



# Developing the port hinterland: Different perspectives and their application to Shenzhen Port, China



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## ABSTRACT

The management and expansion of the port hinterland is at the core of ensuring the competitiveness of modern ports. Considering the impact of the global supply chain and regional economy development, this study proposes different perspectives to analyse the development of the port hinterland, and applies these perspectives to Shenzhen Port in China. In accordance with the changing nature of a port's function, we view hinterland development from physical, logistics, and macroeconomic perspectives, and analyse the influencing factors from the shippers' viewpoint in terms of three driving forces: spatial, value, and organizational. We find that the influence of these driving forces and their relevant strategies differ from these three perspectives. For Shenzhen Port to develop its hinterland sustainably, its geographical boundaries should be extended in both directions (i.e. inland-bound and foreland-bound), and the structure of container throughput needs to be optimized. Some relevant strategies in this regard are proposed.

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## 1. Introduction

The rising uncertainty of global trade and sustainable infrastructural investment are placing massive competitive pressure on modern ports, especially those in mature markets in well-developed regions. Against this background, managing the port hinterland, namely, the geographical area to and from which cargo passing through the port can be distributed, has been shown to be an influencing factor in the sustainable development of a port. For example, Tan (2007) analyses the evolution of the port cities of Singapore and Calcutta (now known as Kolkata). Through his description of these two port cities and their relationships with the hinterlands, he identifies the contributions of port hinterlands. That is, Singapore expands its hinterland to the world by adopting an outward-oriented economic policy and taking forceful measures to stimulate port development, which has elevated the port of Singapore as one of the two leading international container hub ports (container throughput reaching 33.55 million TEUs in 2014, according to the PSA International (2015)). Kolkata, in contrast, confines its hinterland to Bengal due to some complicated reasons, and therefore, it has remained only a regional port (with container turnover at 0.6 million TEUs in FY2012, according to the Kolkata Port Trust).

The Port of Shanghai is another typical example of the relationship between the port and its hinterland. Its hinterland covers the Yangtze River Delta and Yangtze River Basin, two of China's most developed regions. The excellent geographical location and efficient inland transport

network of the Port of Shanghai has resulted in tremendous development in recent decades, and it has remained the highest ranked hub port in terms of container throughput since 2010. Meanwhile, in North-Western Europe, the Ports of Rotterdam, Hamburg, and Antwerp have long shared a highly competitive hinterland. Recently, slow economic growth and the rapid development of Southern European ports have led their traditional hinterland to become more competitive (see Zondag et al., 2010).

The boundary of the port hinterland used to be determined by the transport links and cost between the hinterland and port (i.e. inland transport cost). In the past, the existence of undeveloped transport networks meant that the area of the port hinterland was relatively fixed, with each port typically having a captive hinterland zone. However, owing to sustainable improvements in transport networks and the increasing application of information technology (IT), transport access to the hinterland is no longer a major constraint. The total expense incurred in the entire transport chain, as well as transport quality and efficiency (termed the extended cost), are considered. Furthermore, with the notion of the global supply chain and the increasing awareness of the relationship between the regional economy and the port, the impacts of value-added services, the logistics organization mechanism, industrial clusters, and the regional economy on the development of the port hinterland are increasing significantly, although extended cost is still a decisive factor. Against this background, the scope of the port hinterland extends beyond classical geographical settings. Moreover, the introduction of the concepts of 'dry port' and 'sea hinterland (foreland)' (see Section 2) is changing the traditional understanding to the port hinterland, and the spatial continuity of the hinterland might be fragmented but is functionally integrated.

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Overall, influenced by these numerous factors, the port hinterland is becoming more dynamic and uncertain. As such, the issue of the port hinterland has been examined from various perspectives: types and attributes of the port hinterland (see Guerrero, 2014; Konings et al., 2013; Rodrigue & Notteboom, 2006); the relationship between the hinterland and port (see De Langen & Chouly, 2004; De Langen, 2007; Doonan, 2006; Notteboom & Rodrigue, 2007; Rodrigue & Notteboom, 2010; Tan, 2007); external factors influencing the port hinterland (see Franc & Van der Horst, 2010; Jafari & Khosheghbal, 2013; Zondag et al., 2010); sustainable development of the port hinterland (see Bergqvist & Egels-Zandén, 2012; Cho & Ha, 2009; Flämig & Hesse, 2011; Iannone, 2012; United Nations Economic and Social Commission for Asia and the Pacific, 2005; Van den Berg & De Langen, 2011); optimization of the hinterland transport network (Aronietis et al., 2011; Castillo-Manzano et al., 2013; Furió et al., 2013; Woodburn, 2013); and improvements in access to the port hinterland (see Aronietis et al., 2011; Frémont & Franc, 2010; Ubogu, 2011; Ubogu et al., 2011; Van Klink & Van den Berg, 1998; Visser et al., 2007).

It can be observed that current research has created conceptual models for the port hinterland and analysed the strategies used by ports to extend the hinterland. However, both theoretical and practical research has mainly focused on transport accessibility and transport costs incurred for moving cargo between the hinterland and port. Owing to the complexity and dynamism of hinterland development, it is now necessary to take multi-perspectives that are able to capture its characteristics, in particular, how to integrate the notion of the global supply chain and the increasing awareness of the impact of the regional economy on the port's development. This study bridges this gap in the body of knowledge on this topic by conceptualizing hinterland development from different perspectives and applying these perspectives to Shenzhen Port in China.

The remainder of the paper is organised as follows. Section 2 studies the development of the port hinterland from different perspectives, focusing on the main perspectives—physical, logistical, and macroeconomic—and the driving forces—spatial, value, and organizational—of the development of the port hinterland, as well as some relevant competition strategies. Section 3 applies these different perspectives to the hinterland development of Shenzhen Port and proposes some suggestions for extending its hinterland. The key points and relevant conclusions are discussed in Section 4.

## 2. Development of the port hinterland from different perspectives

### 2.1. Perspectives on developing the port hinterland

The port hinterland is becoming more dynamic and uncertain, and competition for hinterlands among ports tends to be increasingly fierce. In accordance with the changing connotation of the port hinterland, Notteboom and Rodrigue (2007, p. 52) classifies the types of hinterland into 'physical, logistics, and macroeconomic'. In this study, by borrowing these words and adopting some of their viewpoints, we describe three perspectives on hinterland development, described as follows.

First, the physical perspective follows the conventional principle of spatial focus. The major influencing factors on developing hinterland from this viewpoint are transport links and inland transport costs. The criteria for a shipper to choose a port is quite simple: the cargo can be moved to the destination through the nearer port where the inland and maritime transport are connected. In this case, inland access is the first priority while inland transport distance (transport cost or transport time) is considered second. Traditionally, the undeveloped inland transport infrastructure has determined that shippers usually have to choose a unique harbour to and from which to distribute cargo. With an increasingly efficient inland transport infrastructure, however, contemporary transport access is improved by both the single transport mode and various intermodal transport ways, such as road–rail transport, water–water transit, and road–water transport. Furthermore, the maritime

network and its connection with the inland transport system is becoming a key element in transport access. As a result, the geographic boundary of the port hinterland is further extended. Due to the complexity of the entire transport network incorporating various forms of intermodal inland transport and maritime transport, the boundaries of the port hinterland overlap and become more dynamic.

Second, the logistics perspective is closely related to the rising influence of the global supply chain. According to a definition given by APICS (Cox & Blackstone, 2013, p. 172), the management of the supply chain means 'the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally'. With the notion of the global supply chain, shippers pay more attention to the value achieved from the entire supply chain. They are not focused solely on transport links and inland transport costs, but naturally consider the organization of the entire supply chain for optimizing all supply-chain expenses and time, and also focus heavily on the value-added logistics services the port could provide. Obviously, from the logistics perspective, the port is not only a connecting node between the inland transport and maritime network, but can also play a more important role in enhancing shippers' value, that is, to minimize the integrated cost of the entire supply chain and provide competitive value-added logistics services. Compared to the physical perspective focusing on spatial transport, the logistics perspective, considering the organization of the entire supply chain and value-added services, makes the port hinterland influenced by more numerous factors. There is no doubt that the uncertainty of the port hinterland has increased significantly.

Third, a macroeconomic perspective gives importance to the regional economy for the hinterland development. The World Bank 'emphasises the importance of considering corridors, particularly at the international level, as a means of improving the physical flows of goods compared to the traditional consideration of transport infrastructure and services on a fragmented basis' (see Arnold et al., 2005, cited from United Nations Economic Commission for Europe, 2010). Usually, there are two ways to understand the impact of regional economy on port hinterland development. First, cargo throughput will increase with the sustainable growth of the regional economy. Second, a strong regional economy and various relevant industry clusters could increase the region's impact in global or regional resource allocation, and therefore, create more cargo flow in or out of the port located in this region, resulting in the port hinterland being extended as far as possible. As the economic impact of this contribution typically extends beyond classical geographical settings, the spatial continuity of the hinterland might be fragmented (especially with the introduction of the concept of sea hinterland) and in turn, its geographic boundary may become more dynamic. For example, Singapore Port, by relying on its powerful logistics services and advanced shipping service industry, has established its position as an international shipping cluster and extended its hinterland (mainly refer to the sea hinterland) far beyond its traditional geographical boundaries.

### 2.2. Identification of influential factors defining hinterlands

Using the three perspectives proposed in Subsection 2.1 for hinterland development, namely, physical, logistics, and macroeconomic, we now examine the influencing factors of hinterlands in this subsection.

Essentially, the scale of port hinterland is determined by two elements: the spatial scope of shippers and how many shippers within it choose the port to and from which to distribute cargo. Thus, the port choices of shippers are quite important for the development of the port hinterland. Nowadays, the influencing factors for shippers' port choice are more complex, diverse, specific, and politicised than before (see the following Table 1).

From Table 1, the most influential factors for shippers' port choices are mainly related to cost, time, and service. Generally, the port

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