Emergency Transportation Network Design Problem: Identification and Evaluation of Disaster Response Routes

Mohsen Babaei, Afshin Shariat Mohaymany, Nariman Nikoo

PII: S2212-4209(17)30215-7
DOI: http://dx.doi.org/10.1016/j.ijdrr.2017.07.003
Reference: IJDRR606

To appear in: International Journal of Disaster Risk Reduction

Received date: 11 March 2017
Revised date: 8 July 2017
Accepted date: 9 July 2017


This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.
Emergency Transportation Network Design Problem: Identification and Evaluation of Disaster Response Routes

Mohsen Babaei, Afshin Shariat Mohaymany, Nariman Nikoo

Abstract
Since disasters have considerable effects on transportation networks, the functionality of an emergency transportation network can play an important role in mitigation phase, especially in developing countries that sometimes suffer the sad experience of almost complete destruction of several cities. Transportation related disaster response activities typically include search and rescue, emergency medical care and fire-fighting trips. In this paper, the emergency transportation network design problem is proposed to determine the optimal network to perform emergency response trips with high priority in the aftermath of disasters. The problem has three objective functions designated to identify the optimal routes for emergency vehicles considering the length, the travel time and the number of paths, as a performance metrics of network vulnerability. A combined approach for considering the three objectives including weighted sum and lexicographic methods is used. The proposed model is solved using a branch-and-cut solution method. The suggested method is tested on the well-known Sioux-Falls network as well as on the real-world network of Tehran metropolis, Iran. Computational experiments are conducted to examine the effects of varying the maximum network length, and the relative weights of other objectives.

Keywords: Disaster mitigation, Emergency transportation network, Vulnerability analysis, Emergency response trips, Critical links.

1. Introduction
Natural disasters such as earthquake, flood, and hurricane inflict significant human and financial losses every year. The number of natural disasters and people affected by these natural disasters has increased in recent years [1]. Comparing yearly earthquake death rates among Iran, Japan and the USA during three different periods revealed that while Japan and the USA have reduced their yearly rates, Iran’s status has been worsening [2]. Unlike developed countries where the main concern is to return the city to the pre-disaster conditions quickly, developing countries attempt to rescue more people in the response phase [3]. Many Iranian cities have suffered from earthquakes. Statistical analyses show that Iran has
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات