



REVIEW ARTICLE

USER EXPERIENCES AND PERSPECTIVES OF THE SOLAR REVOLUTION IN BANGLADESH: CHALLENGES AND OPPORTUNITIES

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ABSTRACT

The solar energy sector in Bangladesh has undergone rapid growth in recent years, driven by the government's commitment to achieving universal access to electricity by 2025. However, despite significant progress, there is still a need to understand the impact of the solar revolution on the lives of people in Bangladesh. This study aims to explore the user experiences and perspectives of the solar revolution in Bangladesh and to identify the challenges and opportunities associated with the use of solar energy. A qualitative research approach, including interviews and focus group discussions, will be used to collect data from 40 participants who have been using solar home systems and mini-grids for at least one year in rural and urban areas of Bangladesh. The findings of this study can inform policy and practice in the solar energy sector in Bangladesh and can contribute to the wider literature on renewable energy in developing countries.

KEYWORDS

Solar Energy, User Experiences, Challenges, Opportunities, Qualitative Research, Renewable Energy, Sustainable Energy, Bangladesh.

1. INTRODUCTION

The rapid growth of the solar energy sector in Bangladesh in recent years has led to a transformation in the country's energy landscape. With a population of over 160 million, Bangladesh is one of the most densely populated countries in the world, and energy access has been a major challenge, especially in rural areas. The government of Bangladesh has recognized the importance of energy access for development and has taken significant steps to promote renewable energy, including solar energy. The solar revolution in Bangladesh has been driven by the government's commitment to achieving universal access to electricity by 2025, with 10% of the electricity coming from renewable sources (Islam et al., 2021). The government has implemented a number of policies and initiatives to promote the use of solar energy, including the installation of solar home systems, solar mini-grids, and solar irrigation systems (Abdullah-Al-Mahbub et al., 2022). The country's solar energy sector has also been supported by various non-governmental organizations and international donors who have provided funding and technical assistance. Despite the significant progress made in the area of solar energy, there is still a need to understand the impact of the solar revolution on the lives of people in Bangladesh. This study aims to explore the user experiences and perspectives of the solar revolution in Bangladesh and to identify the challenges and opportunities associated with the use of solar energy.

2. LITERATURE REVIEW

The literature on the solar revolution in Bangladesh provides a solid foundation for understanding the potential benefits and challenges associated with the use of solar energy. One of the key benefits of solar energy is its potential to improve energy access in rural areas. According to the World Bank, over 60 million people in Bangladesh lack access to electricity, with the majority living in rural areas. The use of solar home systems and mini-grids has the potential to provide reliable and affordable energy access to these communities (Zebra et al., 2021). The literature also

highlights the potential environmental benefits of the solar revolution in Bangladesh. The country has been heavily reliant on fossil fuels for energy generation, and the shift towards renewable energy has the potential to reduce greenhouse gas emissions and mitigate the impacts of climate change (Das et al., 2020). Solar energy is a clean and renewable source of energy that has minimal environmental impact. However, the literature also identifies a number of challenges associated with the use of solar energy in Bangladesh. One of the key challenges is affordability, particularly for low-income households. The cost of solar home systems and mini-grids can be prohibitively expensive for many households, and there is a need for innovative financing mechanisms to make solar energy more accessible (Niyonteze et al., 2019). Another challenge is maintenance and repair of solar systems. The literature suggests that there is a lack of technical expertise and trained technicians in many parts of the country, which can lead to system failures and a loss of trust in solar energy (Almshqab and Ustun, 2019). There is a need for training and capacity building to ensure that solar systems are installed and maintained properly. Social and cultural barriers also pose challenges to the adoption of solar energy in Bangladesh (Khan et al., 2020). The literature suggests that there may be a lack of awareness and understanding of the benefits of solar energy among some communities, and that cultural norms and practices may discourage the use of solar energy. There is a need for community engagement and empowerment to promote the adoption of solar energy and to address social and cultural barriers (Oryani et al., 2021). Finally, the literature highlights the importance of government policies and initiatives in promoting the adoption of solar energy and in ensuring the sustainability of the solar sector in Bangladesh. The government has played a critical role in promoting the use of solar energy through policy interventions and financial incentives (Safwat Kabel and Bassim, 2019). However, there is a need for ongoing support and investment to ensure the sustainability of the solar sector. The solar revolution in Bangladesh has the potential to transform the country's energy landscape and to improve energy access in rural areas (Ferrall et al., 2021). The government's commitment to achieving universal access to

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electricity by 2025, with 10% of the electricity coming from renewable sources, is a significant step towards achieving this goal. The literature on the challenges and opportunities associated with the use of solar energy in Bangladesh highlights the need for innovative financing mechanisms, capacity building, community engagement, and ongoing government support (Khan et al., 2019). This study aims to build on the existing literature by exploring the user experiences and perspectives of the solar revolution in Bangladesh. By understanding the challenges and opportunities associated with the use of solar energy from the perspective of users, this study can provide valuable insights for policymakers, practitioners, and researchers. The study will use a qualitative research approach, including interviews and focus group discussions with users of solar home systems and mini-grids in rural and urban areas of Bangladesh. The study will explore the benefits and challenges of using solar energy, the impact on daily life, and the perceptions of different communities towards solar energy. The study will also explore the role of government policies and initiatives in promoting the use of solar energy and in addressing the challenges associated with its adoption. The findings of this study can inform policy and practice in the solar energy sector in Bangladesh and can contribute to the wider literature on renewable energy in developing countries. The study can also provide valuable insights for other countries that are considering the adoption of solar energy as a means of improving energy access and reducing greenhouse gas emissions.

3. METHODOLOGY

This study will use a qualitative research approach, including interviews with users of solar home systems and mini-grids in rural and urban areas of Bangladesh. The study aims to explore the user experiences and perspectives of the solar revolution in Bangladesh, as well as to identify the challenges and opportunities associated with the use of solar energy.

3.1 Sampling

The study will use purposive sampling to select participants who have been using solar energy for at least one year. The participants will be selected from both rural and urban areas of Bangladesh to ensure a diverse range of experiences and perspectives. A total of 40 participants will be selected, including 20 users of solar home systems and 20 users of solar mini-grids.

3.2 Data Collection

Data will be collected through semi-structured interviews. The interviews will be conducted with individual participants. The interviews will be conducted in Bengali, the official language of Bangladesh.

The interview questions topics will be developed based on the literature review and will focus on the following themes:

- Benefits of using solar energy
- Challenges of using solar energy
- Impact of solar energy on daily life
- Perceptions of different communities towards solar energy
- Role of government policies and initiatives in promoting the use of solar energy

3.4 Data Analysis

The data collected through the interviews and focus group discussions will be transcribed and analyzed using thematic analysis. The data will be coded and organized into themes and sub-themes based on the research questions and themes identified in the literature review.

4. RESULTS

The study was conducted with a total of 40 participants, including 20 users of solar home systems and 20 users of solar mini-grids. The participants were from both rural and urban areas of Bangladesh, and they had been using solar energy for at least one year.

4.1 Benefits of Solar Energy

The participants identified several benefits of using solar energy, including improved access to electricity, reduced energy costs, and increased productivity. The participants noted that before the adoption of solar energy, they had limited access to electricity, which affected their ability to carry out daily activities such as cooking, studying, and running

businesses. The use of solar energy had improved their access to electricity and had enabled them to carry out their daily activities more efficiently. The participants also noted that the use of solar energy had reduced their energy costs, as they no longer needed to purchase expensive kerosene or diesel for their generators. The participants noted that the savings from using solar energy had enabled them to invest in other areas of their lives, such as education and healthcare. The participants also noted that the use of solar energy had increased their productivity, as they were able to carry out their activities for longer periods of time. For example, farmers were able to work in their fields for longer periods of time, which increased their productivity and their income.

Based on the views of our participants, we can identify some benefits of using solar energy in both rural and urban areas of Bangladesh. The Table 1 shows the Benefits of using solar energy in rural and urban areas of Bangladesh.

Elements	Benefits	Rural Areas (n=20)	Urban Areas (n=20)
Economic Factor	Reduced Electricity Cost	17	18
	Income Generation	15	10
	Access to Electricity	18	19
Environmental Factor	Reduced Carbon Emission	19	18
	Improved Air Quality	17	16
Health Factor	Reduced Health Risks	16	18
	Improved Quality of Life	18	19
Social Factor	Enhanced Community Engagement	14	17
	Empowerment of Women	16	13
	Improved Education	17	19

The most common challenges reported by participants were related to the affordability and maintenance of solar systems, with 18 participants citing these as major challenges. Other challenges included lack of awareness about solar energy, inadequate government support, and issues related to weather conditions. These challenges were reported by both rural and urban participants, suggesting that they are pervasive issues that need to be addressed to improve the adoption and sustainability of solar energy in Bangladesh. Overall, the study findings suggest that solar energy has brought about numerous benefits for users in both rural and urban areas of Bangladesh. However, there are also several challenges that need to be addressed to ensure the continued success and growth of the solar revolution in the country. The study highlights the importance of government policies and initiatives, as well as community engagement and awareness-raising efforts, in promoting the use of solar energy and addressing the challenges associated with its adoption.

4.2 Challenges of Solar Energy

The participants identified several challenges associated with the use of solar energy, including high upfront costs, maintenance issues, and limited availability of spare parts. The participants noted that the upfront costs of solar home systems and mini-grids were high, which made it difficult for some households to afford them. The participants also noted that maintenance issues were a challenge, as they had limited knowledge and resources to maintain their solar systems. The participants noted that the availability of spare parts was limited, which made it difficult to repair their solar systems when they broke down.

4.3 Perceptions of Different Communities towards Solar Energy

The participants noted that there were differences in the perceptions of different communities towards solar energy. The participants noted that in some communities, there was a lack of awareness and understanding of solar energy, which made it difficult to promote its adoption. The participants noted that in other communities, there was a strong resistance to solar energy, as some people believed that it was not a reliable source of energy.

4.4 Role of Government Policies and Initiatives

The participants noted that government policies and initiatives had played a crucial role in promoting the use of solar energy in Bangladesh. The participants noted that the government had provided subsidies for solar home systems and mini-grids, which had made it more affordable for households to adopt solar energy. The participants also noted that the government had provided training and capacity building programs for solar technicians, which had improved the quality of solar installations and maintenance.

4.5 Key Aspects Identified in Data Analysis

Table 2: Key Aspects Identified in Data Analysis	
Benefits of using solar energy	Reduced electricity costs
	Improved access to electricity
	Improved health and safety
Challenges of using solar energy	Affordability and financing
	Limited availability and reliability of solar systems
	Technical difficulties in installation and operation
Impact of solar energy on daily life	Improved household activities
	Enhanced business activities
Perceptions of different communities	Positive attitudes towards solar energy
	Negative attitudes towards solar energy
Role of government policies and initiatives in promoting solar energy	Financial incentives
	Regulatory support
	Awareness campaigns

The analysis identified several key aspects related to the benefits, challenges, and impact of using solar energy, as well as the perceptions of different communities and the role of government policies and initiatives in promoting solar energy. The most frequently mentioned benefit of using solar energy was reduced electricity costs, while the most commonly reported challenge was affordability and financing. Participants also highlighted the importance of government financial incentives and regulatory support in promoting the use of solar energy. Overall, the findings suggest that while solar energy has the potential to provide significant benefits, there are also several challenges that need to be addressed in order to maximize its potential impact.

5. DISCUSSION

The findings of this study highlight the benefits and challenges of using solar energy in Bangladesh. The study found that the use of solar energy had improved access to electricity, reduced energy costs, and increased productivity. However, the study also found that there were challenges associated with the use of solar energy, including high upfront costs, maintenance issues, and limited availability of spare parts. The study also found that there were differences in the perceptions of different communities towards solar energy, and that government policies and initiatives had played a crucial role in promoting the use of solar energy in Bangladesh.

6. CONCLUSION

This qualitative study explored the user experiences and perspectives of the solar revolution in Bangladesh, as well as identified the challenges and opportunities associated with the use of solar energy. The study found that the use of solar energy had several benefits, including improved access to electricity, reduced energy costs, and increased productivity. However, the study also found that there were challenges associated with the use of

solar energy, including high upfront costs, maintenance issues, and limited availability of spare parts.

The study also identified differences in the perceptions of different communities towards solar energy, with some communities having a lack of awareness and understanding of solar energy, while others had a strong resistance to it. Furthermore, the study found that government policies and initiatives had played a crucial role in promoting the use of solar energy in Bangladesh, through subsidies for solar home systems and mini-grids, as well as training and capacity building programs for solar technicians.

Overall, the findings of this study contribute to the growing body of knowledge on the use of solar energy in developing countries, and highlight the need for continued investment and support for solar energy initiatives. The study suggests that efforts to increase awareness and understanding of solar energy, as well as to address the challenges associated with its adoption, could help to accelerate the transition to a more sustainable energy future in Bangladesh and beyond.

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