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Functional Transformation of the Settlement Network in the Zone of Surface Coal Exploitation: A Case Study of the Municipality of Gacko (Republic of Srpska, Bosnia and Herzegovina)

This research examines the functional transformation of the settlement network in the Municipality of Gacko, located in a zone of surface coal exploitation. With over seventy years of mining tradition, Gacko experienced intensified surface coal extraction in the 1980s following the construction of a thermal power plant. This marked a turning point in the industrialization process and initiated significant changes within the settlement network. The research question focuses on identifying the spatial pattern of functional transformation within the settlement network, changes in settlement centrality, as well as demographic trends under the conditions of mining-industrial development. The theoretical framework is grounded in the concepts of functional settlement typology and spatial impacts of industrial development. Particular attention is given to the transition of settlements from primary (agricultural) to secondary and tertiary sectoral orientation, reflecting broader structural economic shifts and the marginalization of rural spaces. Methodologically, the study employs a comparative analysis of census data from 1971 and 2013, enabling an assessment of the functional structure of settlements prior to and after the onset of intensive surface mining. QGIS software was used to map the spatial differentiation of transformation patterns. The results reveal that the settlement network originally had an agrarian character, with 75% of settlements having changed their functional type over time (mostly toward industrial or transitional forms) indicating a widespread process of deagrarization. Transformation was accompanied by notable shifts in centrality. Using Schmook's index, it was determined that 49% of settlements increased in centrality. Demographic trends in the municipality are negative, with agrarian settlements accounting for over 50% of the total population loss. These findings highlight complex internal dynamics within the settlement network, driven by mining-industrial development. Overall, the study enhances understanding of functional transformation processes in mining regions and offers valuable insights for spatial planning and the sustainable management of settlement systems.

Keywords: Settlement network, functional transformation, surface coal exploitation, demographic dynamics, Municipality of Gacko