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The Occurrence of Gold Mineralization in (Eastern and Western) Dharwar Craton, Karnataka India: Avenues for Looking Beyond 2021

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Gold occurrences spread over a vast geological time span from Archaean to Recent in Indian cratons and the world-class lode gold Kolar deposit in EDC were studied. Principal types of deposits in order of decreasing bulk reserves are in ancient conglomerates, greenstone belts, epithermal veins, metamorphosed turbidities, and carbonate-rich sediments. In India, a fair understanding of gold prospects in the 2.7 Ga megametagenic epoch, featuring oxide-sulphidic banded iron formations (BIFs) of different stratigraphic horizons and profusely developed intense auriferous quartz veins hosting lode gold deposits in greenstone belts and high-grade terrains of the Dharwar craton, has emerged in recent years from studies on Sargur, Chitradurga, Gadag, and Shimoga schist belts. During the COVID-19 pandemic, gold demand in India suffered a setback, with demand for April-June 2020 quarter at 63.7 tonnes compared to 213.2 tonnes in the same quarter the previous year (World Gold Council). The average grade produced in India has fallen from 47.5 g/t in 1891-1900 to 3 g/t in 2020. It is thus imperative that a high degree of accuracy is to be attained in the evaluation of the lean orebodies. In view of the high degree of variation in width (pinch-and-swell structure) of lodes and heterogeneity of distribution of gold in the host rock, borehole data by itself is not a reliable mining tool. Therefore, a judicious integrated programme of exploratory drilling and exploratory mine development with close-spaced sampling is considered to be the reliable method of assessment of gold lodes beyond 2021. About 70 tonnes of gold metal is categorized as reserves (economically mineable), and gold resources are estimated at 585 tonnes of gold metal. These resources await upgrade by substantial deep diamond drilling >2 km and RC drilling, resource modeling, exploratory mining, and mining feasibility studies before they reach the status of mineable reserves. To look beyond 2021, we have to look for gold mineralisation and deposits in unexplored areas (concealed) by application of sophisticated methodology/equipment and technology such as 1) conceptual exploration by geological modeling, 2) use of remote sensing techniques with satellite imageries and air photos, 3) ground geophysical mapping using MT and seismic data integrated with traditional geophysical methods and airborne geophysics, 4) use of on-site portable analysers such as hand held XRFs, trace element, and isotopic geochemistry, 5) several sample preparation protocols using automated mineralogy tools and mass spectroscopic analyses, 6) geological and structural mapping, 7) data management using AI and machine learning using drone-based technology, 8) data integration, 9) shortwave infrared (SWIR) and laser petrology and mineralogical studies using XTSCAN, and 10) ore beneficiation and geometallurgical studies. In the next century, the Dharwar Craton will be a gold hub with another new Kolar deposit in India beyond 2021.

