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## The Risk of Coal Fires And Land Subsidence in Jharia Coalfields, India, Analysed Using Remote Sensing Techniques

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Coal fires, land subsidence, roof collapse, and other life-threatening risks are a predictable phenomenon for the mineworkers and the neighbourhood population in coalfields. Jharia Coalfields in India are suffered heavily from land subsidence and coal fires for over a century. In addition to the loss of precious coal reserves, this has led to severe damage to the environment, livelihood, transportation, and precious lives.

Such incidents highlight the dire need for a well-defined methodology for risk analysis for the coalfield. In this study, we regenerated a Land Use Land Cover map prepared using Indian Remote Sensing satellite imagery and ground survey. Persistent Scatterer Interferometry analysis using Sentinel -1 images was carried out to study the land subsidence phenomenon between Nov 2018 and Apr 2019. For the same study period, coal fire zones were identified with Landsat - 8 thermal band imagery. Integration of coal fire maps, subsidence velocity maps, and land use maps was further implemented in a geographical information background environment to extract the high-risk zones. These high-risk areas include residential areas, railways, and mining sites, requiring immediate attention.

The results show that the coal mines are affected by subsidence of up to 20 cm/yr and a temperature anomaly of nearly 20°C is noticed. A high-risk zone of almost 18 sq. km. was demarcated with Kusunda, Gaslitand, and West Mudidih collieries being the most critically affected zones in the Coal mines. The study demonstrates the potential to combine data from multiple satellite sensors to build a safer ecosystem around the coal mines.