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矿业城市土地损毁生态风险评价与空间防范策略

Ecological risk assessment and spatial prevention tactic of land destruction in mining city

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中文摘要:

为量化矿业城市土地损毁生态风险、提高土地复垦和综合整治有效性,以吉林省辽源市为研究区,提出基于GIS的矿业城市土地损毁生态风险定量评价与空间防范的思路和方法。首先将土地损毁作为直接生态风险源,将土地生态系统作为生态风险受体,借助遥感信息模型与GIS空间分析模型,依次评价土地生态系统的生态敏感性、土地损毁累积作用以及二者间的暴露关系;然后确定综合生态风险值及其等级空间分布,并据此将矿业城市土地利用划分为环境敏感特别保护区、一般生态保护区、生态保育区、生态协调区、生态复垦区、限制发展区、工矿发展区与城镇发展区等八大功能区,各区内生态风险防范措施各有侧重;最后利用2010年城市总体规划图对评价与分区结果进行有效性分析,分析结果表明,辽源市90%以上的规划建设用地属于发展主导区域、70%以上的非规划用地属于生态保护主导区,研究结果与2010年城市规划用地布局范围基本吻合。基于GIS定量方法进行矿业城市土地损毁生态风险分析可空间化土地利用的风险等级与主导风险因素,为制定有针对性的风险防范措施提供了空间信息;也为矿业城市土地复垦规划、土地整理规划与土地利用总体规划的有机结合提供了参考。

英文摘要:

Abstract: Mining is a key economic activity, and it contributes greatly to the economic growth of China. However, the consequents of land destruction, such as ecological losses and environmental pollution, could adversely damage the living environment and sustainable development of the mining area. In recent years, research studies on ecological risk assessment have been hotspots in the field of land use and environmental science for mining cities. Land destruction is recognized as the most direct and obvious source of ecological risk in mining areas. A lot of theoretical frameworks and qualification models have been built to evaluate the ecological risk of land destruction. However, it is not clear how the spatial heterogeneity of ecological risk based on land destruction can be quantitatively visualized, and what kind of targeted prevention measures should be taken in various types and grades of ecological risk, which leads to some ineffectiveness of land reclamation plans in mining cities. In this paper, a framework for ecological risk assessment and spatial prevention of land destruction for the mining city was proposed. Liaoyuan city in Jilin province, as one of the representative mining areas in China, was chosen as the case area. First, the data of land use type, land destruction type and site were vectored into a GIS platform, and an integrated GIS-based model involving the ecological sensitivity evaluation, the cumulative effect evaluation of land destruction and the evaluation of the probability of exposure to destructed lands, were constructed and applied to quantify the comprehensive value of ecological risk based on land destruction. Secondly, the spatial pattern of ecological risk of land destruction was visualized and illustrated by four zones with degrees of comprehensive value: the high-risk zone (2.5% of the total area), the medium-risk zone (17.4% of the total area), the low-risk zone (39.1% of the total area) and the risk-free zone (41% of the total area), in which the dominant risk factors were differentiated. Thirdly, the zoning matrix of land use for ecological risk prevention was built, based on risk zones, which can be used to picture the land use control zone. The zoning matrix of land use included specially-protected environmentally sensitive areas and ecological conservation areas, ecological restoration areas, ecological coordination areas, ecological reclamation areas, limited development areas, mining development areas, and urban development areas. The regionalization is consistent with the land use pattern from 2010 Urban Master Planning of Liaoyuan City, which shows this prevention-oriented land use zoning approach is effective and feasible. The study reveals that the quantitative evaluation can not only provide the spatial heterogeneity of ecological risk, but also provide an operational approach to integrate land reclamation into land use planning by making targeted risk prevention decisions. This study helps to improve the effectiveness of land reclamation and land management in the mining city.

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