

Outline for a Master's Thesis in the Risk Management Research Group

Topic: Development of an Optimization Model for the Distribution of Humanitarian Goods in Urban Areas

Context:

The high population in urban areas combined with a comparably high amount of congestion and other logistical constraints generate a challenging situation for logistic planners. This becomes especially difficult in times of disasters, when logistical infrastructure might be destroyed, people start to panic, and the possibilities to plan the transportation properly reduce drastically. Even though many different mathematical models to optimize the delivery to areas affected by disasters exist, the applicability of general models to an urban context is challenging.

The following aspects should be included in the thesis:

- (1) An overview of disasters affecting urban areas should be provided (using academic literature, public databases, and verifiable (!) internet sources). Furthermore, damages to the infrastructure and different ways to cope with the difficulties in urban areas should be analyzed. Moreover, the applicability of these coping strategies should be compared to coping strategies in non-urban areas. The specific advantages and disadvantages of the conditions in urban areas should be discussed (e.g. more volunteers vs. more people in need).
- (2) A literature review on mathematical models to optimize the distribution processes in urban areas should follow, focussing on a classification of the important components of the models (e.g. types of models, dynamics, objective functions, in- and output parameters, restrictions).
- (3) Dependent on the results of (1) and (2), a case study for the city of Stuttgart should be developed. Therefore, a disaster scenario has to be defined and the mathematical model formulated/implemented using the GAMS-software. Finally, the results of the optimization have to be discussed critically.

Requirements:

Advanced knowledge in the fields of operations research, supply chain management, and programming is mandatory (and/or the motivation to acquire this knowledge).

Experience with GAMS is appreciated but not mandatory.

Your contact:

M.Sc. Florian Diehlmann,
florian.diehlmann@kit.edu