EGU26-1059, updated on 18 Nov 2026
https://doi.org/10.5194/egusphere-egu26-1059
EGU General Assembly 2026
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Future Directions in understanding gully initiation and recurrence in the Lower Chambal valley, India

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The Badlands of the Lower Chambal Valley (LCV) continue to evolve under the combined influence of overland flow, seepage-induced piping, and land-use interventions such as widespread land levelling. Recent work in the region has shown that slope–area (SA) relationships, when combined with width–depth ratios, can differentiate dominant erosion processes and reveal the strong role of soil piping in gully initiation. However, several key research gaps limit the ability to predict where gullies will form—and reform—under changing land management. This contribution outlines emerging research prospects in the LCV. First, the sustainability of land-levelling remains poorly understood: recurrence of gullies on reclaimed parcels suggests that the original erosional thresholds persist in the subsurface, yet the conditions that trigger renewed incision remain unquantified. Second, integrating SA thresholds can offer a new understanding to link surface thresholds with subsurface susceptibility to piping. Third, multi-season monitoring of newly levelled and marginal lands is needed to establish recurrence intervals and identify early-warning indicators of gully reactivation. Finally, combining SA relationship with continuous monitoring of gully recurrence and soil characteristics may allow better understanding of processes that dominate in pristine Badlands and remodelled slopes (land levelling). By framing these prospects, a future direction may be adopted to better understand and possibly check recurrence of gullies in the remodelled slopes.