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## Regional scale prospectivity modelling of NW India for REE deposits associated with carbonatites and alkaline complexes

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The rare earth elements (REEs) are a group of seventeen metals including 15 lanthanides, scandium and yttrium. These metals have been projected to be critical for future industrial development. However, India currently does not have any economic grade primary deposit of REEs; all of India's production comes from monazite-bearing beach sands along the eastern and western coasts that have been derived from REEs-enriched continental rocks such as pegmatites or carbonatites. This contribution documents a GIS-based prospectivity model for exploration targeting of REE associated with carbonatites and alkaline-complexes in the geologically permissive tracts of NW India comprising parts of western Rajasthan and northern Gujarat. A mineral systems approach is applied to model the key ingredients of an REE system including geodynamic setting; fertile mantle/crustal sources of REEs; deep to shallow crustal architecture; and REE deposition. This conceptual genetic model of REE mineral systems is, in turn, used to identify the key regional-scale REE-deposit targeting criteria in NW India. Regional-scale multi-parametric exploration datasets are processed to represent the targeting criteria in form of predictor GIS layers. Finally, an expert-driven fuzzy inference system is designed for delineating and ranking prospective REE targets. Simultaneously, the stochastic and systemic uncertainties in the prospectivity modeling are modelled to delineated (a) high priority REE exploration targets areas with low uncertainty and high prospectivity for immediate ground follow up and (b) areas with high uncertainty and high prospectivity for further data acquisition in order to reduce uncertainty.