

Bio-waste as an Alternative Source of Fossil Fuel in Iraq

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ABSTRACT

With considerable potential advantages, including decreased reliance on fossil fuels, waste management, economic prospects, and environmental benefits, the idea of using bio-waste as an alternative to fossil fuels in Iraq is an attractive one. Additionally, the government must contend with issues related to feedstock availability, policy and regulation, societal acceptability, and technological infrastructure. The potential of bio-waste is a promising target; yet, overcoming the challenges requires a multi-pronged approach. Collaboration between the government, private sector, research institutions, and local communities is the key to developing a sustainable and economically viable bio-waste-to-fuel industry in Iraq.

Introduction:

Bio-waste is a renewable energy source capable of producing various types of energy, including electricity, heat, and transportation fuels. A distinctive characteristic of biofuels is their carbon-neutral nature, meaning no additional carbon dioxide is released into the atmosphere when they are burned. Fluctuations in oil prices have spurred collective efforts to identify a domestic source of renewable energy as an alternative to fossil fuels [1].

In Iraq, electricity-related issues have a substantial impact on the economy and the lives of its people. Moreover, the industrial and agricultural sectors have suffered significant damage as they are forced to rely on generators, which are both expensive and unreliable. This situation hampers the growth of businesses and the creation of jobs, contributing to the

abnormal lifestyle of the population, who lack access to reliable electricity for cooking, cooling, and lighting their homes. The demand for electricity, particularly during the summer, may exceed 30,000 MW. In contrast, the Iraqi Ministry of Electricity reported that in 2021, the country's electrical system produced 21,145 MW of power, marking the highest level ever[2].

Here, it is imperative to devise serious alternative solutions for obtaining renewable green energy. Globally, efforts are now concentrated on utilizing various eco-friendly sources such as hydro, solar, wind, and bio-waste. These alternative sources have demonstrated higher efficiency in the production of green energy worldwide. However, in Iraq, oil and natural gas remain the primary sources of energy. Consequently, the country has recently adopted a policy encouraging the use of alternative energy by unifying efforts and promoting research in the field of clean energy and its application within Iraq.

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It's essential to acknowledge that each country has different waste production and bioenergy generation patterns compared to others, influenced by factors such as geography, biodiversity, technology, economy, and resource availability. By 2050, it is expected that biomass will generate 3000 TWh of electrical energy, contributing to a reduction in annual emissions of up to 1.3 billion tons of CO₂ equivalent. Each TWh produced by biomass will result in the emission of 472.89 kg of CO₂ [3].

Altahir and Salman (2023) conducted a brief study on managing solid waste in one of the governorates in Iraq, using hotels as their primary focus. The results revealed that the majority of the trash consisted of organic waste (57%), followed by paper, plastic, and miscellaneous materials at 15%, 14.6%, and 6.5%, respectively. These findings suggest a promising opportunity for energy production, particularly by considering the volume of food waste. Glass, metal, paper, and plastic can also be collected and separated for recycling.

Jawhar et al. (2022) explored the feasibility of converting biogases generated from the digestion of solid waste into electrical energy. The authors concluded that it is possible to harness the benefits of Iraq's long and hot weather to collect the bio gas generated from the decomposition of organic compounds by heat, thereby producing electrical energy.

In the same region, Chabuk et al. (2023) presented an intriguing study that calculated the expected quantity of methane (CH₄) produced by the landfills of Al-Hillah City, Iraq, between 2023 and 2070, along with the potential amount of electricity that could be generated from this methane. The findings confirmed that, based on an annual waste accumulation rate of 1,046,413 tons and a total waste quantity of 50,227,808 tons, the predicted total landfill methane emissions over 48 years would amount to 875,217 tons, with an average annual CH₄ gas emission of 18,234 tons. Between 2023 and 2070, the anticipated methane gas volumes could potentially generate approximately 287,442 MW of electricity annually.

Conclusions

In summary, it is recommended that the Iraqi government adopt measures similar to those

implemented by other nations, exploring renewable alternative sources, such as the recycling of bio-waste and other eco-friendly options. This approach would provide tangible evidence of the potential advantages for both the economy and the environment.

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Conflict of Interest

There is no known conflict for the presented work.

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النفائات الحيوية كمصدر بديل للوقود الأحفوري في العراق

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الخلاصة:

تعد فكرة استخدام النفائات الحيوية كبديل للوقود الأحفوري في العراق فكرة جيدة، وذلك نظراً لانخفاض الاعتماد على الوقود الأحفوري، وتشجيع تدوير النفائات، وتوفير آفاق اقتصادية، وتحقيق الفوائد البيئية. بالإضافة إلى ذلك، ينبغي على الحكومة التعامل مع القضايا المرتبطة بتوفر المواد الخام، ووضع السياسات والتنظيمات، وتطوير البنية التحتية. بشكل عام، تُعد إمكانية استخدام النفائات الحيوية كمصدر بديل للوقود في العراق تكنولوجيا واعدة، ولكن التغلب على التحديات يتطلب نهجاً متعدد الجوانب. وبما أن التعاون بين الحكومة والقطاع الخاص والمؤسسات البحثية والمجتمعات المحلية ضروري، فإنه يجب أن يكون هذا التعاون مبنياً على تطوير صناعة تحويل النفائات الحيوية إلى وقود مستدام واقتصادي في العراق.

الكلمات المفتاحية: المصادر الحيوية، الوقود الأحفوري، إدارة النفائات، الطاقة النظيفة، الطاقة الشمسية، طاقة الرياح.