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EDITORIAL

SI: disaster risk management

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Optimization methods play an important role in all parts of disaster risk management (DRM) for natural and man-made disasters, including preparedness, mitigation, response and recovery. We are very happy to present nine papers, which have passed the rigorous reviewing process of EJCO,[1] and which confirm this statement. The focus of the papers is on the derivation of new optimization models, their implementation, and computational experiments with realistic datasets.

In the paper *Evacuation Modeling: A Case Study on Linear and Nonlinear Network Flow Models*, co-authored by Sebastian Kühn, Simone Göttlich, Jan Peter Ohst, and Stefan Ruzika, a nonlinear traffic flow network model is presented which is coupled with gaseous hazard information for evacuation planning. This model is evaluated numerically against a linear network flow model for different objective functions that are relevant for evacuation problems. A numerical study shows the influence of the underlying evacuation models on the evacuation time as well as the exit strategies.

The role of uncertainty in the evacuation process is considered by Marc Goerigk[1] and Ismaila A. Ndiaye in their paper *Robust Flows with Losses and Improvability in Evacuation Planning*. They consider a two-stage network flow model where at each node, the throughput is diminished by some percentage. These percentages are not

[1] The reviewing of the two papers with the guest editors as co-authors were handled by the main editor of EJCO to avoid a conflict of interests.

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completely known. Additionally, a budget is available to improve the safety of some nodes. The question they consider is how to allocate the budget, such that the maximum flow in each scenario is as large as possible. Using a scenario relaxation procedure, the problem is solved using a problem instance based on Nice city.

In order to include human behavior of the evacuees into the modeling process, Alf Kimms and Kerstin Seekircher use in *Network Design to Anticipate Selfish Evacuation Routing* an agent-based approach and suggest a model to restrict the available street network to counteract selfish behavior. The results of their computational study indicate that their approach reduces the negative influence of selfish routing without undue risks in the evacuation process.

The next two papers consider the problem of providing evacuees with shelters, i.e., a place to stay for a given amount of time until they can return to their homes. Melissa Gama, Bruno Filipe Santos and Maria Paola Scaparra focus in *A Multi-Period Shelter Location-Allocation Model with Evacuation Orders for Flood Disasters* on the scenario of evacuations due to flooding and decisions over several time periods. They propose an integer program (IP) formulation based on shortest path distances and propose a simulated annealing approach to tackle simultaneously the selection of shelters and the allocation of evacuees to these shelters.

Philipp Heßler and Horst W. Hamacher formulate in *Sink Location to Find Optimal Shelters in Evacuation Planning* the shelter problem as a selection of sinks in a network flow problem with known supplies. Depending on the type of evacuation, several network flow models are suggested, a classification of the resulting sink location models is given, and complexity questions are answered. Both papers contain extensive numerical tests showing the viability of the respective approaches.

Jens Poppenborg and Sigrid Knust consider in *Modeling and Optimizing the Evacuation of Hospitals Based on the MRCPSP with Resource Transfers* a part of an evacuation process requiring particular attention. They formulate a resource-constrained project scheduling model with additional resource transfers and blockings, and propose two heuristic decomposition approaches which are tested against each other using randomly generated instances based on real-world scenarios.

The next two papers tackle the problem of dealing with debris caused by a disaster and which blocks roads.

In *Road Network Emergency Accessibility Planning After a Major Earthquake*, Celso Satoshi Sakuraba, Andréa Cynthia Santos, Arnaud Durand Lucie Bouillot, Bernard Allenbach, and Christian Prins focus on two problems: finding traversable paths for relief teams to reach the population, and generating a repairing schedule to improve accessibility to refugee areas. The methods presented in their paper are tested on simulated instances and on the graph of Port-Au-Prince, with more than ten thousand vertices and edges.

Nihal Berktas, Bahar Yetis Kara, and Oya Ekin Karasan develop in *Solution Methodologies for Debris Removal in Disaster Response* models to help in deciding which roads to clean in order to be able to transport relief items. The goal is to minimize the time to reach critical nodes (e.g., schools, hospitals). Heuristic solution approaches are suggested and tested on two data sets derived from districts of Istanbul.

In *Applying Ranking and Selection Procedures to Long-Term Mitigation for Improved Network Restoration*, Emily A. Heath, John E. Mitchell, and Thomas C.

Sharkey consider methods to determine the best single arc mitigation plan for improving rapid recovery of a network with a given level of statistical certainty. They show that their approach finds a best single arc mitigation plan with 95 % confidence in all cases and outperforms a brute-force approach.

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