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## Geodynamic Framework and Mineral Resource Potential of the Northeast Indian Shield: Insights in Economic Geology of the Indian Plate Projection

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The Northeast (NE) India region represents a geologically distinct Northeast Projection of the Indian Plate, serving as an active tectonic pivot between the Himalayan Orogen to the north and the Indo-Burman Ranges to the east. The region's geological foundation is dominated by the Shillong-Mikir Massif, a rigid Precambrian cratonic block bounded by the Dauki Fault (south), Kopili Fault (east), and Dhubri Fault (west). This unique "pop-up" tectonic setting has facilitated the preservation of a diverse and high-value mineral inventory.

According to recent data from the Geological Survey of India (GSI) and the Indian Bureau of Mines (IBM, 2024-2025), the region's mineral wealth is led by Limestone and Coal. Limestone reserves, primarily within the Eocene Jaintia Group of Meghalaya, are estimated at over 5,737.82 million ton, supporting critical infrastructure development. Tertiary Coal reserves in the Makum (Assam) and Jaintia Hills (Meghalaya) fields are calculated at approximately 623 million ton, noted for their high calorific value.

A central feature of the regional mineralogy is the world-renowned Sonapahar Sillimanite Deposit in Meghalaya. Hosted within high-grade metapelites of the Shillong-Meghalaya Gneissic Complex (SMGC), recent assessments by MECL confirm high-grade reserves of approximately 0.25 million ton of sillimanite-corundum rocks. Beyond these, the region hosts substantial deposits of Kaolin (~10 million ton), Iron Ore (~20 million ton), and Fuller's Earth in the Garo Hills. Strategic potential is further highlighted by Base Metal (Cu, Pb, Zn) occurrences in Arunachal Pradesh and Beryl within pegmatitic belts, alongside extensive Granite resources for the dimension stone industry.

This abstract synthesizes recent exploration outputs from GSI, CEIC, DGM and IBM, illustrating how NE India's structural projection provides a fertile ground for both industrial and strategic mineral exploration, advocating for modernized geophysical surveys to unlock deeper basement-hosted mineralization.