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Unlocking the Potential of Solar Energy in India: Regional Feasibility and Socio-Economic Impacts

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Introduction

India, as one of the world's fastest-growing economies, faces a substantial challenge in meeting its escalating energy demands. According to the International Energy Agency (IEA), India is expected to become the largest driver of global energy demand over the next few decades, with its energy consumption projected to grow by over 50% by 2040 [1]. Presently, the country relies heavily on conventional energy sources, primarily coal, to meet its energy needs, contributing to air pollution, environmental degradation, and significant carbon emissions. In light of these challenges, renewable energy sources, particularly solar power, have emerged as viable alternatives to ensure sustainable energy production while addressing environmental concerns [2].

India's geographic location provides it with an abundance of solar radiation, making it one of the most favorable regions for solar energy deployment. The country receives an average of 4–7 kWh/m² of solar radiation per day, with areas in the western and southern parts of India receiving the highest solar insolation levels [3]. Recognizing this vast potential, the Indian government has aggressively pursued the development of solar power through initiatives such as the National Solar Mission (NSM), which targets an installed capacity of 100 GW by 2022 and 500 GW by 2030 [4]. These ambitious targets are part of a broader strategy to reduce the country's dependence on fossil fuels, mitigate the impacts of climate change, and transition to a low-carbon economy. The rapid growth of the solar sector is further supported by favorable policies, financial incentives, and a supportive regulatory environment designed to attract investments and accelerate the adoption of solar technologies.

Despite its immense potential, the large-scale adoption of solar energy in India faces several hurdles. The initial capital cost of solar installations remains one of the most significant barriers, with the upfront investment for both residential and commercial systems being relatively high compared to conventional energy sources. Additionally, the intermittency of solar energy, along with a lack of adequate energy storage solutions, raises concerns regarding grid stability and reliability [5]. Moreover, the availability of financing options, access to skilled labor, and local infrastructure challenges can also impede the widespread deployment of solar technologies. These factors necessitate a comprehensive feasibility and economic analysis to evaluate the true potential of solar energy in India, taking into account both the technical and financial aspects of large-scale solar projects.

This paper explores the potential of solar energy in India, with a focus on regional feasibility and socio-economic impacts. The study evaluates the financial viability, technical performance, and long-term benefits of solar energy installations across different regions, taking into account factors such as solar resource availability, land requirements, technological choices, and local economic conditions. The aim is to assess the feasibility of solar power projects at the regional level and examine the socio-economic outcomes, including job creation, income generation, and rural development. Through a comprehensive analysis of costs, benefits, and socio-economic impacts, this study seeks to provide insights into how solar energy can contribute to India's energy security and sustainable development goals, while identifying strategies to overcome barriers to its wider adoption.

Review of Literature

The feasibility and economic analysis of solar energy in India has been the subject of extensive research in recent years, driven by the country's increasing energy demands and its commitment to sustainable development. Several studies have examined various aspects of solar energy deployment in India, including technical feasibility, cost analysis, policy impacts, and financial viability. This section reviews the recent literature on these topics, focusing on papers published in reputed journals indexed in Scopus, IEEE, Springer, and others.

1. Technical Feasibility and Resource Assessment

A significant body of literature focuses on the technical feasibility of solar power generation in India, with studies evaluating solar resource availability, land requirements, and the integration of solar power into the national grid. For instance, Yellishetty et al. (2020) reviewed the solar energy potential across India and highlighted the country's vast solar resource, particularly in the states of Rajasthan, Gujarat, and Madhya Pradesh, where the solar irradiation levels are optimal for large-scale deployments [6]. Furthermore, Sharma et al. (2021) analyzed the integration of solar photovoltaic (PV) systems with India's electricity grid, pointing out challenges related to intermittency and variability. They proposed the use of advanced storage technologies and grid flexibility to enhance reliability and stabilize the supply [7].

2. Economic Viability and Cost Analysis

Economic analysis remains a central focus of solar energy research in India. A study by Reddy et al. (2019) assessed the financial feasibility of utility-scale solar PV projects in India, considering factors such as initial capital costs, operation and maintenance (O&M) expenses, and the cost of financing [8]. The study concluded

that solar power, although initially expensive, offers long-term savings due to low operational costs and decreasing capital expenditures over time. Similarly, Garg et al. (2020) provided a detailed cost-benefit analysis of rooftop solar systems in India, comparing them to conventional electricity sources, and found that rooftop solar is economically viable in high-insolation regions with favorable government incentives [9].

In a more recent paper, Kumar et al. (2022) performed a financial analysis of both rooftop and utility-scale solar power projects in India. They used levelized cost of electricity (LCOE) as the primary metric and found that the LCOE of solar energy has decreased significantly, making solar projects more attractive to investors and developers. Their results also highlighted the importance of policy support and financing mechanisms, such as low-interest loans and subsidies, in driving the economic feasibility of solar projects [10].

3. Policy and Institutional Framework

The role of government policies and institutional frameworks in fostering solar energy adoption has been extensively explored. In their 2017 paper, Awasar et al. discussed the key policy incentives under India's National Solar Mission (NSM), which include financial subsidies, tax exemptions, and feed-in tariffs aimed at reducing the initial investment burden for solar projects. They also highlighted the role of state-level policies in determining the success of solar energy projects, with states like Gujarat and Telangana offering favorable regulatory environments [11]. Furthermore, Bansal et al. (2021) examined the evolving regulatory landscape for solar energy in India and suggested that further policy improvements, particularly in terms of long-term contracts and transparent pricing mechanisms, are needed to accelerate the pace of solar adoption in both urban and rural areas [12].

4. Financing and Investment Models

The financial aspects of solar projects, including the availability of financing and investment mechanisms, have also received considerable attention in the literature. In 2018, Gupta et al. explored the challenges faced by solar project developers in securing financing in India. They identified the lack of access to low-cost capital as a major barrier to large-scale solar deployment, and suggested innovative financing models such as public-private partnerships (PPP) and green bonds to mitigate these challenges [13]. Moreover, Singh et al. (2021) proposed a risk-adjusted return model to assess the attractiveness of solar energy investments in India, emphasizing the importance of risk mitigation strategies such as insurance and power purchase agreements (PPAs) to attract foreign direct investment (FDI) in the solar sector [14].

5. Environmental and Social Impact

Beyond economic and technical feasibility, the environmental and social impacts of solar energy deployment in India have been analyzed. According to Soni et al. (2020), solar energy provides significant environmental benefits in terms of carbon emission reduction, especially in comparison to fossil fuel-based electricity generation. They estimated that a 1 GW solar power plant could offset approximately 1.5 million tons of CO_2 annually, thereby contributing to India's climate goals under the Paris Agreement [15]. Additionally, Kumar and Rathi (2022) explored the social impact of solar energy projects, emphasizing their role in creating employment opportunities in rural areas, particularly in solar installation, maintenance, and manufacturing sectors [16].

6. Challenges and Future Outlook

Despite the progress in solar energy adoption, several challenges remain in terms of scalability, grid integration, and financing. In their 2024 study, Singh and Yadav analyzed the current state of solar energy projects in India, identifying key barriers such as land acquisition issues, supply chain disruptions, and limited access to modern technologies in rural areas. They called for greater collaboration between government bodies, private sector players, and international organizations to overcome these obstacles and ensure the long-term success of solar energy projects in India [17].

The reviewed literature highlights the significant strides made in understanding the feasibility and economics of solar energy in India. While substantial progress has been made in lowering costs and improving efficiency, continued research is required to address challenges related to grid integration, financing, and scalability. The findings underscore the need for a comprehensive and coordinated approach that combines technological innovation, policy support, and financial mechanisms to accelerate solar energy deployment in India.

Research Gaps

- **Regional Variability in Solar Resource Assessment:** While the feasibility of solar energy in India has been studied extensively, there is a gap in understanding the regional variability in solar resource availability and its direct impact on the technical and economic performance of solar projects. Most studies focus on general assessments, neglecting region-specific differences in solar radiation, land availability, and infrastructure conditions.

- **Socio-Economic Impact Analysis:** There is a lack of comprehensive studies that focus on the broader socio-economic impacts of solar energy adoption at the regional level. Research often concentrates on technical and financial aspects but overlooks how solar energy projects can contribute to local job creation, skill development, and rural economic development.
- **Long-Term Viability and Sustainability:** Many existing studies evaluate solar projects primarily in terms of short-term financial returns but fail to assess their long-term sustainability and scalability in different regional contexts. Understanding the long-term socio-economic benefits of solar energy, including its contribution to local economies and energy security, remains underexplored.

Research Objectives

- **To assess the regional feasibility of solar energy deployment across India:** This objective aims to evaluate the potential of solar energy in various regions of India by considering solar resource availability, regional land use patterns, technological adaptation, and grid integration challenges.
- **To examine the socio-economic impacts of solar energy adoption at the regional level:** This objective focuses on understanding the broader socio-economic outcomes of solar energy projects, including job creation, skill development, local economic growth, and poverty alleviation, particularly in rural and underserved areas.
- **To identify strategies for overcoming barriers to the widespread adoption of solar energy in India:** This objective aims to identify key barriers, such as financing challenges, infrastructure gaps, policy constraints, and socio-political factors, and propose actionable strategies to address these issues, facilitating broader adoption and long-term sustainability of solar energy across regions in India.

Research Methodology

The research methodology for this study relies on secondary data to evaluate the regional feasibility and socio-economic impacts of solar energy in India. Data is collected from various government reports, energy sector publications, academic journals, and industry analyses, focusing on solar resource availability, regional economic conditions, and existing solar projects. Additionally, socio-economic impact data, including job creation, income generation, and regional development, is sourced from national surveys and government publications. The analysis involves assessing the viability, technical performance, and socio-economic outcomes of solar energy projects at the regional level to identify key barriers and propose strategies for their effective adoption.

Assessing the Regional Feasibility of Solar Energy Deployment across India

The assessment of regional feasibility for solar energy deployment in India involves a detailed analysis of various factors, including solar resource availability, land use patterns, technological adaptation, and grid integration challenges. The findings, based on the latest available data, provide insights into the regional disparities and opportunities for solar energy across India's diverse geographical landscape.

1. Solar Resource Availability

India boasts a considerable solar energy potential, with an average solar insolation of approximately 5-6 kWh/m²/day, benefiting from around 300 sunny days per year [18]. However, solar resource distribution is uneven across the country. Regions like Rajasthan, Gujarat, and Madhya Pradesh receive the highest solar insolation levels, ranging from 5.5 to 6.5 kWh/m²/day, making them optimal for large-scale solar installations [19]. These areas are characterized by vast arid and semi-arid lands, making them ideal for utility-scale solar farms. In contrast, the northeastern states, such as Assam and Meghalaya, experience lower solar radiation, with values around 3.5 to 4.0 kWh/m²/day due to persistent cloud cover and rainfall [20].

2. Regional Land Use Patterns

Land availability is a crucial factor affecting the deployment of solar energy. In states like Rajasthan and Gujarat, large stretches of barren or semi-arid land are suitable for large-scale solar farms, contributing significantly to India's solar capacity [21]. Rajasthan, with over 90% of its land area being suitable for solar projects, stands out as a top contender for large-scale solar installations [22]. Similarly, Gujarat's extensive desert landscapes provide ample space for solar energy development, such as the Charanka Solar Park, one of the largest solar parks in India.

However, urban and densely populated regions, such as Delhi and Maharashtra, face challenges regarding land availability for large-scale projects. In these areas, rooftop solar installations are more viable. Yet, urbanization, high building density, and limited rooftop space often restrict the large-scale implementation of rooftop systems [23]. Data from satellite imagery and land use surveys are used to analyze the feasibility of land for solar energy installations, identifying areas where large-scale and rooftop solar systems can be deployed effectively.

3. Technological Adaptation

Technological advancements play a significant role in enhancing the feasibility of solar energy projects across different regions. India primarily uses crystalline silicon-based photovoltaic (PV) technology for solar power generation, which has seen substantial cost reductions and efficiency improvements in recent years [24]. For regions like Rajasthan and Gujarat, which offer abundant land and high solar irradiance, large-scale PV systems are most effective.

In addition to traditional PV technology, regions with limited land availability, such as Kerala and Tamil Nadu, are increasingly adopting floating solar systems, which offer a solution for utilizing water bodies without competing with land use. Floating solar technology is particularly relevant in regions with abundant water resources but limited land for conventional solar farms [25]. Moreover, more advanced technologies like bifacial PV panels and Concentrated Solar Power (CSP) are being considered for deployment in areas like Rajasthan, where high solar insolation allows for the use of more sophisticated, higher-efficiency technologies [26].

This study evaluates regional technology choices by examining cost structures, technological performance, and regional suitability, based on findings from government reports and academic studies [27].

4. Grid Integration Challenges

Integrating solar energy into India's national grid poses significant challenges due to the intermittent nature of solar power generation. Solar power generation peaks during daylight hours, whereas electricity demand often peaks in the evening. This discrepancy creates an inherent challenge in matching supply with demand, particularly in regions where grid infrastructure is underdeveloped [28].

States with robust transmission networks, such as Rajasthan and Gujarat, face fewer challenges in integrating large-scale solar projects, aided by the development of high-voltage transmission lines and energy storage solutions. These states are well-positioned to handle intermittent solar energy and maintain grid stability [29]. However, states like Uttar Pradesh and Bihar face significant challenges in integrating solar energy due to outdated grid systems and inadequate transmission infrastructure [30].

In short, the regional feasibility of solar energy deployment in India is highly influenced by factors such as solar resource availability, land use patterns, technological adaptation, and grid integration. The analysis of solar

radiation data, land availability, and technological suitability enables a targeted approach to solar energy deployment in different regions of India. Regions with abundant solar resources, such as Rajasthan and Gujarat, are particularly suitable for large-scale solar power generation, while areas with land constraints, such as Kerala and Tamil Nadu, are exploring alternative technologies like floating solar. Addressing the grid integration challenges through enhanced infrastructure and energy storage solutions will be key to unlocking the full potential of solar energy across India [31].

Examining the Socio-Economic Impacts of Solar Energy Adoption at the Regional Level

The socio-economic impacts of solar energy adoption in India, particularly at the regional level, are crucial in understanding how solar energy projects influence local economies, create jobs, and contribute to rural development. This analysis focuses on the broader socio-economic outcomes, including job creation, skill development, local economic growth, and poverty alleviation, with particular emphasis on rural and underserved regions.

1. Job Creation and Skill Development

The deployment of solar energy projects in India, especially in rural areas, has the potential to create significant employment opportunities. According to the National Solar Mission, the solar energy sector has already created over 200,000 jobs in various capacities, including manufacturing, installation, and maintenance [32]. States like Rajasthan, Gujarat, and Uttar Pradesh, which have seen large-scale solar installations, are leading in employment generation within the renewable energy sector [33]. In rural areas, solar energy projects offer direct employment through the construction of solar farms, while indirect employment opportunities emerge in fields such as local transportation, sales, and retail of solar products.

Moreover, the adoption of solar energy encourages skill development among local populations. Specialized training programs, often organized by government bodies and private companies, enable individuals to gain technical expertise in solar technology installation, operation, and maintenance. As a result, local workers acquire skills that can improve their employability, contributing to sustainable economic development.

2. Local Economic Growth and Infrastructure Development

The economic growth stimulated by solar energy projects in rural and underserved areas is noteworthy. Solar energy investments contribute to local economic development through infrastructure improvements, such as the construction of access roads, power transmission lines, and communication networks, especially in remote regions. The development of solar parks, particularly in states like Rajasthan and Gujarat, not only generates employment but also boosts the local economy by increasing demand for goods and services, benefiting local businesses [34].

Furthermore, solar energy projects in rural areas lead to improvements in energy access, which can significantly enhance agricultural productivity. Farmers in regions with reliable solar power can utilize irrigation systems, cold storage facilities, and processing units that depend on electricity, reducing reliance on expensive diesel generators and improving overall productivity. This results in increased income for rural households and contributes to poverty alleviation [35]. The economic multiplier effect, where local businesses benefit from the presence of large-scale solar energy installations, is also observed in the case of Gujarat's solar energy revolution [36].

3. Poverty Alleviation and Social Impact

One of the most significant socio-economic impacts of solar energy adoption in rural India is its role in poverty alleviation. Solar energy projects provide affordable and reliable electricity, which is a key factor in improving living standards in underserved regions. Access to solar power allows for better lighting, cooking, and educational opportunities, particularly for women and children in rural communities. It also facilitates small-scale businesses, empowering local entrepreneurs by providing them with a stable power source for their operations [37].

Additionally, the income generated from solar energy initiatives can directly contribute to reducing poverty. For example, rural solar projects have been shown to reduce the cost of electricity for local communities, enabling households to reallocate resources to other essential needs such as healthcare and education [38]. Moreover, the rural electrification efforts through solar power have improved access to clean energy, reducing dependence on traditional biomass and kerosene, which often have detrimental health effects [39].

4. Regional Disparities and Social Equity

While solar energy adoption brings substantial socio-economic benefits, the impacts are not uniformly distributed across regions. States with more developed infrastructure, such as Gujarat and Maharashtra, experience quicker benefits in terms of job creation and local economic growth compared to less developed regions like Bihar and Jharkhand, where infrastructure and skill development programs are lacking [40]. This disparity in socio-economic impacts highlights the importance of addressing regional inequalities in the adoption and scaling of solar energy projects. By promoting region-specific policies and targeted investment in rural areas, the Indian government can maximize the positive socio-economic impacts of solar energy deployment.

The socio-economic impacts of solar energy adoption in India, particularly in rural and underserved regions, are substantial. Solar energy projects contribute to job creation, skill development, local economic growth, and poverty alleviation. The benefits of these projects extend beyond the energy sector, positively influencing broader socio-economic outcomes and improving living standards [41].However, the distribution of these benefits is uneven across regions, highlighting the need for targeted policies and investments to ensure that the socio-economic advantages of solar energy reach the most disadvantaged communities. By addressing regional disparities, India can unlock the full potential of solar energy to drive sustainable development and poverty reduction.

Identification of Strategies for Overcoming Barriers to the Widespread Adoption of Solar Energy in India

The widespread adoption of solar energy in India faces several barriers, ranging from financing challenges and infrastructure gaps to policy constraints and socio-political factors. These barriers hinder the scalability and long-term sustainability of solar energy projects, especially in rural and underserved areas. This analysis identifies key obstacles to solar energy adoption across various regions of India and proposes actionable strategies to overcome them, thus facilitating broader adoption and enhancing the sustainability of solar energy solutions.

1. Financing Challenges

One of the most significant barriers to solar energy adoption in India is the challenge of financing. Despite the government's initiatives such as the Solar Park Scheme and the National Solar Mission, financing for solar energy projects, particularly at the regional level, remains inadequate [42]. Small-scale solar projects often face difficulties in securing affordable financing due to high upfront costs and the perceived risk associated with

renewable energy investments. Additionally, the long payback period of solar projects (5-7 years) and fluctuating energy prices contribute to the reluctance of financial institutions to fund such projects [43].

To address these financing challenges, several strategies are proposed. First, the government can enhance its financial support mechanisms by providing low-interest loans, tax incentives, and subsidies to solar energy projects, particularly for rural and underserved regions. Second, public-private partnerships (PPPs) can be encouraged to share risks and leverage private sector investment in solar energy projects. Third, innovative financing models such as green bonds, securitization of solar assets, and crowdfunding platforms can be explored to provide more accessible financing solutions for small and medium-scale solar installations [44]. Additionally, providing subsidies to state-level financing institutions and facilitating easier access to capital for solar projects can lower the barriers for private investors and developers.

2. Infrastructure Gaps

Infrastructure gaps, particularly in transmission and distribution networks, present another significant challenge to solar energy deployment in India. Although regions such as Rajasthan and Gujarat have considerable solar potential, many remote areas lack the necessary infrastructure to integrate solar power into the grid. This limits the ability to transmit solar energy from solar farms to areas with high electricity demand, especially in rural regions [45]. Furthermore, the absence of energy storage solutions exacerbates this issue, as solar power generation is intermittent and cannot be relied upon for consistent energy supply.

To overcome these infrastructure gaps, several strategies are recommended. Upgrading the existing grid infrastructure to accommodate renewable energy sources, including solar, is critical. This involves reinforcing transmission lines, building additional substations, and investing in smart grid technologies that can manage fluctuations in solar energy production. Furthermore, energy storage systems, such as lithium-ion batteries or pumped hydro storage, should be integrated into solar power systems to ensure the availability of electricity during off-peak hours and periods of low solar generation. The government should also provide incentives for private players to invest in energy storage technologies, thus ensuring better grid integration of solar power [46].

3. Policy Constraints

Despite the ambitious targets set by the Indian government under the National Solar Mission, several policy constraints continue to hinder the expansion of solar energy. These include bureaucratic delays in project

approvals, complex regulatory frameworks, and inconsistent policy enforcement at the state and local levels [47]. In some states, the lack of clear policies regarding land acquisition and interconnection agreements further discourages investors from setting up solar projects.

To address these policy constraints, the government must simplify regulatory processes and create a more conducive policy environment for solar energy adoption. Streamlining the permitting process, establishing a single-window clearance system, and enforcing transparent and consistent policies across states will help reduce delays and improve project turnaround times. Additionally, the government should create a national-level solar energy policy that ensures uniformity in regulations and incentives, making it easier for both domestic and international investors to navigate the solar energy market. Providing clear guidelines for land acquisition and making interconnection processes more efficient will further ease the expansion of solar energy across India [48].

4. Socio-Political Factors

Socio-political factors, such as resistance from local communities, political instability, and lack of public awareness, pose additional barriers to solar energy adoption. In certain regions, local communities may oppose large-scale solar projects due to concerns about land use, displacement, and lack of adequate compensation. Additionally, political instability and changes in government policies can result in inconsistent support for solar energy initiatives [49]. Addressing these socio-political challenges requires a multi-pronged approach. First, local communities must be actively involved in the decision-making process regarding solar projects to ensure that their concerns are addressed and that they are adequately compensated for land use. Awareness campaigns and educational programs about the benefits of solar energy can help build public support and reduce resistance to solar projects. Second, creating a stable and transparent policy environment that spans political changes will provide long-term certainty for solar energy investors. Finally, promoting decentralized solar energy solutions, such as rooftop solar panels, can empower communities to adopt solar energy independently, reducing reliance on large-scale government projects that may face resistance [50].

Overcoming the barriers to widespread solar energy adoption in India requires a comprehensive approach that addresses financing challenges, infrastructure gaps, policy constraints, and socio-political factors. By improving access to financing, upgrading infrastructure, simplifying regulatory frameworks, and fostering public support for solar energy projects, India can unlock the full potential of solar energy as a sustainable and reliable power source. The strategies outlined in this analysis provide actionable solutions that, if implemented, can pave the

way for the broader adoption of solar energy across regions in India, contributing to the country's renewable energy goals and its socio-economic development.

Conclusion

This research provides a comprehensive analysis of the feasibility and socio-economic impacts of solar energy adoption in India, focusing on regional variations and barriers to its widespread deployment. The study reveals that while India has substantial solar potential, various challenges such as financing difficulties, inadequate infrastructure, complex regulatory frameworks, and socio-political resistance continue to impede the large-scale adoption of solar energy. Addressing these barriers through targeted strategies—such as enhancing financing mechanisms, upgrading grid infrastructure, streamlining policies, and fostering community engagement—can facilitate the broader deployment of solar energy. Moreover, the socio-economic benefits, including job creation, rural economic growth, and poverty alleviation, indicate that solar energy projects have the potential to contribute significantly to India's sustainable development goals.

The research underscores the importance of a multi-dimensional approach to overcoming the challenges faced by solar energy projects. It highlights that addressing financial constraints through innovative models like public-private partnerships, creating efficient infrastructure for solar power integration, and providing a stable and supportive policy environment are crucial for fostering widespread solar adoption. Additionally, increasing public awareness and minimizing socio-political hurdles can pave the way for a more inclusive energy transition, particularly in rural and underserved regions. In conclusion, solar energy holds tremendous promise for enhancing India's energy security, promoting socio-economic development, and meeting its renewable energy targets. However, its success hinges on overcoming the identified barriers and implementing effective strategies for sustainable growth. The findings of this research provide valuable insights for policymakers, energy developers, and stakeholders to shape future actions in advancing solar energy across the nation.

Limitations and Future Directions

This study is primarily based on secondary data from existing literature, government reports, and case studies, which may limit the scope of its findings. The reliance on regional case studies may not capture the full diversity of challenges and opportunities faced in other parts of India. Future research could benefit from primary data collection, such as interviews and surveys with stakeholders involved in solar energy projects, to gain more granular insights into regional and local barriers. Furthermore, exploring the potential of decentralized solar

energy systems, especially in remote and rural areas, could provide innovative solutions to bridge gaps in energy access. Long-term impact studies that assess the environmental, economic, and social outcomes of solar energy adoption on a national scale would be valuable in informing future energy policies and strategies for a sustainable and inclusive energy transition.

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