

Spatial Vulnerability and Community Resilience in the Peri-Urban Interface: A Comparative Study of Shallow Mountain Areas in Western Taiwan

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Driven by the escalating impacts of extreme climate events and rapid urbanization, the "shallow mountain areas" (lower foothills) of western Taiwan have emerged as a critical peri-urban interface, confronting the dual challenges of development pressure and environmental vulnerability. This study assesses the environmental vulnerability and adaptive capacity of communities along the Dahan River basin, focusing specifically on the Sanxia and Daxi Districts. Grounded in resilience theory, this research employs a mixed-methods approach—integrating field surveys with 60 structured questionnaires—to conduct a multidimensional vulnerability assessment encompassing physical-ecological and socio-economic domains.

Empirical findings reveal significant spatial differentiation in resilience characteristics. The downstream Sanxia District, constrained by topographical factors, exhibits a heightened perceived threat from the physical environment. However, bolstered by strong social capital—manifested through neighborhood mutual trust and high community cohesion, the area demonstrates robust social resilience and rapid post-disaster recovery capabilities. Conversely, the upstream Daxi District faces compound vulnerabilities. Physically, it lacks sufficient flood-control infrastructure compared to downstream areas; socio-economically, it is constrained by an aging demographic and lower community participation. The study concludes that the governance of peri-urban transitional zones requires context-specific interventions rather than a one-size-fits-all approach. Differentiated optimization strategies are proposed: the upstream area (Daxi) must prioritize investments in hard infrastructure, whereas the downstream area (Sanxia) should continue to leverage its soft social networks to enhance disaster

preparedness. Ultimately, this research provides a concrete blueprint for the adaptive governance of high-risk peri-urban interfaces

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