The Brazilian Solar Belt and its Contribution to Energy Efficiency in Anápolis-Goiás

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ABSTRACT

This work explored the relevance of the "Brazilian Solar Belt" as a means to improve energy efficiency and reduce the carbon footprint in Anápolis, Goiás. Brazil, with its vast territorial expanse and high incidence of solar radiation, presents significant potential for the transition to a more sustainable energy matrix. The "Brazilian Solar Belt" was identified by the National Institute for Space Research (INPE) as a region with high levels of solar irradiation, extending from the Northeast to the Pantanal. Anápolis, located within this solar belt, emerges as a center with great potential for photovoltaic energy generation. The study analyzed Anápolis' current energy infrastructure and the specific challenges the city faces regarding energy, including the growth in demand and the need to reduce greenhouse gas emissions. The city receives significant levels of solar irradiation, making it ideal for photovoltaic projects. In conclusion, Anápolis exemplifies the challenges and opportunities faced by Brazil in the pursuit of a cleaner and more sustainable energy matrix. With the adoption of renewable energies, such as solar, Anápolis and other cities in the "Brazilian Solar Belt" have the potential to lead the country towards a more sustainable future, where economic growth is aligned with environmental preservation and energy resilience.

Keywords: Solar Belt; Photovoltaic Energy; Anápolis.

INTRODUCTION

Brazil, with its vast territory and high incidence of solar radiation throughout the year, emerges as a promising candidate in the search for a more sustainable energy matrix. The country is home to the so-called "Brazilian Solar Belt," a region notable for its solar irradiation, as identified by the National Institute for Space Research (INPE) in the Brazilian Solar Energy Atlas. This belt extends from the Northeast to the Pantanal and exhibits above-average solar incidence rates (PEREIRA et al, 2017).

Within this context, the city of Anápolis, located in this solar belt, emerges as a center of great potential for photovoltaic energy generation. However, Anápolis, like many other Brazilian cities, faces significant energy challenges. This includes the need to supply a constantly growing population and the urgency to find solutions to reduce

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greenhouse gas emissions, thereby contributing to the mitigation of climate change (PEREIRA et al, 2017).

In this scenario, the implementation of photovoltaic technologies emerges as a promising opportunity to improve the energy efficiency of Anápolis and reduce its carbon footprint. This study aims to analyze the impact of the "Brazilian Solar Belt" in the city of Anápolis, exploring how solar energy is being integrated into the local energy matrix, its potential economic and environmental benefits, as well as the challenges that may arise during this transition. Furthermore, the relevance of photovoltaic efficiency in maximizing the use of solar energy in this context will be addressed, thus contributing to a more sustainable and efficient energy matrix in Anápolis and Brazil as a whole (PEREIRA et al, 2017).

METHODOLOGY

The research was conducted in two stages. A bibliographic survey on the topic "Solar Belt" was conducted at the National Institute for Space Research. Next, governmental and non-governmental websites were consulted for the analysis of data related to solar energy in Anápolis.

The Brazilian Solar Belt and Solar Energy in Brazil

The search for clean and sustainable energy sources has become a global priority. Brazil, known for its biodiversity and natural wealth, stands out for its solar potential. Taking advantage of this potential, the "Brazilian Solar Belt" was established (PEREIRA et al, 2017).

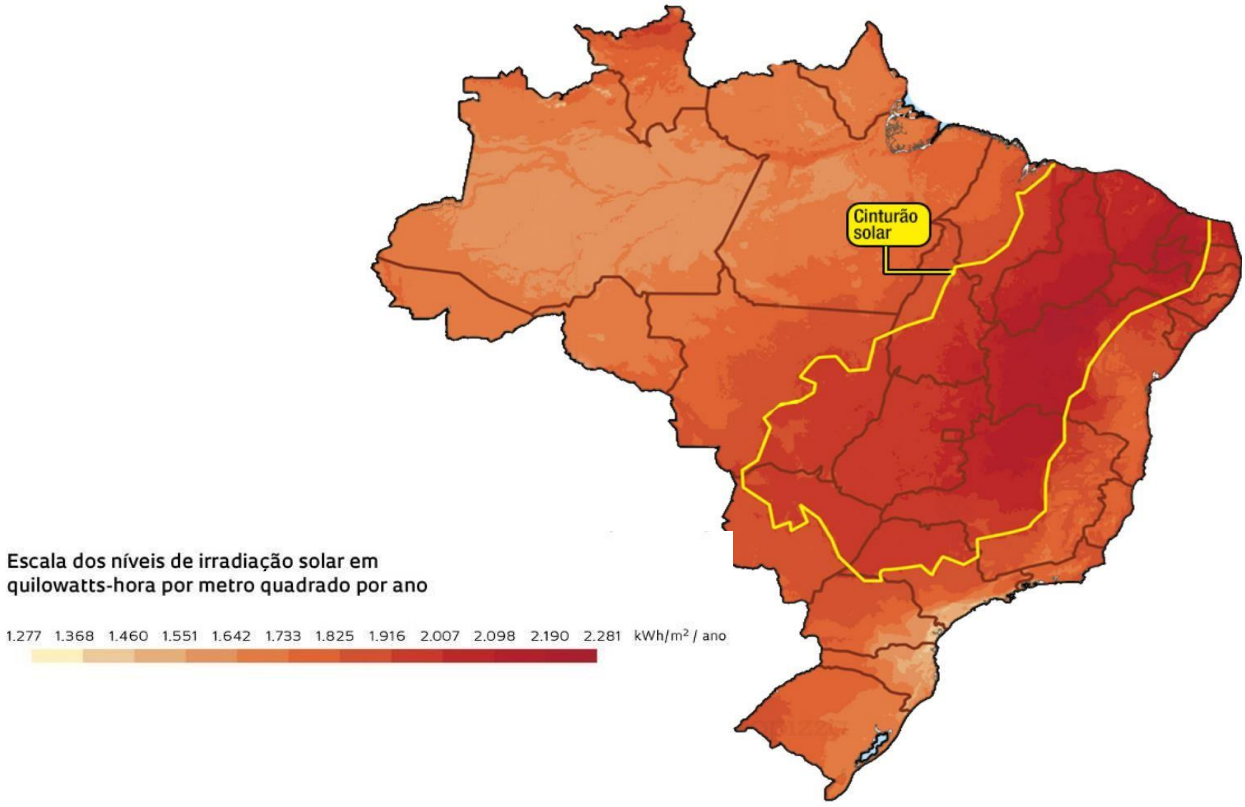
The term "Brazilian Solar Belt" was created based on the discoveries of (INPE), expressed in the 2nd edition of the Brazilian Solar Energy Atlas. This initiative aims to identify and harness locations with the highest solar incidence in Brazilian territory, optimizing the potential for generating clean and renewable energy. The region covered by this belt extends from the Northeast to the Pantanal, where solar irradiation levels consistently exceed the average (PEREIRA et al, 2017).

Solar energy, both photovoltaic and concentrated, is a renewable source that still has high installation and maintenance costs. The "Belt" has become useful for attracting public and private investments because it identifies which regions of Brazilian

territory have above-average solar potential and which regions do not receive good amounts of irradiation according to the seasons, thus making it easier to predict locations for good investments in the sector.

Figure 1: Brazilian Solar Belt

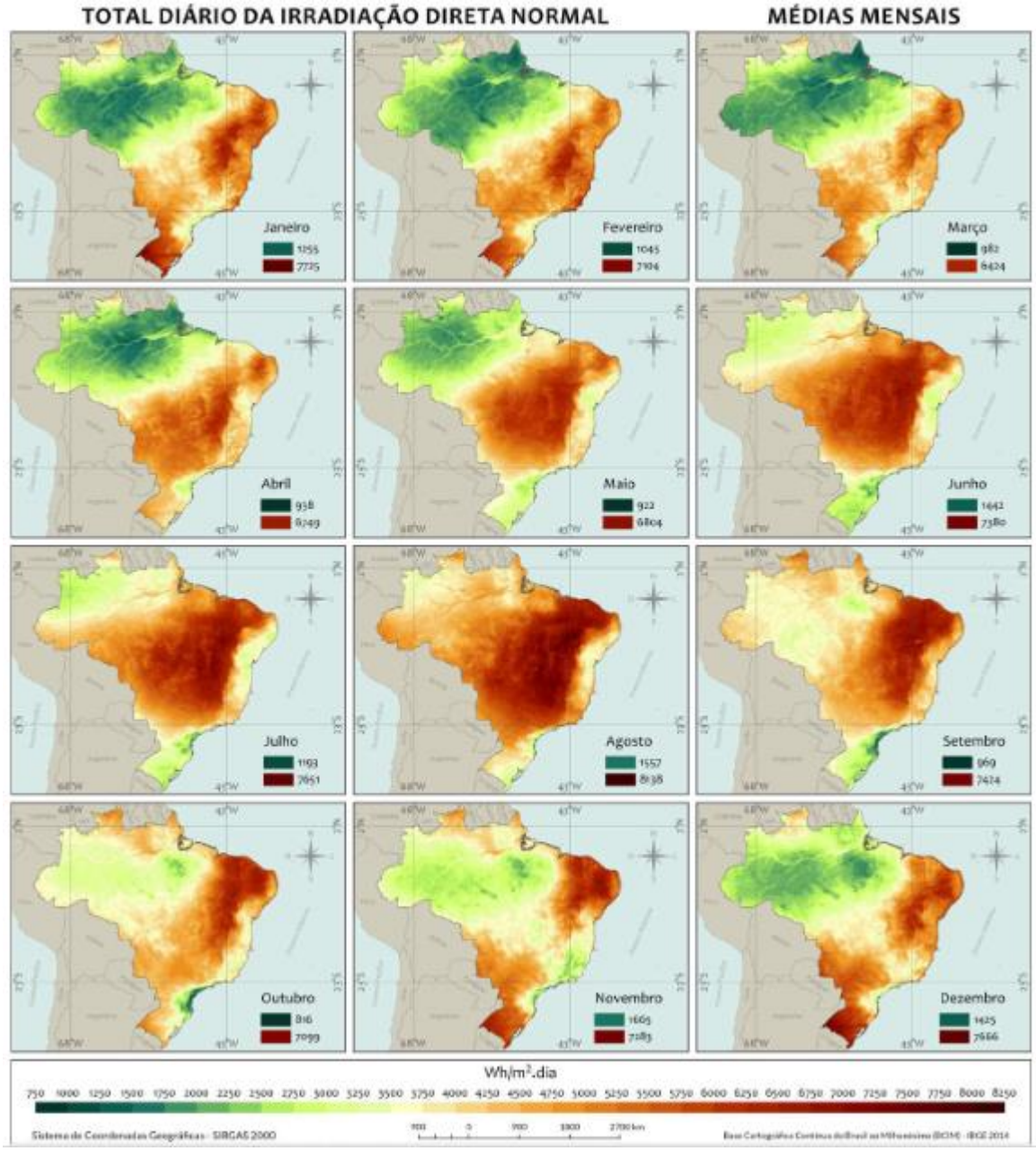
Source: Brazilian Solar Energy Atlas



Source: Brazilian Solar Energy Atlas

Figure 1 scales the levels of solar irradiation in KWh/m² (kilowatt-hours per square meter) per year. In the map, the stronger the red color, the greater the irradiation the location receives. In figure 2, the daily total of normal direct irradiation is demonstrated, which is the solar irradiation that directly strikes the surface without any influence (PEREIRA et al, 2017).

Figure 2: Daily Total of Direct Normal Irradiation



Source: Brazilian Solar Energy Atlas

As can be seen in figures 1 and 2, the Goiás region receives good levels of irradiation throughout the year, except for the month of November, when direct irradiation decreases over the state (PEREIRA et al, 2017).

Anápolis as a Case Study

Anápolis, strategically located in the heart of Brazil and therefore at the center of the "Solar Belt," is a city that plays a vital role in the country's economic and industrial development. With a constantly growing population and a diversified economy, the city faces significant challenges regarding energy, which play a fundamental role in its future sustainable development (PEREIRA et al, 2017).

The city receives good solar irradiation levels, averaging 5,204.5 Wh/m².day, while the capital of Goiás, Goiânia, has a daily average of 5,257.3 Wh/m².day. Such numbers demonstrate the excellent solar potential that the city of Anápolis possesses for future photovoltaic projects (PEREIRA et al, 2017).

CONCLUSION

In this work, the importance of the Brazilian "Solar Belt" was explored, demonstrating that the implementation of photovoltaic technologies reveals itself as a promising opportunity to improve the energy efficiency of Anápolis and reduce its carbon footprint.

Anápolis exemplifies representatively the challenges and opportunities faced by Brazil on the path towards a cleaner and more sustainable energy matrix. With the determination to embrace renewable energies, such as solar, Anápolis and other cities in the "Brazilian Solar Belt" have the potential to lead the nation towards a brighter and more sustainable future, where economic growth aligns with environmental preservation and energy resilience.

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