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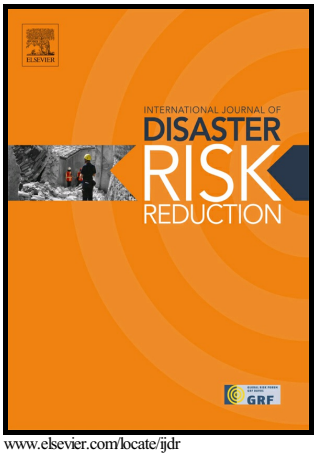

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Integrated optimization for shelter service area demarcation and evacuation route planning by a ripple-spreading algorithm

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Abstract

Shelter is one type of emergency facilities and plays a critical role in disaster response. In operation level, a shelter is the destination of post-disaster evacuation route, whose scientific service area demarcation can have a great positive influence on evacuation route planning. Effective evacuation route planning can also validate and support the service area demarcation of shelter. This study aims to optimize shelter service area demarcation and post-disaster evacuation route planning simultaneously in order to improve the efficiency of current shelter operation and further reduce disaster risk, which is seldom addressed before. We proposed an integrated optimization model for jointly solving shelter service area demarcation and evacuation route planning problems, which keeps contiguity of service areas, ensures an evacuation route within the same service district, shortens the evacuation route, satisfies capacity constraints and maintains integrity. To solve the problem, a ripple-spreading algorithm is adopted with combining contiguity and capacity operators. A real-world case study was conducted in the Chaoyang district of Beijing, China. A locally optimal scheme for service area demarcation and evacuation route planning was obtained with satisfying

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