

Geographic Information Application Practice for the Protection and Enhancement of the "Four Mountains" in Downtown Chongqing

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SUMMARY

The "Four Mountains" of Chongqing's central urban area—Jinyun, Zhongliang, Tongluo, and Mingyue—constitute a critical ecological barrier in the upper reaches of the Yangtze River. These areas have historically faced significant challenges, including unauthorized construction, encroachment on forest lands, and inefficient supervision. The complex topography further complicates manual inspections, while insufficient inter-departmental collaboration and a need for enhanced risk warning and intelligent management have hindered conservation efforts.

This paper is based on the sequential monitoring practices of the "Four Mountains" from 2021 to 2024. It details the construction of a "4+10+52" comprehensive monitoring and evaluation index system for natural resources. By integrating "UAV + 3D Real-scene + AI" technologies, this study successfully achieved centimeter-level, 3D Real-scene modeling and high-frequency, precise monitoring across the entire 1,509-square-kilometer area.

The results indicate a significant enhancement of the "Four Mountains" ecological functions. In 2024, the indices for water conservation, soil retention, and windbreak/sand-fixation reached 0.67, 0.64, and 0.73, respectively. In terms of governance, industrial and mining land was reduced by 621.07 hectares, and 1,902.83 hectares of historical illegal buildings were addressed. All monitoring achievements have been integrated into the "Cloud-based Four Mountains" comprehensive management service platform, providing scientific support for decision-making in the protection and high-quality development of the region's natural resources.

This practice demonstrates that a chain-based work mechanism, a multi-dimensional index system, and stereo-perceptual methods founded on geographic information technology can effectively elevate the systematicness and efficacy of natural resource monitoring in large-scale mountainous

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cities. This work not only offers precise decision support for Chongqing's "Four Mountains" conservation, robustly serving ecological protection, law enforcement, and the "Digital Chongqing" initiative, but its "UAV + 3D Real-scene + AI" technology suite and comprehensive evaluation system also provide a replicable reference solution for ecological monitoring and governance in similar urban environments. It is a vivid embodiment of the philosophy that "lucid waters and lush mountains are invaluable assets," holding significant demonstrative value for promoting the green development of the Yangtze River Economic Belt and fostering harmony between humanity and nature.

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