Economic Evaluation of Placer Gold Along Khair Abad-Nizampur transect, Indus River Khyber Pakhtunkhwa, Pakistan

M. Abdullah Shah[1], Muhammad Naveed Anjum[1], Faizan Haider[1], and Aimal Ishfaq[1]

[1]*Department of Geology, University of Peshawar*

Email; naveed_geo@uop.edu.pk

This study aims to conduct an economic evaluation of placer gold deposits along the Indus River, specifically focusing on the Kahi and Darwazgai sites in District Nizampur. The Atomic Absorption Spectroscopy (AAS) analysis indicates that gold concentrations in the samples range from 1.83 to 18.09 ppm. X-ray Diffraction (XRD) analysis of the pan concentrates reveals that quartz, magnetite, ilmenite, hematite, anorthite, and albite are the primary mineral phases associated with gold, suggesting a complex mineralogical environment that could impact the processing techniques used for gold extraction. Furthermore, rare earth elements (REEs) are also detected in economical concentrations with xenotime and monazite as the main phases. The SEM examination of gold grains in the Indus River reveals a wide range of sizes and forms, with most grains exhibiting rounded shapes and some being sub-rounded. Platy grains, a common feature, display evidence of folding during river transport and characterized by fold hinges, scratches, and drags. Comparisons with previous studies indicate that the heavy minerals, including gold, are likely transported from deformed and uplifted rocks in the Himalayas. Potential sources include porphyry and epithermal-type mineralization or fault-hosted veins, which could guide future exploration efforts. This research identifies feasible placer gold sites, underscoring the potential for exploration and exploitation. Such activities could significantly enhance the socio-economic conditions of the region by creating jobs and stimulating local economies. The research findings endorse advance exploration, mining, and the development of appropriate processing techniques for the commercial extraction of gold and associated heavy minerals including REEs at the south of the study area along Indus River.