

# ***Integrated Safer Settlements: GIS (Geographical Information System) as a technological aid for its conceptualization***

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## **ABSTRACT**

*In Nepal, the hill settlements are largely characterized by low-density scattered settlements. Several of these are situated in steep slopes with low accessibility. They are also remotely located. In many instances, these settlements are found to be in the flood plains of rivers. Since Nepal being located in an active seismic zone, these settlements are therefore exposed to risk of multiple hazards such as earthquake, landslides, and floods. The recent Gorkha earthquake of April 25, 2015 is an evidence to the prevalent vulnerability, as multitudes of settlements—just not the isolated buildings—succumbed to devastation including ground rupture and mounting threat of impending landslides. This has necessitated examining location vulnerability of settlements closely. In this regard, spatial analysis of existing datasets such as land-cover, terrain topography, slope and geological data provide key insight into identifying the possible hazard/risk prone areas. Only by ensuring location safety of settlements, enforcement of earthquake resistant building design will ensure safety of precious human lives and physical assets.*

*Emerging from this background, this paper takes GIS (Geographical Information System) as a technological aid for conceptualizing the integrated safer settlements. The published reports and experiential knowledge are further combined for conceptualization. The paper takes on Sindhupalchowk district as a case. It relies primarily on the census for the socio-economic data, while spatial and geological analysis has been carried out using data from the Survey Department and Department of Mines and Geology. Using GIS based analysis; this paper systematically examines the natural hazard factors which are associated with the incidence of earthquake, landslides and floods. These factors include (a) slopes (b) coverage of natural resource areas such as water bodies (the forest area is also identified as this is unin-habitable area) and (c) geological fault zones. These factors tend to primarily inhibit safety of settlements in the hill region. By excluding coverage and proximity of these areas, habitable area of the district is determined. Such habitable area has a potential of lower risk of natural hazards. Further, by incorporating the recent (freely available) satellite imagery of the district, mismatches between the existing settlements and habitable area of the district are examined and settlements exposed to higher risk are determined. The damage pattern of the recent earthquake reveals that the settlements which encountered greater devastation or such threat fall in higher risk zone. Based on this analysis, this paper further goes on to recommend reasonable norms and standards for the policy makers to ensure safer settlement practices.*

**Keywords:** *spatial analysis, location vulnerability, hazard factors, location safety, safer settlements, norms and standards*