

Earth sciences and mineral exploration history of Pakistan with reference to Khyber Pakhtunkhwa and its adjacent Tribal area

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At the time of independence in August 1947, Pakistan was generally perceived to be a country of predominantly younger sedimentary basins and orogenic belts with a low mineral potential. Despite the knowledge regarding occurrence of large deposits of salt, gypsum, limestone and marble, and relatively larger terrain of older metasediments and some crystallines, Khyber Pakhtunkhwa (KP; then know as North West Frontier Province: NWFP), and the neighbouring Tribal belt (FATA) was also thought to be a region of limited mineral prospects. Systematic geological maps on the standard scale of 1:50,000 were non-existent, although some sketchy references to various aspects of the geology of the region were available. This position remained unchanged till mid- 1950s when the aerial photography on 1:40,000 scale for almost the whole country was undertaken providing a much needed impetus to systematic geological mapping and other field surveys and investigations. It was also the time when several Pakistani universities started offering studies in geology.

Between 1950 and 1980, the geological community of Pakistan can be credited with several major achievements in economic geology, such as the discovery of a major gas field in the Middle Eocene Limestones at Sui in Balochistan in 1952, uranium mineralization in the Siwalik rocks of Miocene age on the foothills of Suleiman Range in Punjab in 1962, and the later discovery of the same type of uranium mineralization in similar geological conditions in southern KP. Other important mineral discoveries during this period included those of barite in Balochistan and KP, chromite and China Clay in KP, the famous emerald of Swat in KP and copper-gold and lead-zinc mineralizations in Balochistan and KP.

The copper-gold deposit at Saindak in Balochistan was identified as a porphyry deposit in 1967. It was being studied at a time when the concept of plate tectonics was resulting in a paradigm shift in geological thinking and conceptualization on a world-wide scale. Pakistan was fortunate in benefiting from this earth-sciences revolution and attracted several international groups of researchers who, along with their local counterparts, contributed immensely to redefine geodynamically the tectonic framework of Pakistan with consequent fresh light on basin configuration, metallogenic zonation and seismicity. It also provided the much needed new insight in formulating future programmes of mineral, water and hydrocarbon exploration and development.

The application of this integrated approach of exploration was soon awarded by a world class copper-gold deposit at Reko Diq in Balochistan, and some promising prospects in Waziristan and elsewhere in KP; oil and gas in Badin basin in Sindh and in Karak-Kohat region in KP; rock phosphate in Hazara, KP, and a variety of gems, and precious stones and dimension stones in

FATA, KP, Gilgit – Baltistan and other places in Pakistan. In the years that followed saw the discovery of the huge lignite type coal reserves in Thar desert, Sindh, and the development of other coal deposits in the country, notably in Hangu – Kohat–FATA region in KP and Chamalang in Balochistan.

Pakistan, hosting two large salt basins and two island arcs, a large and active subduction zone with accretionary prism, a regional transform fault and large continent-to-continent collision boundary system– all wonderfully exposed, offers unmatched opportunities for research and exploration. What has been found so far is much too small than what is expected to be discovered in not too distant future.