RAPID DEVELOPMENT AND EVALUATION OF HUMANITARIAN RELIEF STRATEGIES

Dr. Dennis Duke – Florida Institute of Technology
Mr. William Morrissey – COL U.S. Army (Ret)
Mr. Michael Hugos – SCM Globe

INTRODUCTION

There are both man-made and natural disasters with different onset times. Disasters that are slow to form allow time for logisticians to identify suppliers and develop plans for supply chains similar to business supply chains. Unfortunately, most disasters occur rapidly and provide little time for coordination between military and relief agencies. Rarely do they allow for prepositioning strategies to place warehouses, distribution centers or preferred delivery routes. These logistics decisions are critical and the supply chain manager must be able to quickly change them as circumstances warrant.

Supply chains used in humanitarian disasters and in business logistics utilize the same basic concepts. The biggest difference is that time is much more important in humanitarian logistics than the cost of storage and transportation.

Unlike the business environment, where a manager is able to choose suppliers, predict short-term demand, decide upon schedules, transport systems and routes, supply chain managers responding to humanitarian disasters face "... a chaotic, possibly hostile, environment where every passing minute could mean another life saved…The nature of the situation ensures that the business of transporting humanitarian aid is highly unpredictable. Logisticians often have little or no notice of what and how much material they must move, not to mention when and where it is to go." [1] Additionally, logisticians have to work with teams from different regions, languages, and cultural values. All of these factors impact communication.

The most distinguishing characteristic of the humanitarian supply chain is the dimension of uncertainty. In Puerto Rico, emergency managers did not know what their supply chains looked like until they started operating - and then, they rapidly changed as the situation developed. Many suppliers were well-intentioned donors but they provided the wrong type of supplies for the relief effort. This variability in quantity, quality, and

[1] Gooley, Toby B. "In Time of Crisis, Logistics is on the Job." Logistics Management and Distribution Report, 38: 82-86 (September, 1999).p. 83

suitability burdened the supply chain manager because of the sorting, storing, and distribution that had to occur before distribution.

The purpose of this paper is to propose a methodology that offers disaster managers and first responders an opportunity to develop strategies and improve communication and coordination prior to the onset on any type of emergency. This methodology is devoid of political inferences - it simply involves having periodic virtual eLearning "training sessions" attended by representatives from various agencies who would probably be called upon to work together during a natural disaster. The virtual exercises would enable them to discuss "lessons learned" on simulated crisis scenarios thus improving camaraderie, decision-making and efficiency.

METHODOLOGY

One of the first tasks a supply chain manager must accomplish is to determine supply chain strategy. Although humanitarian supply chain strategies may differ from commercial strategies similar elements in both must be managed. The elements of a commercial supply chain strategy include: customers' current and future needs; strengths, weaknesses, opportunities and threats (SWOT) faced by the firm; threats generated by competition, and the risks facing the supply chain. The humanitarian supply chain manager deals with victims that are affected by the disaster rather than customers. However, he must be able to quickly undertake a SWOT analysis of the situation and determine risks he will face.

Effective relief provided in an expeditious manner is dependent upon decision makers knowing what should occur logistically during different phases of a disaster. But how can this be done?

This can be best explained using a simulated disaster scenario. The example shows disaster response supply chains created to handle a flooding disaster similar to the floods that occurred in Central Europe in 2013. The map-based user interface provides a clear geographic context for people to understand simulation results.

Prior to the seasonal warming period, relief planners in areas prone to spring time flooding should review lessons learned from previous floods, closely examine flood plain maps and identify what areas may be the first to be breached - not only for the immediate area but areas upriver as well. In the following example, a disaster scenario is simulated using the four supply chain components (products, facilities, vehicles supply, and routes).

THE SIMULATION

Using the results of the SWOT flood analysis, personnel from different agencies participate in creating an initial supply chain model(s). The product inventory, facility size, location, vehicle type and route would be determined by examining the situation and making appropriate calculations (i.e., optimal inventory, reorder points, facility location models, etc.). This information would then be input into the simulation which displays hourly and daily operations.

As the scenario progresses the phased deployments are affected by the predicted areas of flooding. The product(s), facilities, vehicles, and routes are shown in the simulation (figure 1).

The dialog box in the upper left shows information on one of the prepositioned products, "Food Mix" for 100 people. The sidebar menu on the right lists the four supply chain entities: Products; Facilities; Vehicles; and Routes. A partial list of the facilities is shown with routes displayed in blue.

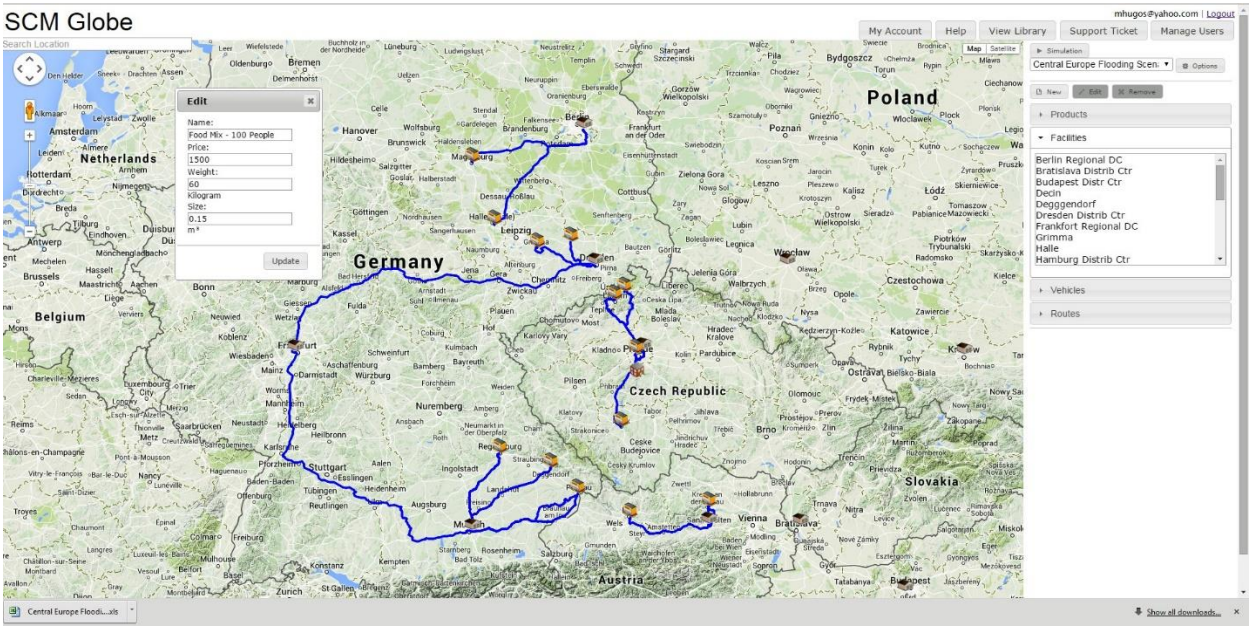

Figure 1 Simulated Supply Chain

Once this supply chain model is constructed, the participants simulate the performance of the model. The simulation can display real time performance and find points of failure. Participants can use the simulation to troubleshoot their supply chains until they find the most effective design.

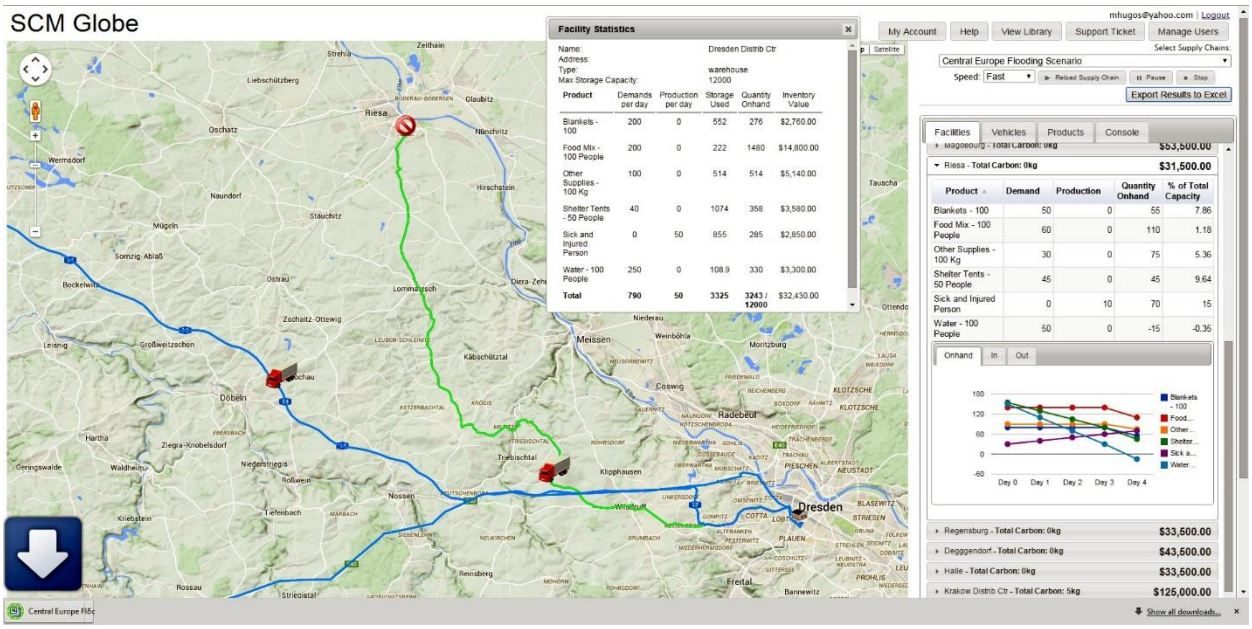

Figure 2 Problem Identification

The simulation above has found a problem in the design - the response aid center in Riesa ran out of potable water on the fourth day. This is seen in the graph as the light blue line on the right side of the screen showing on-hand inventory at Riesa. The simulation data can be downloaded to a spreadsheet for further analysis as required.

Displays for on-hand inventory at other facilities as well as information on products and vehicles are also available by opening the different tabs shown in the display area on the right side of the screen. It is also apparent from looking at the map of the supply chain that supplies for Riesa are delivered from the Dresden warehouse where they were prepositioned.

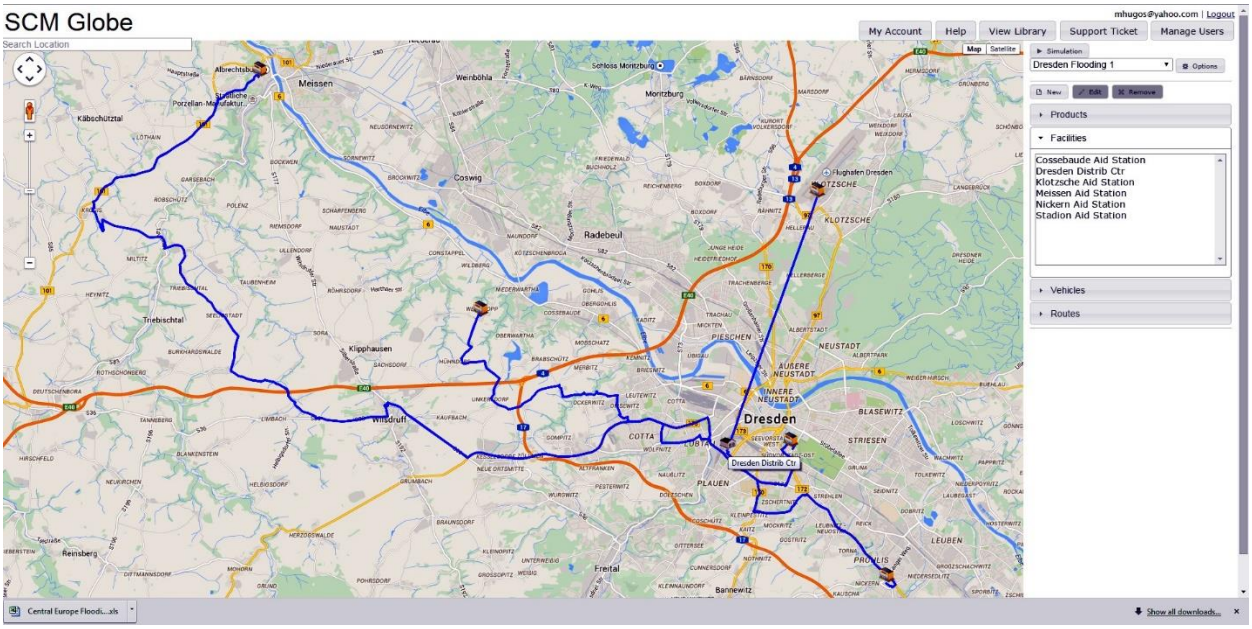

Figure 3 Dresden Distribution Center

Figure 3 shows a detailed model of the disaster supply chain in the Dresden area. Most of the delivery routes are by roads traveled by trucks but one delivery route - the straight line between Dresden warehouse and the airport across the river is an air route traveled by helicopters.

People quickly find out more about the aid station across the river by clicking on the Klotzche Aid Station facility. In the screenshot below the dialog box on the left shows information about this facility.

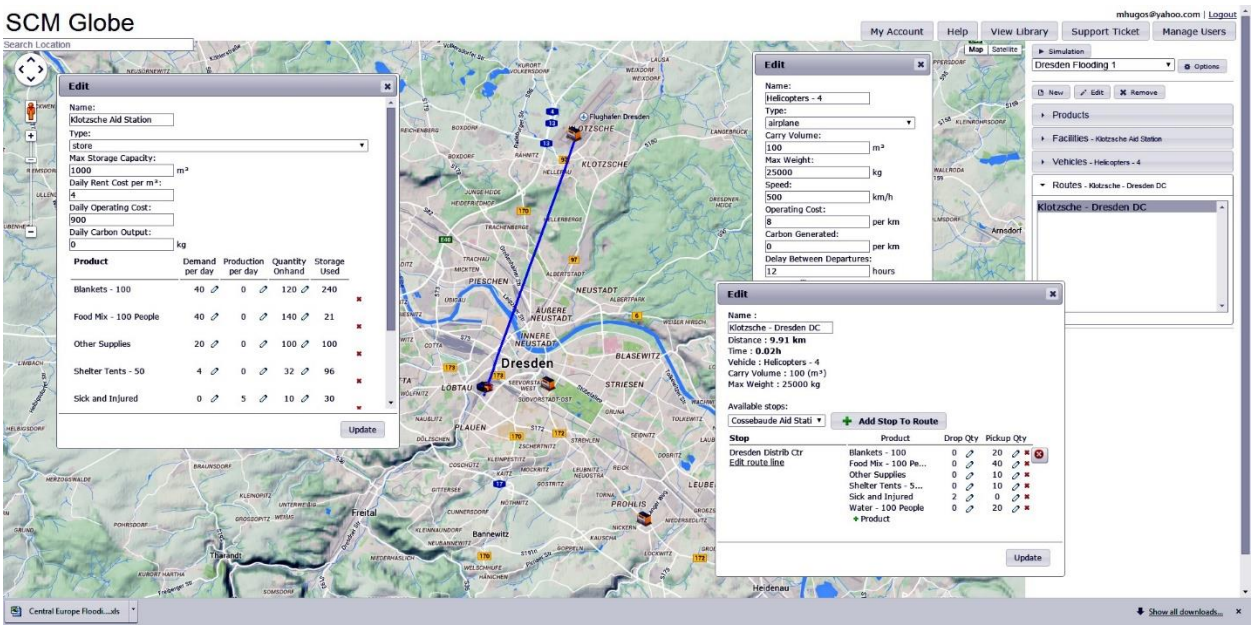

Figure 4 Supply Chain Element Data

Summary

Historically, centralized command and control have often broken down in disaster response situations due to changing circumstances. Decision-making skills, in concert with effective communication and coordination allow for successful disaster responses.

The players in these simulations may be geographically dispersed, but personnel from different disaster response organizations would be able to work through these scenarios together. All personnel would see the same “big picture” map of the scenario and see how their proposed supply chains operate. Most importantly, when they run these simulations, everyone can see the results and collectively compile their “lessons learned.”