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# An Analysis of the Capacity of Biomass Power Plants to Produce Electricity from Solid Waste from Palm Oil: A Case Study from Aceh Province

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## Introduction

Biomass novel and renewable energy sources that are specifically based on biomass must be used. Oil palm plantation waste in the form of fronds and trunks that are converted with multi-stage downdraft gasification technology is one of the potential biomasses of plantation trash that can be used. This study sought to examine the technical, economic, social, and environmental impacts of power plants using oil palm plantation trash. It also sought to estimate investment risk. The process involved scaling up a power prototype [1]. According to the social aspects study, building new power plants has a favourable effect on the community's income and the development of new economic sectors that rely heavily on energy. In order to reduce the effects, it is essential to analyse the environmental effects. Overall, it is worthwhile to think about building small-scale power plants on oil palm farms as long as it is done so in accordance with the relevant regulations. Oil palm trunks and fronds are waste products from palm plantations.

## Description

Currently, oil palm trunks after the replanting process are not used; instead, oil palm fronds are often burned as fuel in processing factories, and the leftovers are disposed of in plantations. The residue of the oil palm industry's activities can be eliminated by using oil palm trash as a raw material for renewable energy that can produce power. However, the renewable energy market in is not yet perfect because it relies on solar panels with imported components. In order to control the cost of new renewable electricity, the government is promoting a draught [2]. It is envisaged that this strategy will enable oil palm industrial locations to produce more renewable energy using oil palm trash as a raw material. Gasification is one technology that may be utilised to transform biomass into alternative energy without emitting any emissions. The process of transforming solid or liquid source materials into thermochemical gases is known as gasification. Gasification, as opposed to combustion, has a better efficiency and nevertheless emits pollutants at levels below the legal limit [3]. The drying, pyrolysis, partial oxidation, and reduction stages make up the sequential steps of the gasification process. Media such as air, oxygen, or water vapour are needed for gasification [4]. Synthetic gas syngas, the end product of the gasification process, is composed of the combustible syngas CO, $H_2$, and $CH_4$ and the non-combustible syngas $CO_2$, $N_2$, and the residual $O_2$.

A gasifier is a type of reactor where gasification reactions take place. There are several different kinds of gasifiers, including circulating fluidized beds, bubbling fluidized bed gasifiers, cross draught, updraft, and downdraft models. The downdraft gasifier is one that is frequently employed. In comparison to other varieties, a downdraft gasifier has the benefit of a high rate of carbon conversion, a low generation of tar, and a straightforward design. This study's objective was to examine how oil palm plantation waste was used as fuel in gasification power plants. Technical, economic, investment risk, social, and environmental impact evaluations were all conducted at the same time. Oil palm trunks and fronds from oil palm plantations were used as fertiliser. Several earlier investigations have noted both of these plantation wastes, and they are the power plant under investigation was upsized from a laboratory-scale prototype with a reported capacity of to a small-scale power unit with a capacity [5]. The multi-stage downdraft gasifier was used for gasification. Comparing this method to the single-stage downdraft gasifier that has been described in earlier studies, it has the benefit of being able to create syngas with a high low heating value and a low tar content of twice.

## Conclusion

Additionally, this multi-stage gasification process included an air heating system that could boost temperature in the partial oxidation zone while maintaining a stable equivalent ratio and producing low tar content up to that point. Gasification technology has been used for power generation in a number of prior experiments. By using agricultural waste as a fuel source for gas generators, Romania. By modifying the supply of oxidizer air supply into the reaction zone, the gas generator was modified. Gasification power plant of the downdraft variety with a capacity of was created. Additionally, with a power output of, a downdraft-style gasification power plant was created. As long as the fuel utilised is not difficult to obtain, a gasification power plant with a capacity of is more profitable than one with a bigger capacity in the current market. According to Situmorang, gasification power plants can be used to generate electricity using locally accessible biomass as fuel.

## Conflict of Interest

None.

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