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Mitigation of social, ethical and environmental conflicts regarding open-pit lignite power generation projects

Michał Dudek

Faculty of Geoengineering, Mining and Geology, Wroclaw University of Science and Technology, Poland
(michal.dudek@pwr.edu.pl)

Openpit lignite power generation projects or other mineral industry mining activities have direct multilevel impact on Earth surface. Question can be raised whether it is geoethical to design a mine in a dense urban area and perform buyout or so-called mining induced displacement and resettlement. It is a subject of not only legal and economic studies but also it involves social and environmental interaction. While enabling mining activities we propose to strengthen real estate ownership rights by ensuring that the local communities will fully participate in prefeasibility studies and land will be bought for the fair market value (or replacement cost) and special energy company profit sharing policy will be applied as certain percentage from company‘s profit to land owners that comes from selling product - energy.

Lignite reserves represent a subset of resources, which could be mined economically with regard to realistic mining and economic conditions at the time of reporting. In order to identify lignite reserves, at least the ultimate pit shell has to be designed. Owing to ultimate pit optimization and to modelling, a graphical feedback of a pit extent for each scenario is produced. This graphical visualization enables analyses of occupied land and might be helpful in terms of mining-induced displacement and resettlement or in preparation of spatial development plans for strategic mineral deposits.

Investigated research, case study aims to discuss complex economics of lignite-based energy projects with respect to risk and uncertainty, optimisation, sustainable land use and the importance of lignite as fuel that may be expressed in situ as a deposit of energy. The sensitivity analyses and Monte Carlo simulations performed in this article include estimated land acquisition costs, geostatistics, 3D deposit block modelling, electricity (product) price, power station efficiency, the unit cost of lignite processing at the power station, CO_2 allowance costs, mining unit cost and also geological risk considered as kriging estimation error for lignite reserves. The investigated parameters have a nonlinear influence on the final results and hence the economically viable amount of lignite in the optimum ultimate pit varies. The optimum ultimate pit area varies across scenarios from 11.2 km2 (or even 9.1 km2) up to 14.3 km2. The performed simulations allowed each optimum ultimate pit to be calculated from a unique set of project parameters based on their distributions. As a result of mining optimization a certain profit can be forecasted which may lead to prediction that certain share in company‘s profit will give extra money for each of square meter of occupied land area.