

Chapter 20

Tool for Decision Making in Humanitarian Logistics Chains

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ABSTRACT

This chapter develops a decision support tool with a focus on the humanitarian logistic chain in a crisis environment considering process drivers' constraints such as costs, capacity, and throughput time. For instance, elements to reduce the suffering of the affected families, by using an adequate supply support for the first 72 critical hours. The authors will focus on minimizing the risks of shortages in the first response supplies in a high flood probability zone in Peru. This research presents different scenarios and it analyzes the representative variables (demand, civil defense warehouses, points of distribution, distance and logistics resources), the humanitarian chain value, and the effective distribution of the aid in the affected areas with efficient operations that balance between the economic and operative resources in this recurrent logistical problem. The results present three crisis situations with a distribution plan and a base of a public policy to prevent a crisis.

INTRODUCTION

Cities are artificial environments created by humans where several inhabitants and their activities concentrate. These activities have different functions related with political, economical, cultural, social, technological, ecological and other human functions (David, 2011). These functions generate flows such as products, people, money and information between their entities (Liu & Savy, 2012) (Heckmann,

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Shorten, & Engel, 2003) (Sunil, 2019). The value of this complex network is to satisfy humans' resource requirements (Hesse & Hall, 2013) (Dablanc & Frémont, 2015) and basic services as infrastructure, housing, transportation, among others (Kilroy, Mukim, & Negri, 2015).

This human delighting environment generates the urbanization process ; the urban population has grown exponentially and is projected to be 6,50 billion by 2050 or 68% of the world's population (United Nations, Department of Economic and Social Affairs, Population Division, 2018). These cities have different characteristics and challenges, the most populated city is Tokyo with 38,80 millions of inhabitants in 2 188 km² or 17 733,09 inhabitants/km² (United Nations, Department of Economic and Social Affairs, Population Division, 2018). Currently, Tokyo and other 37 cities are considered as megacities, cities with more than 10 million of inhabitants (MIT, 2014). Japan, with a GDP of US\$ 41 418,25 (International Monetary Fund, 2019), had four of the fifteen tectonic plates in the world, 20% of the earthquakes with a magnitude of six or more occur there also 7% or 110 of the active volcanoes. (Disaster Management Cabinet Office, 2018) (Japan Meteorological Agency, 2019) (Centre for Research on the Epidemiology of Disasters - CRED, 2019).

On April 14th and 16th, 2016, the Kumamoto Earthquakes occurred with a maximum seismic intensity of 7 and caused 228 fatalities, 200 000 houses were affected (totally and partially); and all the infrastructure services were in operation in a month (Disaster Management Cabinet Office, 2017). This case and other catastrophes such as the earthquake in Haiti in 2010, the earthquake and tsunami in Tohoku in 2011 or the earthquake in Azerbaijan in 2012, are one of the reasons why the world's attention is focused on humanitarian logistics. Those disasters illustrate the unforeseen of the nature, the consequences in the population and the lack of trained professionals to manage the response and attend the affected population (Carter, 2008) with its fundamental objective, which is to reduce human suffering (Holguín-Veras, Pérez, Jaller, Van Wassenhove, & Aros-Vera, 2013) as well as the socio-economic wellbeing principles, considering logistic and deprivation costs when a natural or anthropogenic disaster occurs (Leiras, De Brito Junior, Peres, Rejane, & Yoshizaki, 2014). Natural disasters are explained as a low frequency phenomena over time, but with high impacts in a concentrated population; for instance the "Niño Costero" phenomena back in 2017, the earthquake in Puebla, the three strong hurricanes in North America (Harvey, Irma and Maria) and the tsunami in Greenland (Venkateswaran, MacClune, & Enríquez, 2017) (Centre for Research on the Epidemiology of Disasters - CRED, 2019), while the anthropogenic disasters or caused by man will increase drastically (Centre for Research on the Epidemiology of Disasters - CRED, 2019) with a complex relation between actors, phases and processes (Kovács & Spens, 2007), and unknown demand, uncertain supply and disrupted flow which belong to business logistics and humanitarian logistics factors, such as complicated operation, infinitive challenges and unfamiliar issues (Apte, Khawam, Regnier, Simon, & Nussbaum, 2013); reflected on 366 humanitarian missions from the US Army between 1979 to 2000, twenty of them in combat situations. In 2019, we had a global humanitarian crisis caused by Venezuela, Honduras, Nicaragua, Afghanistan and Syria's migration against their neighbor countries, which rises from internal conflicts, disaster, poverty, ideological alignment and the lack of food and public services as water, electricity, healthcare, among others (Winkler Osorio, 2019), with consequences in their health system, demographic composition and unequal opportunities.

The disaster management cycle has four phases after the emergency: response, recovery, preparedness and mitigation (Emergency Management Institute, 2012). The response phase occurs before the disaster and focuses on saving lives and reducing human suffering, with emergency aid and adequate food. The recovery phase is based on activities with the purpose of returning to the original scenarios. The preparation phase focuses on early warning activities, such as plans, training and tools before the

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