

Researchers on Environmental Rehabilitation after Coal Mining in Southeast Asia

Russian scholars jointly with the international partners adopted the remote sensing methods to assess the mining and rehabilitation activities at open-pit coal mining in north-east Vietnam. The research conducted is intended as a continuation of a large project on a coal mining study in Southeast Asia. The results might be used to verify data from open sources.



According to the research authors, in the provinces of Thai Nguyen, Lang Son, and Quang Ninh, there has been a steady trend towards an increase in coal production in recent years. At the same time, the owners of coal enterprises have taken a responsible approach and adopted principles of restoration ecology – a positive example for coal mining businesses in other countries.

In Southeast Asia, Vietnam is considered the second country in the amount of produced coal after Indonesia. They mine coal mainly in the northeast of the country in the three provinces of Thai Nguyen, Lang Son, and Quang Ninh, which are abundant with anthracite deposits developed for export. The research team used satellite imagery and studied in detail the technical equipment of Vietnamese coal mining companies, the volume of coal production, and the peculiarities of the environmental rehabilitation of open cuts.

“Thanks to advanced remote sensing technology, we now are able to obtain accessible and detailed first-hand information from the satellite images. According to our estimates, in the provinces of Thai Nguyen and Lang Son, the volume of coal production does not exceed 3 million tons per year, while in Quang Ninh province, at least 50 million tons of coal can be mined annually. Extraction is carried out with the help of hydraulic excavators, and in recent years they have been replaced by more powerful models with a bucket capacity of 10 cubic meters. To date, the industry provided more than 5 thousand workplaces. In addition, we tracked the rehabilitation process for open-pit coal mines from 2008 to 2018,” shared **Igor Zenkov**, research leader, professor, School of Petroleum and Gas Engineering, SibFU.



Open pit mining in Quang Ninh Province has been carried out since the late 1990s along Ha Long Bay, on a coastal strip less than 7 km wide. The of quarries, dumps and infrastructure facilities is 15 800 hectares - there are five quarries and four mining sites. According to the researchers, the coal seams have a complex structure, so that only deep mining equipment can be applied – especially for the cases when the position and size of the working zone constantly varies. For example, the depth of quarries ranges from 110 to 230 m.

“To understand how the environmental rehabilitation is carried out, we examined three open-pit mines with a total area of 480 hectares. Within a decade, the workers formed the slopes angles more obtuse, horizontal platforms were inscribed in their design for the machinery to pass and plant tree seedlings, which resulted in quite satisfactory architecture. Five years after the forest was planted, the crowns of the trees were grown enough to



*stop the mineral dust from the slopes to be carried away by the wind. This was especially crucial, because residential development and hotels for tourists are located only 2 km from the mining site. Thus, we can sum up that the rehabilitation process has given positive results,” noted **Yury Maglinets**, co-author, head of the laboratory for information support of satellite monitoring, SibFU.*

According to the university experts, the work on environmental rehabilitation carried out on the waste rock dumps of Quang Ninh Province can be a fine role model for countries mining mineral deposits, in particular coal, in open pits.

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