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Guatemala: Renewable energy

*The World Food Prize 2024*

*Impact of renewable energy in Guatemala*

## **Introduction**

Guatemala is a country in Central America with a rich history and natural resources, and it is taking a shift to renewable energy to reduce environmental harm (“Guatemala - Countries and Regions - IEA”). This change is beneficial in many aspects, but it also affects agricultural productivity, household income, and food availability (Henry et al). The country relies on natural resources such as sugarcane for biofuels, raising conflicts over land and water resources, affecting small-scale farmers and rural areas (Rosenthal). Renewable energy could support economic growth and environmental sustainability, but the implementation must be managed to prevent social and economic inequalities.

## **Effect on Agricultural Productivity**

The push for cleaner energy globally has increased the demand for biofuels, making Guatemala the fourth largest producer of sugarcane (*Increasing Sugarcane Production by 25% in Guatemala With Xcel-Wobblers | Hunter Agricultural Irrigation*). This growth has disturbed traditional agricultural practices. Sugarcane biomass is used to generate electricity, but farming sugarcane requires three times more water than corn (Guest,2017). Large sugarcane farms require more water, resulting in diverting river routes, extracting groundwater, and taking away water from local communities, leading to severe water shortages (*Water Grabbing in*

*Guatemala*). Affected communities already struggle to access piped water, and the increased strain on these resources further endangers livelihoods.

Additionally, large sugarcane farms lead to deforestation and soil degradation (Chami et al.). Large farms replace ecosystems, reduce soil fertility, and increase vulnerability to pests and diseases. This affects food security; small-scale farmers who grow staple crops such as corn and beans struggle with declining yields. Many rural families depend on subsistence farming, and when the crops fail because of the lack of water, the families rely on imported foods, leading to economic hardships.

Moreover, sugarcane production contributes to pollution, releasing chemical waste into rivers, contaminating water and irrigation sources (Geomatico. “Geomatico – Desarrollo De Software SIG Open Source.” *Geomatico*, 23 Sept. 2025, [geomatico.es](http://geomatico.es)). As a result, there is a shortage of water for agriculture, and the remaining water is unsafe for use. Without a solution, the expansion of sugarcane farms could lead to long-term damage to Guatemala's agricultural sector and food security.

### **Effect on Household Income**

Energy poverty is a significant problem in Guatemala; 76% of the population lacks access to reliable, affordable, and clean energy (Henry, Baker, B. K. Shaw, et al.). One example of this is Juliet's community, where children from rural communities are not able to attend school, or if given the chance, most drop out because of a lack of light or internet (Barzallo). The use of biofuel has not changed the cost of energy to rural populations, as the profit from sugarcane cultivation benefits large landowners and corporations (Neslen, 2017).

Families without electricity face numerous challenges. Without refrigeration, food would spoil quickly, requiring more trips to the market, increasing household expenses. With no

electricity, there would be a turn to using firewood, posing health risks due to smoke inhalation and contributing to deforestation(Hako,2022). There were interviews with one woman who uses firewood at least three times a day to make meals, commenting that the smoke hurts her eyes, makes it hard to breathe, and sometimes causes coughing and chest pains (Hako,2022). There would also be students who turn to using a candle to study with, which is hazardous and inefficient. Young people, such as students, are prone to health effects such as irritation, damage, and signs of inflammation in the blood(Aarhus University,2025). These cases could especially be harmful to people with mild asthma. Expanding the use of renewable resources could alleviate the burdens by providing sustainable and cost-effective electricity solutions.

Additionally, job openings created by renewable energy companies tend to favor urban areas, leaving rural populations with limited employment opportunities (Saget et al.). The sugarcane industry would pay employees low wages and provide harsh working conditions, reinforcing existing economic inequalities (“Improving Labor Conditions and Social Dialogue in the Latin American Sugar Cane Industry With KoboToolbox”). A more just approach to renewable energy development could involve community-owned renewable projects, empowering local populations rather than large corporations.

### **Present Status of Renewable Energy in Guatemala**

Guatemala has committed to reducing greenhouse gas emissions and aiming to generate more than 80% of its electricity from renewable sources. There are organizations like USAID supporting clean energy initiatives, especially in rural areas where electricity remains low (Martin). Additionally, solar energy projects and small-scale hydropower plants are being introduced to help reduce costs and improve energy reliability for underserved communities (Dolezal et al.). In an effort to address these problems, Barefoot College, which is an

organization. Have been teaching women to install and manage solar panels. One woman who is benefiting from this program is Julieta, where at the age of 64 with nine other women, were able to attend a 5 month engineering skill program. Letting them be able to bring solar panels into their communities, giving opportunities to children to attend school, and bringing light to their communities(Barzallo,2024).

Furthermore, education on renewable energy and sustainable agriculture is becoming more widely known. There are universities and institutions offering programs for solar panel installation, biofuel production, and water conservation, giving the next generation skills that are needed for a sustainable energy transition. There is, however, a challenge remaining in ensuring the initiatives reach the most vulnerable populations, particularly indigenous communities that have been historically marginalized.

### **Trends in renewable energy**

Although the entrance of renewable energy in Guatemala has both positive and negative implications. There is renewable energy that reduces carbon dioxide emissions, combats climate change, and environmental degradation (Council). Hydropower, solar, and wind energy offer long-term sustainability and can help lift millions out of energy poverty (Martin). Foreign investments in renewable energy projects have also created job opportunities in infrastructure development and maintenance (*Renewable Energy and Jobs: Annual Review 2023*).

On the other hand, the methods used to obtain renewable energy pose serious challenges. Sugarcane cultivation for biofuel production contributes to deforestation, soil erosion, and water pollution (Fischer et al.). Large hydropower projects have displaced communities and disrupted local ecosystems (solidar.org). If renewable energy development is not managed carefully, it

could exacerbate existing social and economic disparities rather than alleviate them (Volodzkiene and Streimikiene, 2025).

For a just transition, Guatemala could implement policies that will protect local communities from resource exploitation. Investments would provide renewable energy systems, such as solar microgrids, providing sustainable electricity to rural areas with no negative consequences, such as large-scale biofuel production. Additionally, stricter regulations on sugarcane plantations and hydropower projects could help mitigate environmental and social harm.

### **Benefits of improving renewable energy access**

The expansion of renewable energy access in Guatemala could have significant economic, social, and environmental benefits. Reducing the reliance on imported fossil fuels, Guatemala could lower energy costs and improve financial stability (“Understand Low-Carbon Energy in Guatemala Through Data”). Additionally, households would have access to electricity, improving the quality of life with the use of modern appliances such as refrigerators, clean stoves, and radios.

Improving energy access could also benefit healthcare by making sure rural clinics and hospitals have reliable access to electricity for medical equipment and refrigeration. Having electricity is crucial for “communication, lighting, and bettering health, such as safe childbirth, vaccination, diagnostic capacity, and emergency response”(World Health Organization: WHO,2023). Additionally, investing in community-based renewable energy projects could benefit local populations by allowing them to manage their energy production and distribution.

Moreover, sustainable energy initiatives could support agricultural productivity by introducing solar-powered irrigation systems. These systems would help farmers access water

more efficiently, reducing the impact of droughts and water shortages (Foodwise). By promoting renewable energy solutions tailored to the needs of rural communities, Guatemala could improve food security while fostering economic growth. The solar park is an example of a renewable energy solution, where this project would power 89,000 homes and significantly reduce greenhouse gas emissions(Pushkar).

## **Conclusion**

The transition to renewable energy in Guatemala presents both opportunities and challenges. While it has the potential to reduce greenhouse gas emissions, lower energy costs, and improve quality of life, its implementation must be carefully managed to prevent further environmental degradation and social inequality, especially in indigenous and rural communities. Addressing water scarcity, ensuring fair distribution of economic benefits, and investing in energy solutions are crucial steps toward a sustainable future.

By prioritizing renewable energy solutions that balance environmental conservation with social equity, Guatemala can enhance agricultural productivity, reduce energy poverty, and improve food security. With proper policies and community involvement, the country can harness the benefits of renewable energy while safeguarding the well-being of its people.

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