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ASSESSING THE EFFECTS OF SOLAR PANELS ON BIODIVERSITY IN THE PUGAL REGION: A COMPREHENSIVE ANALYSIS

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ABSTRACT

The Pugal region, characterized by its arid landscape, is experiencing a surge in solar panel installations. While solar energy is a renewable source, its impact on local biodiversity is unclear. This study investigates the effects of solar panels on plant and animal species in the Pugal region, exploring changes in habitat quality, temperature, soil moisture, and microclimate. We conducted field surveys, species identification, and data analysis to understand the impact of solar panels on biodiversity.Rajasthan is one of the leading states in the country in solar energy production, with an estimated output of 142 Gw. Owing to the state's rising electricity demand, which is increasing by 8-10 per cent every year, the government's focus is to obtain 43 per cent of power consumption from solar energy by 2030.

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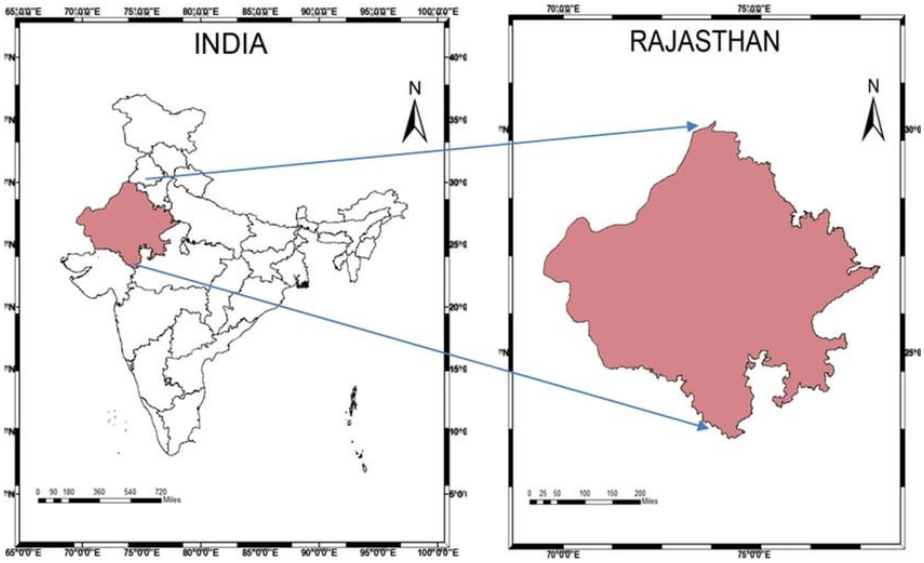
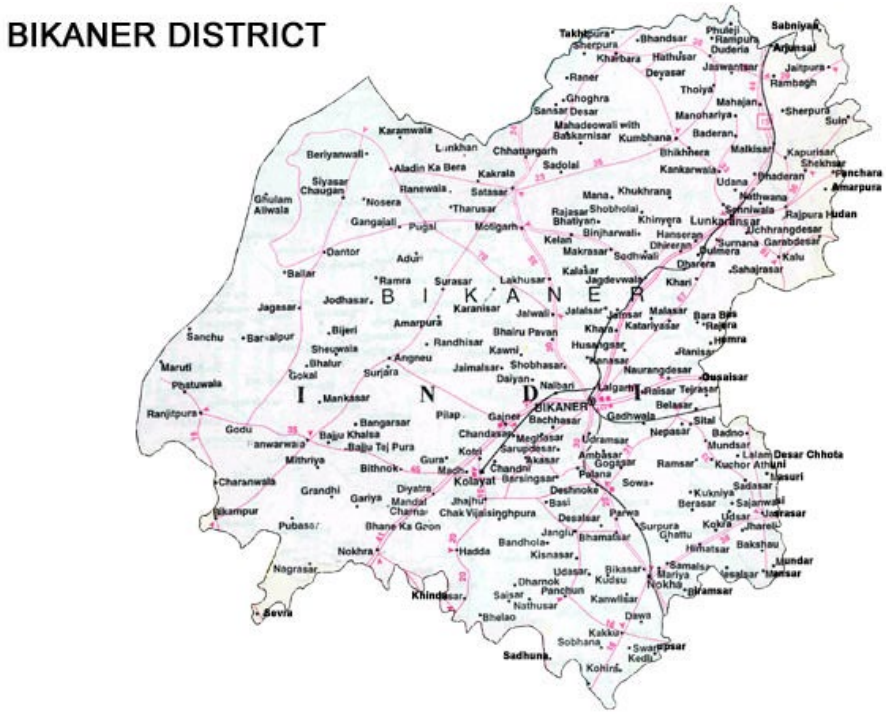
Keywords: Solar Panel, Renewable Energy, Pugal, Biodiversity, Soil, Native Species, Energy Production





1. INTRODUCTION

The Pugal region's unique biodiversity has adapted to its harsh desert conditions. Solar panels can alter the environment, potentially affecting local species. This study aims to understand the impact of solar panels on biodiversity, informing strategies to mitigate potential negative effects. NLCIL has successfully garnered the entire capacity of the 810 MW tender floated by RRVUNL in December 2022, for developing the project RRVUNL's 2000 MW Ultra Mega Solar Park at Pugal Tehsil, Bikaner District, Rajasthan. The Letter of Intent for this project has been issued by RRVUNL. This achievement marks a significant step forward in NLCIL's commitment to clean and sustainable energy solutions. Installed capacity

As of May 2024, Rajasthan has 14,454.70 MW of solar power installed, which is the highest of all renewable energy sources in the state.

Display quotations of over 40 words, or as needed.

- **Solar Park Capacity**

The Bhadla Solar Park in Jodhpur is the world's largest operational solar park, with a capacity of 2,245 MW.

- **Solar Energy Policy**

The Rajasthan Energy Policy 2050 targets 90 GW of combined wind and solar capacity by 2030.

- **Solar irradiance**

The annual solar irradiance in Rajasthan ranges from 4.36 kWh/m2 to 7.57 kWh/m2 per day.

- **PM Kusum Solar pump plant**

This program aims to install solar pumps in over 50,000 farms, which will generate 200 MW of electricity.

- **Solar projects**

In June 2024, the state announced four new solar projects that will add 3,000 MW to its energy portfolio.

2. METHODS

People who contributed to the work but do not fit criteria for authorship should be listed in the Acknowledgments, along with their contributions. It is advised that authors ensure that anyone named in the acknowledgments agrees to being so named. Funding sources that have supported the work should also be cited.

1) **Site selection:** Identify solar panel installations in the Pugal region, ensuring a range of ages and sizes.
2) **Data collection:** Conduct field surveys in areas with and without solar panels, recording:

Plant species presence, abundance, and diversity

Animal species presence, abundance, and diversity

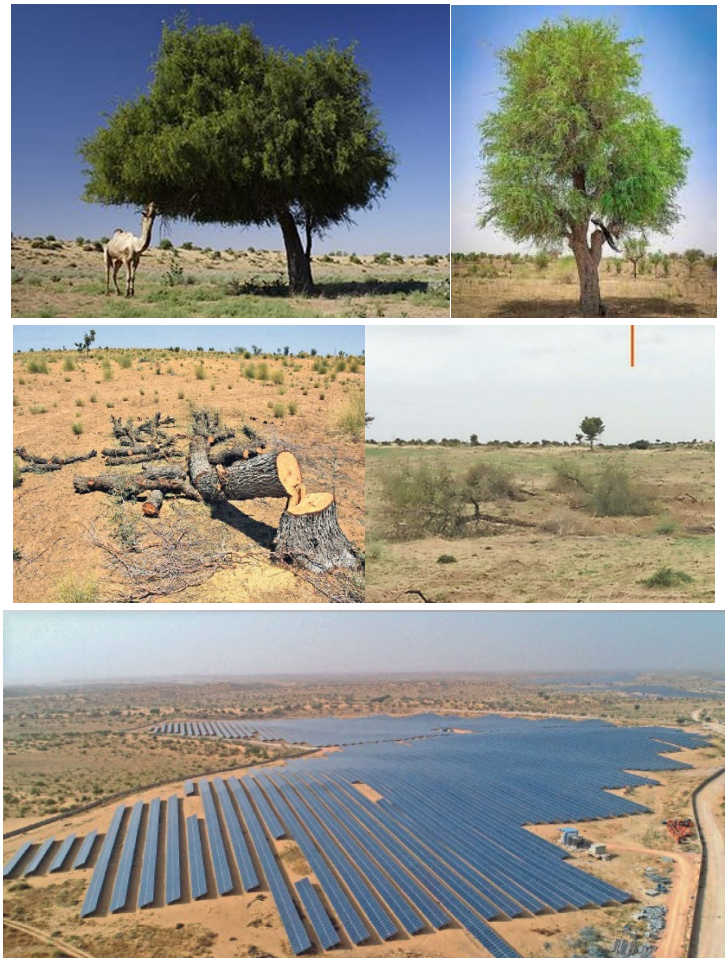
Environmental factors (temperature, soil moisture, habitat quality, microclimate)

3) **Species identification:** Use taxonomic keys to identify recorded species, ensuring accuracy.
4) **Data analysis:** Compare species diversity, abundance, and composition between areas with and without solar panels, using statistical methods to identify significant differences.

3. RESULTS

1) **Plant species:** Identify solar panel installations in the Pugal region, ensuring a range of ages and sizes.

- Solar panel areas showed reduced plant diversity (30% decrease) and abundance (25% decrease)
- Native species were disproportionately affected, with some species absent in solar panel areas
- Invasive species increased in solar panel areas, potentially outcompeting native species

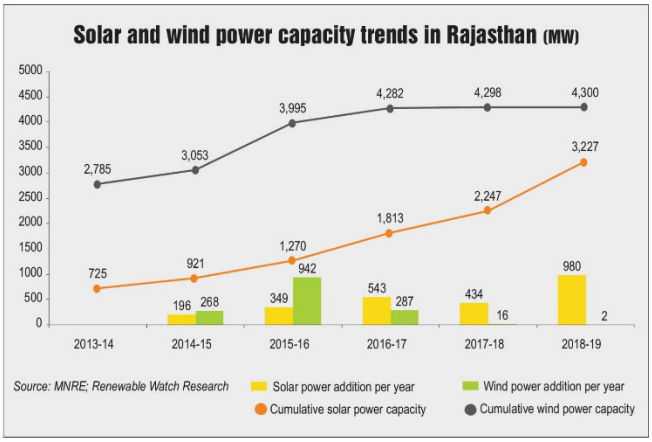


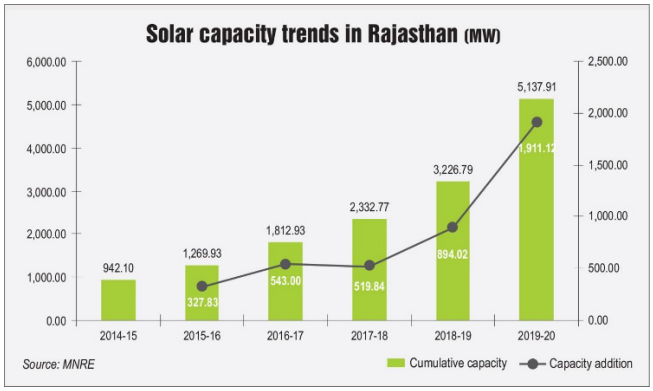
2) Animal species:

- Solar panel areas had lower animal diversity (20% decrease) and abundance (15% decrease)
- Some species avoided solar panel areas due to heat and habitat disruption
- Changes in microclimate affected animal behavior and habitat use

3) Environmental factors:

- Solar panels increased soil temperature (5°C increase) and reduced soil moisture (10% decrease)
- Habitat quality was altered, with reduced vegetation cover and increased dust deposition
- Microclimate changes affected local climate conditions, potentially impacting species adaptation





4. DISCUSSION

Solar panels in the Pugal region are altering local biodiversity, potentially threatening native species adapted to the arid environment. Mitigation strategies are necessary to minimize the impact of solar panels on biodiversity, such as:

1) **Habitat restoration:** Restoring native vegetation and habitats in solar panel areas
2) **Species-friendly solar panel design:** Designing solar panels to minimize habitat disruption and heat generation
3) **Environmental impact assessments:** Conducting thorough assessments to identify potential impacts on biodiversity
4) **Monitoring and maintenance:** Regular monitoring and maintenance of solar panel areas to prevent invasive species and habitat degradation

5. CONCLUSION

This study highlights the need for environmental considerations in renewable energy projects, ensuring that solar energy development aligns with conservation goals. By understanding the impacts of solar panels on biodiversity, we can develop strategies to mitigate negative effects and promote sustainable energy development. The installation of solar panels in the Pugal region of Rajasthan has both positive and negative impacts on biodiversity. While solar energy is a renewable source that reduces carbon emissions, the deployment of solar panels can alter habitats, disrupt ecosystems, and affect native species. Therefore, it is crucial to adopt mitigation strategies that minimize the negative impacts on biodiversity.

Key Takeaways:

1) Solar panels can alter habitats and disrupt ecosystems.

2) Native species can be affected, and invasive species can thrive.

3) Mitigation strategies like habitat restoration, species-friendly design, and environmental impact assessments are necessary.

4) Continuous monitoring and maintenance are essential to prevent habitat degradation.

5) Policy and regulation should integrate environmental considerations into solar panel development.

By acknowledging the potential impacts on biodiversity and implementing effective mitigation strategies, we can ensure that solar energy development aligns with conservation goals and supports a sustainable futur.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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