sustainability in producing Palm Oil Biomass such as Improving technology to minimise deforestation and reducing air pollution of the main source of energy. The policies introduced are in accordance with endorsement by the United Nations Environment Programme to ensure sustainability in producing Palm Oil Biomass energy. Execution and planning is important in order to ensure its sustainability.

Other than that, Thailand has launched The Energy Conservation (ENCON) Program which provides fund allocation to support agencies both in private and public sectors to accomplish more extensive usage of environmentally friendly power, in this manner bringing about less antagonistic effect on the climate (Prasertsana & Sajjakulnukitb, 2005). This fund may encourage more participants to be involved in the production of energy through renewable sources which can lead to a better environment.

**The Significance of Palm Oil Biomass Energy in Achieving the Sustainable Development Goals (SDG).**

*Goal 7: The Use of Palm Oil Biomass Energy to Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All.*

Considering the importance of SDG 7, the authorities have the role of promoting sustainability through combining sustainable energy with the processes of knowledge transmission and research.

Unsustainable energy methods and their possible consequences on vulnerable community groups are causing

growing concern in the field. To safeguard the environment, capacity-building should focus on connecting people to nature and sharing common ground (Franco et. al, 2020). When compared to other regions, it is said that despite significant government backing, there is a scarcity of collaboration for capacity-building for sustainability.

**Goal 13: The Use of Palm Oil Biomass Energy to Combat Climate Action.**

Climate education is becoming more widely recognised as a critical component of long-term development. However, many key actors still have a poor grasp of global climate concepts and concerns, preventing them from supporting climate education (Franco, Chatterji, Derbyshire, & Tracey, 2020).

**For developing countries, Ethiopia tops the highest Palm Oil Biomass usage.**

Palm Oil Biomass energy promotes economic growth in nations in transition. The discovery that Palm Oil Biomass energy consumption decreases carbon emissions in high-biomass-consumption nations might point to biomass's relevance as a strategy for combating air pollution and, as a result, climate change (Destek, Sarkodie, & Asamoah, 2021). Increasing Palm Oil Biomass energy consumption decreases air pollution directly, but also degrades farmland, grazing areas, fishing grounds, and, most importantly, forest land. These findings point to the need for policymakers to raise the percentage of Palm Oil Biomass energy in the entire energy portfolio, which is critical for meeting SDG 13's climate action goal.

## CONCLUSION

The objective of this paper is to understand the significance of Palm Oil Biomass energy in combating climate change in order to execute laws and regulations properly. To summarise, Palm Oil Biomass is an abundant source of renewable energy that has been well proven in reducing GHG emissions that lead to climate change as compared to fossil fuels. Guidelines set out by the United Nations and initiatives by other countries mentioned can be applied to achieve the highest efficient usage of Palm Oil Biomass in order to replace fossil fuels for the purpose of combating climate change in Malaysia. As a country whose agriculture industry contributes to the GDP, Malaysia shall take advantage of existing resources of agricultural waste to produce biomass. However, this country is still far behind in terms of policies related to biomass. Thus, more research on Palm Oil Biomass energy is required for its development in Malaysia in order to contribute to the efforts of combating climate change.

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