Dry port location problem: A taxonomic review

Ghada MTIR¹, Hamdi DKHIL², Abdelkader SBIHI³, Foued ALOULOU¹

¹ University of Sousse, FSEGSo, Faculty of Economic science and Management of Sousse, Tunisia
² Université Le Havre Normandie, LMAH, 76600 Le Havre, France
³ ESCEM Ecole de Management de Tours
ghada.mtir@gmail.com, hamdi.dkhil@univ-lehavre.fr
abdelkader.sbihi@univ-paris1.fr, foued.aloulou@fsegs.rnu.tn

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Introduction

Over the world, there exist 4600 active ports, but less than 100 have global significance. Maritime traffic therefore has a high level of concentration in a limited number of major ports [1]. According to [2], the world container throughput stood at 752 million TEU. It is estimated that between 2017 and 2022 cargo flows are set to expand across all segments, with containerized and major dry bulk commodities trades recording the fastest growth [3]. All this factors lead to the so-called “port congestion” growing concern in international trade.

Due to the increasing freight volumes passing via seaports checkpoints, and increasingly reported delays in customs clearance procedure, dry port, emerged as one kind of solution to such situation, instead of extending the port scale under limited land use [4]. The location of dry ports is one of the most important elements in evaluating the competitiveness of a supply chain system [5]. First, given the understanding that dry port is a port situated in the hinterland servicing an industrial/commercial region connected with one or severa[l ports with rail- or road transport and is offering specialized services between the dry port and the overseas destinations [6].

To build a dry port, the location must be carefully evaluated including many aspects and based on the index system in view of the factors, so as to obtain strategic advantage [8]. With suitable and reasonable location, a dry port can be more competitive and save logistics cost for customers dramatically” [8]. It can solve not only the congestion embarrassment faced by connected seaport, but also can improve economic development of the hinterland by integrating the logistics network and improving the access between dry port and seaport [4].

Despite the problem of dry port location is a particular research area within location analysis which is considered one of the most vital issues; but over its lifespan, this specific location literature has become disjointed. Keeping track of its development has become difficult because its subject matter transcends several academic literature and professions that range from geographical selection to algorithm design and supply chain management...

Yet, the location problem characteristics vary widely and few literature reviews have made an effort to classify the existing articles accordingly. There is a very little research has been done on the assessment of dry ports location. On the other hand, there is a rich literature on the issue of development of dry ports such as [9], [10].

In this paper, we suggest a taxonomic review of 75 papers published between 1990 and 2018. Based on taxonomy, we classify articles and analyze them according to four criteria, which is rarely done in the literature. Within the first criterion, “geographical aspect” where each selected paper is distinguished based on its geographic region means the potential sites of dry port location. This can help us to
investigate the geographical differentiation of the major port-city relationships. Definition of families of criteria that can be the most adapted to location purpose.

Then, based on 75 selected articles, we introduce the second criterion the so-called “key criteria”, which comprises those most adapted factors that affect the location decision. Then, the selected articles may also be classified according to the “used methodology” based on three categories of methodologies, which are the mono-criterion, multi-criteria, and hybrid models. Hybrid models are a combination of different methodologies or systems in order to develop or create better models that attempt to challenge the traditional models.

We finally propose the fourth criterion of classification, which allow us to distinguish between papers using “applied” or “theoretical studies”. It also provides an idea about “type of data” collected by each author.

The principal objective of this paper is to inspect and categorize the dry port location literature from various perspective in order to keep track of its development. We tried to pick papers that represent different periods, different sources, differing paths of dry port location studies and differing research strategies. The classifications allowed us to extract some statistical data, which provides a good tool to explore which key criteria and methodologies are the most used, information about the used data…

At the end of the paper, we can cite some remarks:

- The selected papers studies emanate from different countries, indeed from different continents with a special focus in Asia world and Europe Union. On the other hand, there is no studies on the underdeveloped and developing countries, including the Great Maghreb and the Middle East.
- Cost consideration is a crucial aspect in the literature on dry port location, and in general in any location problem. In contrary, the technology criteria are almost ignored. However, these factors are of great importance that should be given more priority when assessing the cities.
- The mono-criterion approach (using the classical optimization models under the integer programming models, the mixed integer programming models… to locate dry ports with the goal of minimizing total cost or maximizing the total profit) alone are still so far to express the decision maker’s preference therefore the complexity of practical situation. While the hybrid theory (where the mono or and the multi-criteria models can be combined together or with other models) may seems, the best suited to find optimal locations, which can reduce weaknesses and complete the unhelpful sides of mono-criterion and multi-criteria models to deal with dry port location problem.
- Lastly, it is more interesting to study the problem from an empirical point of view because the theoretical researches are not very deeply conducted too, and the location for dry port is a practical problem. On the other hand, the dry ports selection is a multi-criteria problem, which should include both objective and subjective criteria from the point of view of various stakeholders.

To the best of our knowledge, this article provides the first exhaustive classification of dry port location literature. The main contribution of our paper is the various resulting classification, which is made available as supplementary material. This classification enables future researchers to easily find relevant literature by eliminating or selecting characteristics in the taxonomy, leaving only articles tailored to their interests. Additionally, the classification allows to analyze which factors and methodologies are most popular.

References


