

ABSTRACT

The exploitation of hard coal seams in the Upper Silesian Coal Basin (USCB) is carried out in various geological and mining conditions and at different depths, the derivative of which are, inter alia, occurring natural hazards. These threats appear singly, but the most common longwalls are extracted in conditions of their coincidence. Among the natural ones, one of the most dangerous for the operation of mining plants (underground infrastructure) and employees are the seismic and rockburst hazards. The main factors influencing the amount of seismic and rockburst hazards are the depth of exploitation and the geological structure of the deposit. If there are layers of thick and compact rocks in the lithological profile, capable of accumulating elastic energy and its sudden release when the strength is exceeded, the level of potential seismic hazard is high.

The assessment of the rock burst hazard using the mining seismology method in underground coal mining plants is mainly carried out on the basis of a retrospective analysis of the occurring rock mass tremors, while Instruction No. 22 (Barański et al. 2012) also introduced the possibility of using the Gutenberg-Richter law (GR law) for this assessment. Many analyzes have been carried out in underground mining, demonstrating the usefulness of this law for the assessment of seismic hazard.

Regardless of the performed analyzes ("retrospective") of the rock burst hazard assessment, geophysical surveys are commonly used, among which the active seismic tomography method is most often used for mining excavations, which gives the fullest picture of the potential hazard in the analyzed longwall.

In this work, under the title: "The assessment of the seismic hazard using the Gutenberg-Richter law and the active geotomography method" was assumed and an attempt was made to verify the thesis that it is possible to use the linkage of:

- the trend of changes in the coefficient b of the Gutenberg-Richter law in sliding time windows and with a specific step,
- results of geophysical surveys with the method of active seismic tomography (in the surrounding rocks),

as an additional component (criterion) of the assessment of seismic hazard (rockburst) for the exploitation of hard coal seams with longwall systems.

The test site consisted of six longwalls, which were operated in two mining plants belonging to Polska Grupa Górnicza S.A. (PGG SA), i.e.:

- Ruda Coal Mine (Part Bielszowice): longwalls 1 and 2 in seam 506 and 002 and 003 in seam 504,
- Mysłowice-Wesoła Coal Mine: longwalls 01Aw and 02Aw in seam 510.

The longwalls were driven in various geological and mining conditions, and the accompanying seismic activity was at a very different level, both in terms of quantity and quality.

Based on the conducted analyzes, a new, additional method of seismic hazard assessment for the mining of coal seams with longwall systems was developed, using the correlation of the results of the active seismic tomography methods and the Gutenberg-Richter law.