Assessment of a coal fire site near the Barora coalfield, India using the integrated geophysical method: Evidence of abandoned old underground working mines.

The present study tries to assess and mitigate the geohazard-prone area in Barora Coalfield using geophysical methods. Barora being, a significant subsidiary of the Jharia coalfield, plays a crucial role in India's growing energy demand. The study area is affected by coal fire in the subsurface as illustrated by its thermal images. To evaluate subsurface conditions, magnetic data was taken initially. The magnetic data was first then reduced-to-pole and further centroid method was applied to determine the curie depth. The average curie depth was found to be approximately 10.74 ± 0.9 meters, indicating active coal fires beneath this depth. Furthermore, using the multichannel analysis of surface wave (MASW) method, a significant change in velocity gradient was observed at a depth of around 11 meters, indicating variations in the velocity layers. To gain a comprehensive understanding of the subsurface, the ambient noise tomography method was employed. This revealed the presence of a coal seam at an approximate depth of 30 meters and also indicated the existence of abandoned underground galleries below 40 meters depth. Appending the dispersion curve from both seismic methods, we determined that the active coal seam at approximately 30 meters depth extended around 15 meters and was significantly affected by coal fires. The outcomes established the presence of underground galleries, oriented in the NE-SW direction, leading toward the South-Eastern railways which might be prone to subsidence.