

Chapter 1

Military Facility Location Problems: A Brief Survey

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ABSTRACT

In the past decades, facility location problems have attracted much attention among researchers and practitioners from different disciplines. Among those problems, location models observed in military organizations have significant impact to the performance of the military organization since they require large amounts of money, resource, and people. Moreover, an efficient planning of military resources often leads to a good direction to victories. In this chapter, considering a number of selected papers, the authors give a brief survey of facility location models and solution techniques employed for military organizations. After providing the features of core location models, they analyze the military facility location models with respect to the context they are handled. After categorizing the articles with respect to the formulations and solution approaches employed, the authors highlight potential issues for further research.

INTRODUCTION

In the past decades, location science has attracted many researchers and practitioners from different disciplines and fields. Being a very rich field, location science includes several types of location problems, solution techniques as well as considerable amount of theoretical modeling frameworks and solution techniques. Its connection and interaction with other disciplines such as mathematics, geography, logistics, economics is the main driving force behind its development (Laporte et al., 2015).

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Lying at the core of this discipline, facility location problems are mainly concerned with optimally locating, relocating or expanding facilities such as hospitals, warehouses, schools, fire stations, bank branches, post stations, military installations, with respect to different objectives. High construction, setup and relocation costs of facilities make facility location projects long-term investments (Farahani and Hekmatfar, 2009). Moreover, deployment of a new construction requires to take a number of factors into consideration such as distances, travel times, customer types and locations, long-term relocation plans. It is of high importance to conduct an analytic work due to the remarkable cost of changing decisions on facility locations. Hence, these problems are critical components of strategic decision making for many private and public companies (Owen & Daskin, 1998).

There is a vast literature covering the subject of facility location problems in broad terms. Many models have been developed to help decision making in this area. The readers who are interested in learning about facility location models are referred to the early works of Francis and White (1974), Handler and Mirchandani (1979), Love, Morris, and Wesolowsky (1988), Francis, McGinnis, and White (1992), Mirchandani and Francis (1990), Daskin (1995, 1997), and Drezner (1995). More recent studies include Drezner and Hamacher (2002), Nickel and Puerto (2005), Church and Murray (2009).

There are also several facility location books. Among those, Mirchandani and Francis (1990) present methods and solution approaches for discrete location problems. Francis et al. (1992) presents both qualitative and quantitative methods utilized in facility location problems and provides a review of the field's literature. The book by Daskin (1995) considers the network-based location theory and besides providing theory on classical location problems, it also discusses real-life applications of those basic models. Drezner (1995) includes a review important contemporary approaches in locational theory. Drezner and Hamacher (2002)'s book reports some of the main-stream facility location topics observed in the industry and management science. In his book, Chan (2001) integrates practical and theoretical location studies and employs a number of contemporary quantitative models. The book also discusses case studies for locating facilities such as transportation terminals, nuclear power plants, military bases, emergency shelters, etc. Later, the book by Nickel and Puerto (2005) includes a through survey of both continuous and network-based facility location models. The book by Farahani and Hekmatfar (2009) is a comprehensive source of information on location theory. A more recent book by Laporte et al. (2015) provides the reader with the basic and advanced concepts of location science. It also includes a number of applications in telecommunications, healthcare, rapid transit networks, disaster events, etc. Eiselt and Marianov (2015) report some important real-world applications of location analysis. In another book, Karakitsiou, A. (2015) reviews and provides modeling approaches in discrete competitive location problems.

However, location studies concerning military organizations are relatively limited. Studies conducted in military context have a significant impact on organizations and supply chains, as the management and maintenance of military organizations require large amounts of money, resource, and people. Additionally, efficient location planning of military organizations leads to a good direction to victories (Yang et al., 2008). For this reason, we find it useful to examine this limited literature on military facility location problems and report the most common problem classes and solution approaches implemented in this domain.

The rest of the paper is organized as follows: Next section provides an overview of basic facility location classes and their properties as well as examples of their applications. Then, we present a review of facility location models in the field of the military. In particular, we group them with respect to the context of location problem studied. The following section reports a number of statistical results regard-

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