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Light in the Crater: Public Solar Hubs for Landscape Resilience

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by Jian Peng, Yao Yang and Xuelling Tan

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Abstract This study integrates spatial justice theory with the Institutional Analysis and Development (IAD) framework to construct a new analytical model. "Institutional Rules–Spatial Justice Issues–Spatial Injustice Perception–Institutional Feedback." Using Shangri-La Potatso National Park as a case study, our deductive–inductive approach reveals the practical dilemmas [...] [Read more](#).
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Land-Use Governance of Borderland Protected Areas Under Refugee Expansion and Climate Threats: Evidence from Teknaf, Bangladesh

Junling Liu ¹ , Chris Zevenbergen ^{2,*} , Jingyi Lu ¹, Qi Qi ¹, William Veerbeek ³ , Sami W. Chowdhury ⁴ and Liyuan Qian ^{1,*} 

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Abstract

In biodiversity-rich borderlands, some humanitarian settlements are rapidly expanding. This creates a profound conflict: refugees need a place to live, and ecosystems need protection. However, how settlement growth spatially affects the ecology surrounding protected areas remains understudied. This study takes as an example the city of Teknaf in Bangladesh, one of the world's largest refugee gathering areas, to explore how settlement expansion changes the ecological structure and function of protected area boundaries, with a focus on two questions: Are there critical spatial thresholds? What is the role of climate feedback mechanisms? We build an analysis framework that integrates several types of data: multitemporal remote sensing images, land-use changes, ecological indicators (NDVI, LST, HQ), landscape pattern indices, gradient analysis, and 2036 simulations based on the business-as-usual scenario. Through this framework, we identify the ecological threshold at the junction of settlements and forests within the Teknaf Wildlife Sanctuary. The expansion of settlements has turned the landscape, which was originally dominated by vegetation, into fragmented hard patches. At the same time, the habitat is severely degraded, and heat stress intensifies. Notably, a critical transition zone emerges at approximately 300–500 m from the protected area boundary, where landscape fragmentation intensifies, habitat quality declines, and heat stress reaches its peak, highlighting a spatial hotspot of ecological vulnerability. If there are no intervention measures, future scenario simulations show that the continued expansion of settlements will only isolate protected areas and accelerate ecological degradation. On the basis of gradient analysis for spatial diagnosis, we propose a zoning management framework and regeneration landscape strategy with the direct goal of coordinating ecological protection and humanitarian needs in crisis-prone border areas.

Keywords: human–environment interaction; refugee-hosting landscapes; borderland protected areas; land-use change; spatial thresholds; isolated effect; restoration; Teknaf Peninsula



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