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Estimation of freight demand at Bartın Port using time series model

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Abstract

Bartın Port is one of the important ports of the Western Black Sea Region. In order to maintain their position in the global market where competition is increasing, ports should develop new strategies by carrying out future capacity estimation and efficiency measurements. It is necessary to strengthen the infrastructure and technologies at the ports according to the region and customer demands. In the study, Türkiye's GDP, total cargo handled in Türkiye, the population of Türkiye, and the population of Bartın were defined as independent variables. The time series model using the data obtained by the documentary scanning method was applied to the total cargo handling forecast at Bartın Port with a 95% confidence interval. According to the forecast time series model based on the collected data, the amount of cargo handled at Bartın port is expected to reach 2.8 million tons in the next ten years.

Introduction

Commercial ports are one of the essential components of maritime transport. Ports, which serve to fulfill many activities in the transportation chain, contact many organizations or individuals such as shippers, exporters, importers, logistics companies and state authorities, banks, insurance companies, and their essential functions [1]. Bartın Port is one of the important ports of the Western Black Sea Region and plays a key role, especially in mineral ore transportation [2], as it is close to the cities of Karabük and Zonguldak. Congestion at Bartın port and loss of efficiency and productivity will adversely affect the transportation network in the region.

Bartın Port, which is 11 km away from the city center of Bartın, is in the Western Black Sea Region of the Black Sea Region, at the mouth of the Bartın River, where it empties into the Black Sea. With the works carried out in 1991-1995, the pier length was increased to 480 meters by adding 260 meters to the existing 220 meters of dock length in the port. In terms of physical capacity, the port has the main administrative building, the additional building used by the Customs Directorate, two warehouses, watchtowers, kiosks, a waste reception facility, bilge tank, and wastewater tank. The depth of the port is 8 meters, and the inner diameter of the port is 300 meters. It has two warehouses of 1500 square meters, a concrete open area of 30 thousand square meters, and a stabilized open space of 2 thousand square meters [3]. In the port area, port service is provided with one pilot boat and one rental tugboat [3].

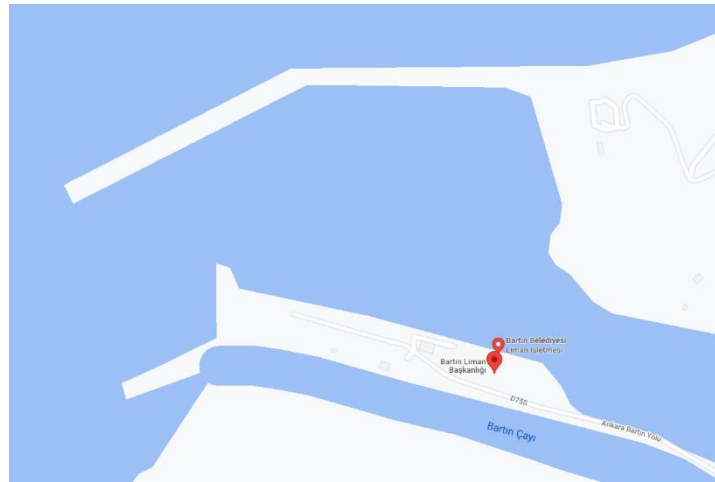


Figure 1. Bartın Port [4]

Private companies and owners carry out loading and unloading services at the port. Firms engaged in loading and unloading at the port organize mobile cranes used for cargo handling. The number of cranes, working days per year, the daily working hours, the average number of movements that the crane can make per hour, the working efficiency coefficient of the crane, the berthing rate, and the unit weight of the part affect the handling capacities of goods, general and dry bulk terminals [5].

Table 1. Data were compiled from UAB, TUIK, and WBG sources [6-8]

Year	Annual development of cargo handled at Bartın port (ton)	Annual development of cargo handled at Turkish ports (ton)	Annual development of Bartın's population	Annual development of Türkiye's population	Türkiye's annual GDP development (USD)
2004	676301	213105438	178122	66845635	40888000000
2005	701070	213025594	179097	67743052	50631000000
2006	1064281	248124426	180117	68626337	55706000000
2007	1105067	291573630	181156	69496513	68134000000
2008	1072963	314604651	182131	70363511	77046000000
2009	1161965	309436705	185368	71241080	64927000000
2010	1110214	348635867	188449	72137546	77699000000
2011	1146328	363346723	187758	74724269	83876000000
2012	1317819	387426232	187291	75627384	88056000000
2013	1778945	384930758	188436	76667864	95778000000
2014	1483978	383120619	189139	77695904	93895000000
2015	1462951	416036695	189405	78741053	86432000000
2016	1123334	430201162	190708	79814871	86969000000
2017	1294824	471173896	192389	80810525	85900000000
2018	1272234	460153560	193577	82003882	77847000000
2019	1358828	484168412	198999	83154997	76100000000
2020	1984035	496642652	198979	83614362	71995000000
2021	1981226	526306784	201711	84680273	79595000000

Studies show that the amount of cargo handled at ports has a significant relationship with GDP and population [9-11]. Bartın Port efficiency decreases in cases such as the contraction of mining operations in the region and increases in the opposite circumstances. In a study conducted by Çelik and Murat [12], the economic structure of Bartın Province was examined, and it was concluded that the most vital aspect of the city was the commercial use of Bartın Port.

Material and Method

The documentary scanning method was used to analyze the current situation in Bartın port. Information on the cargo handling at the port, the number of ships calling at the ports, and the cargo carried in the cabotage were compiled and analyzed. IBM SPSS Statistical Version 26 was used for descriptive analysis and time estimation model with a 95% confidence interval. The study defined Türkiye's GDP, total cargo handled in Türkiye, Turkish population, and Bartın population as independent variables.

Results

According to the estimation time series model based on the collected data, it has been calculated that the amount of cargo handled in Bartın port will be over 2.5 million tons in 2028 and over 2.8 million tons in 2032.

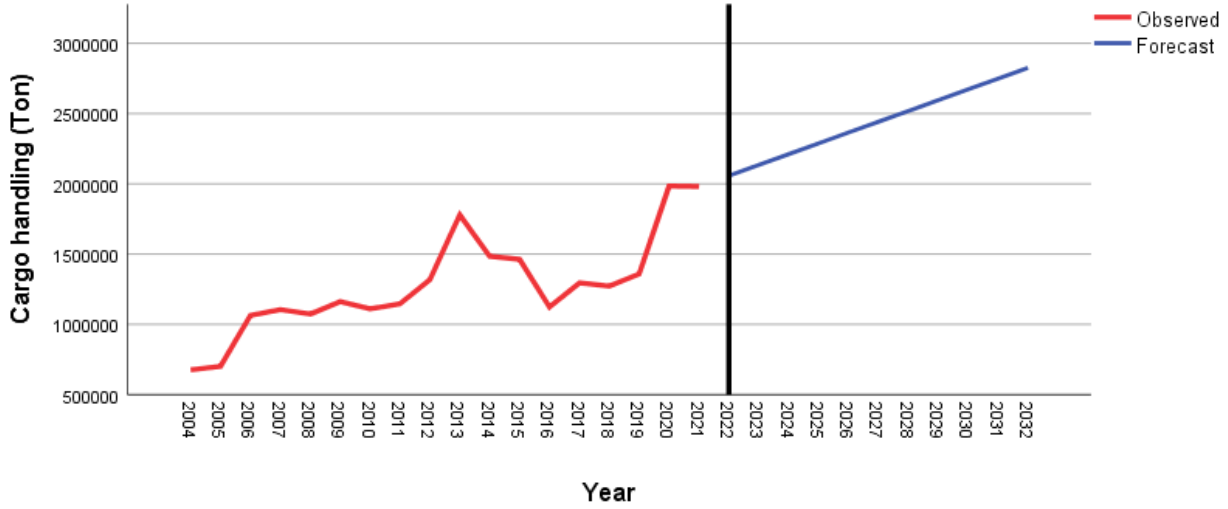


Figure 2. Bartın port cargo handling demand chart

Discussion & Conclusion

It is estimated that the capacity and efficiency of Bartın Port, where mainly plaster, cement, coal, clinker, construction materials, and miscellaneous cargoes are handled, will increase. Considering the efficiency of cranes, berth availability, water depth, and the specific gravity of the transported shipment, the efficiency, and effectiveness of Bartın Port can be increased with structural reforms, if necessary.

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