DEMAND FORECASTING FOR YACHT TOURISM PLANNING IN TURKEY

A.Karanci[1], I.Guler[2], A.Ergin[1] , A.C. Yalciner[1]

[1]Department of Civil Engineering, Middle East Technical University, Ankara,Turkey

[2]Yuksel Proje Uluslararasi A.Ş., Ankara, Turkey

ABSTRACT

Integration of forecasts to the strategic planning is necessary for sustainable and use of the coastal resources. In this study two different quantitative forecasting techniques - Exponential smoothing and Auto Regressive Integrated Moving Average (ARIMA) methods - were used to estimate the demand for yacht berthing capacity demand till 2030 in Turkey. Forecast results suggested that yacht tourism will continue to intensify increasing the demand on infrastructure.

Aiming a dynamic plan which is responsive to both national and international developments in yacht tourism, potential investments were determined by using multi-criteria decision making processes. This study provides a multi dimensioned point of view to planning problem. The paper highlights the need for sustainable and dynamic planning at delicate and high demand areas such as coasts.

INTRODUCTION

Turkey, with its climate, protected bays, cultural and environmental resources is an ideal place for yachting. Subsequently, yacht tourism is developing consistently. Yacht tourism can cause unmitigated development and environmental concerns when aiming to achieve tourist satisfaction. As the demand for yacht tourism intensifies, sustainable development strategies are needed to maximize natural, cultural and economic benefits.

Forecasting plays a crucial role in tourism planning. Demand forecasts of yacht tourism will be the fundamental input for national regional and local development plans to reduce the risk of future shortages or surpluses in goods and services.

In this study, two time-series forecasting techniques - exponential smoothing and ARIMA - were utilized to forecast the 2030 yacht berthing space demand for Turkey.

YACHT TOURISM IN TURKEY

Yacht tourism in Turkey has come up with the revival of domestic and especially foreign demand in the second half of 1980's. The first motion of yachting in Turkey has been provided by appropriate foundation of Aegean and Mediterranean coasts for yacht tourism and in addition by being estranged of world yachters from other yachting regions in terms of hygiene, intensity and habits.

As seen from Table 1, marinas and berthing facilities in Turkey are mostly located at Aegean and Mediterranean Regions. There are no marinas or related facilities that are in operation in Eastern Mediterranean and Black Sea Coasts.

Table 1: Capacities of Marinas and Berthing Facilities in Turkey (DLHI, 2010)

Province	No	Marina	Sea	Land
Antalya	1	Kaleiçi Marina	65	0
	2	Çelebi Marina	235	300
	3	Setur Finike Marina	300	150
	4	Kemer Türkiz Marina	240	140
	5	Kaş Marina	450	150
Aydın	6	D-Marin Didim	580	600
	7	Setur Kuşadası Marina	350	175
Muğla	8	Ece Saray Marina	400	0
	9	Fethiye Municipality Marina	150	0
	11	My Marina Berthing Place	75	0
	12	Göcek Municipality Marina	150	0
	13	Port Göcek	385	150
	14	Skopea Marina	67	0
	15	Göcek Club Marina	205	0
	16	Marina Turk Göcek Village Port	185	240
	17	Marina Turk Exclusive	100	0
	18	Bodrum Milta Marina	455	50
	19	Bodrum Belediye Marina	300	0
	20	D-Marin Turgutreis	550	100
	22	Port Bodrum Yalıkavak	350	100
	23	Yat Lift	0	100
	24	Ağanlar	0	200
	26	Albatros Marina	150	240
	27	Netsel Marmaris Marina	676	120
	28	Martı Marina	350	100
	29	Marmaris Yacht Marina	460	575
İzmir	31	Levent İzmir Marina	70	60
	32	Setur Altınyunus Çeşme Marina	180	60
	33	Alaçatı Marina	250	70
	34	Dalyanköy Berthing Place	100	0
	35	IC Çeşme Marina	400	100
	36	Sığacık Marina	400	200
	37	Old Foça Berthing Place	75	0
İstanbul	38	Kumburgaz Güzelce Marina	250	100
	39	B. Çekmece Marina	150	0
	40	Ataköy Marina	700	100
	41	Kalamış and Fenerbahçe Marina	1,010	220
	42	Atabay Marina	0	100
Balıkesir	43	Ayvalık Setur Marina	200	150
Çanakkale	44	Çanakkale Marina	65	0
TOTAL			**11,075**	**4,650**

Total yacht mooring capacity of marinas and yacht mooring facilities in Mediterranean Basin is about 500 thousand and the capacity of Turkey constitutes approximately 4% of total capacity in Mediterranean Basin (see Figure 1).

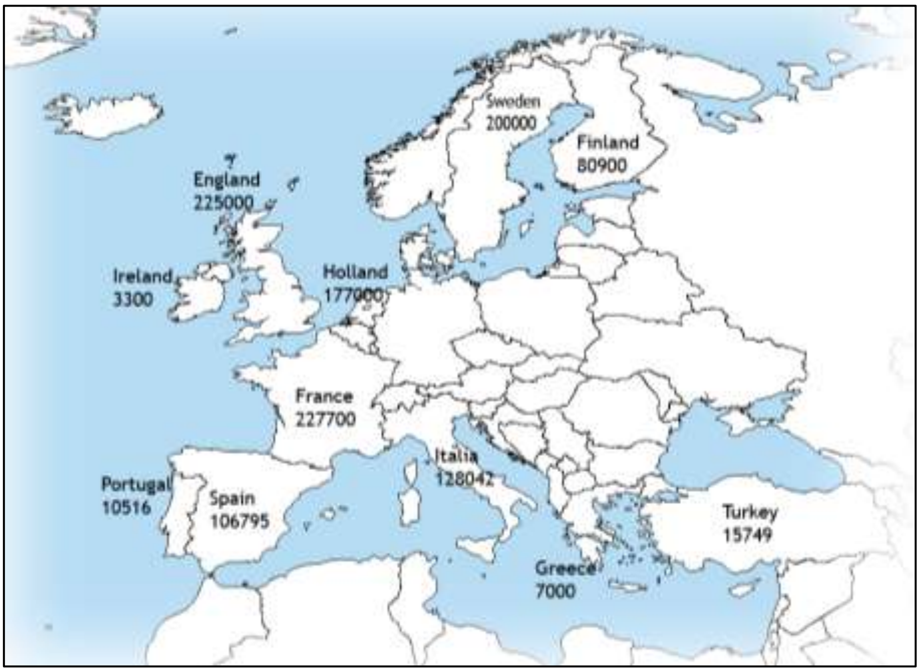

Figure 1. Yacht Berthing Capacities in Mediterranean

In recent years due to sea pollution occurred in Western Mediterranean Sea and increases in prices, Eastern Mediterranean Sea has become an indispensable place for yachters. Taxes imposed for yachts in European Union countries caused yachters to visit Eastern Mediterranean Sea; and this has constituted a good opportunity for Turkey for yacht tourism. Yachters' demand for discovering new places result in new yachting places in Eastern Mediterranean Sea. In addition, especially Mediterranean, Aegean Sea and Marmara Sea have a great economic potential with their natural and historical wealth, geographical properties and mild climate conditions.

METHODOLOGY and ANALYSIS

In general tourism demand forecasting is generally categorized into two-categories: quantitative and qualitative(Song & Li, 2008). Qualitative methods use expert judgments to organize the past information of the variable. Qualitative forecasts are used when historical information about the variable is not available.

Quantitative methods employ mathematical rules to identify the patterns and relationships of the phenemonon to predict future patterns. Quantitative methods can be used when the past information of variable exists and can be quantified. These methods also assume past patterns will continue into the future.(Makridakis, Wheelwright, & Hyndman, 1998)

In this study exponential smoothing and non-seasonal ARIMA were used in forecasting the future yacht berthing demand. Demand forecasting methods are given below, briefly.

Exponential Smoothing

Exponential smoothing method produces smoothed time series by assigning exponentially decreasing weights to older observations. In this method as the weight of the data will decrease exponentially as data get older (Touran & Lopez, 2006). Since seasonality is not expected in annual data single exponential smoothing was adopted.

ARIMA

The abbreviation ARIMA stands for "autoregressive integrated moving average." ARIMA approach is designated to design the simplest model for describing the past patterns of observed data forecasting that are based on linear functions of observations. Forecasts produced by ARIMA models are based on linear functions of the sample data.

ARIMA processes which are sometimes called as Box-Jenkins models consists of three parts. The model is often denoted as ARIMA(p,d,q) where p is the order of autoregressive component, d describes the order of differencing needed in order to achieve stationary time series and q describes the order of moving average component. The three components of the ARIMA method are described below.

DATA and VARIABLES

In this study future demand study for berthing spaces is carried out for the next 20 years. Thus, historical data is needed to extrapolate up to 2030 within the scope of the design phase.

Available Yacht Tourism Data

In Turkey, the most difficult challenge for forecasting is inadequacy of the available yacht tourism data. Data presented in Yacht Statistics Yearbooks (Ministry of Culture and Tourism, 1992 - 2009) only relays yacht movements in Turkey, not berthing space demand.

In order to acquire the lacking historical data for yacht berthing space demand, surveys have been performed in Coastal Tourism Structures Master Plan Studies (DLHI, 2010). In scope of the Master Plan Studies, a questionnaire inquiring information about capacity, infrastructure, yacht berthing trends, environment protection measures and demographic information about the employees of the yacht harbor was prepared and sent to 35 yacht harbors located at Turkey shores. The response rate was %63; 22 of the questionnaires were returned. The berthing capacity provided by the marinas which responded to questionnaires corresponded to %81 of the capacity of Turkey.

The yacht berthing historical data gathered from the questionnaires had not accounted for the yachts moored freely at the protected bays. These yachts over-crowd the bays and cause environmental threats to the marine environment due to anchoring and waste disposal. In order to prevent these social an environmental problems, yachts mooring freely at the protected bays should be encouraged to use organized berthing spaces by creating adequate capacity and enforcing legal obstacles. In order to create adequate capacity these yachts should also be accounted for in future demand. An index which calculates the free yacht/mooring space density is produced in order to include these yachts into the forecasts. For the calculations, data was taken from;

- Göcek capacity assessment study (METU, 2007)
- Bay Assessment Study (Chamber of Shipping Bodrum Branch, 2006)
- Bodrum Bay Assessment Study (Chamber of Shipping, 2006)

Mentioned studies (Göcek Capacity assessment study and bay assessment studies) all provide number of yachts moored freely at Aegean Sea Bays. Incorporating these data with the yacht numbers found from Google Earth images yacht numbers moored freely at protected bays were found. The free yacht/mooring space proportion of the regions was then calculated to attain a connection between the existing infrastructure and free yachts.

The free yacht/mooring space proportion defined as densities are given in Figure 2 where four different areas were categorized. The least dense area is Marmara Region with a density of 0.17. The most crowded area is the coastline between Bodrum and Göcek. Density for this area is calculated as 0.34. The density between Bodrum to Çanakkale and Kaş to Anamur are found as 0.25 and 0.22 respectively.

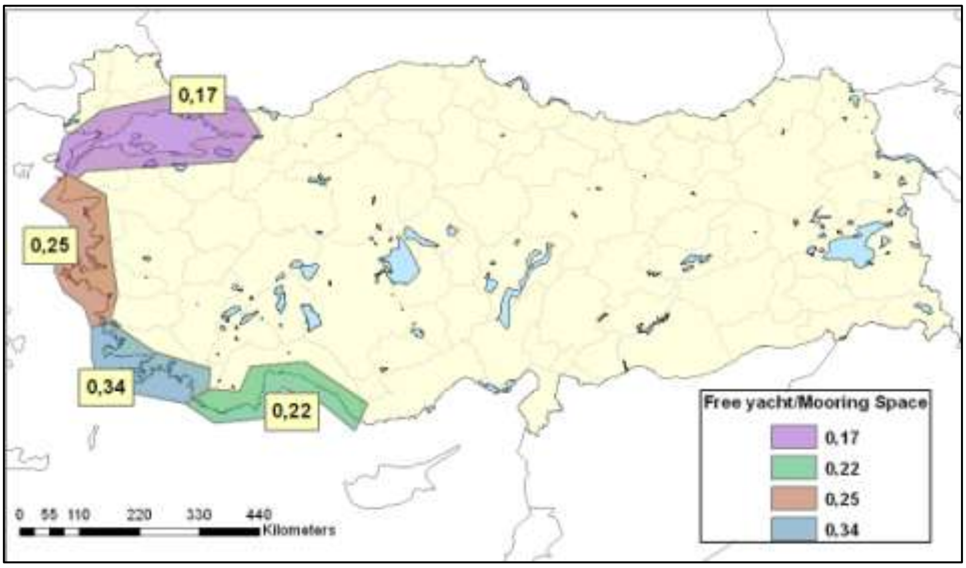

Figure 2. Yacht Densities at Turkey Shores

Combining the data from Coastal Tourism Structures Master Plan Study (DLHI, 2010), with the calculated index values historical yacht berthing space demand from 1998 to 2008 for Turkey is gathered. Demand for berthing space is given in Figure 3.

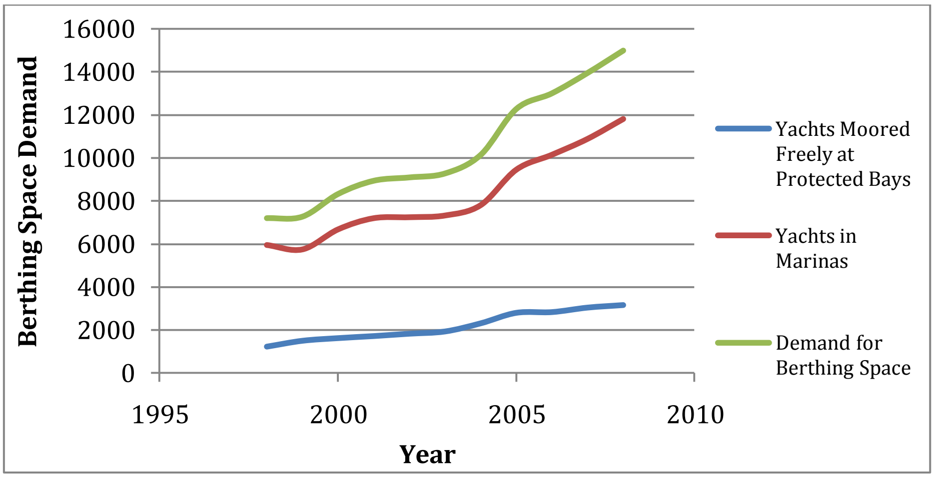

Figure 3. Berthing Space Demand Trends in Turkey

RESULTS AND ANALYSIS

The accuracy of the models discussed was analyzed according to the mean absolute percentage error (MAPE) and the Pearson product moment correlation coefficient (r).

Mean absolute percentage error (MAPE) is a sum of the absolute errors for each time period divided by the actual value for the period, divided by the number of periods. Then, by convention, this value is multiplied by 100. This is a simple measure allowing the comparison of different forecasting models with different time periods and numbers of observations, and weighting all percentage error magnitudes the same (Song & Witt, 2000). Lower MAPE values are preferred to higher ones since they indicate a forecasting model with smaller percentage errors (Frechtling, 2001). MAPE can be denoted as:

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Where n is number of periods, e is the forecast error and D is the actual demand value.

Table 2 shows the results of the different forecasting models. ARIMA (0,1,0) model show similar results and outperform the naïve and exponential smoothing models.

Table 2. Accuracy Comparison of Forecasting Models Used

	r	MAPE
Naive	0.905	6.783
Single Exponential Smoothing	0.813	5.294
ARIMA (0,1,0)	0.947	3.143

According to the analysis, ARIMA seems to be the best forecasting method for berthing space demand. Accordingly, the results using ARIMA is presented.

YACHT DEMAND ESTIMATIONS USING ARIMA METHOD

Using SPSS software seasonal ARIMA models were analyzed using 95% confidence interval. Annual berthing space data from 1998 to 2008 was entered in to the model. The best fitting forecasting model was chosen according to MAPE values.

SPSS analysis estimated that ARIMA (0,1,0) model gives the best fit when MAPE is used as the measure of accuracy. MAPE for ARIMA (0,1,0) model is calculated as 3.143 which indicates a suitable fit. The predicted berthing space demand data and confidence intervals for ARIMA (0,1,0) is given in Table 3 and Figure 4.

Table 3. Yacht Demand Estimations with ARIMA Method

Year	**Lower %95**	**Predicted Demand**	**Upper %95**
2011	16,004	17,891	19,423
2012	16,549	18,708	20,497
2013	17,126	19,526	21,539
2014	17,725	20,343	22,559
2015	**18,341**	**21,162**	**23,562**
2016	18,970	21,979	24,552
2017	19,610	22,797	25,531
2018	20,259	23,614	26,501
2019	20,917	24,432	27,462
2020	**21,581**	**25,249**	**28,417**
2021	22,250	26,067	29,367
2022	22,926	26,884	30,310
2023	23,606	27,702	31,249
2024	24,290	28,519	32,184
2025	**24,978**	**29,337**	**33,115**
2026	25,669	30,155	34,043
2027	26,364	30,973	34,967
2028	27,062	31,790	35,888
2029	27,762	32,608	36,807
2030	**28,465**	**33,425**	**37,723**

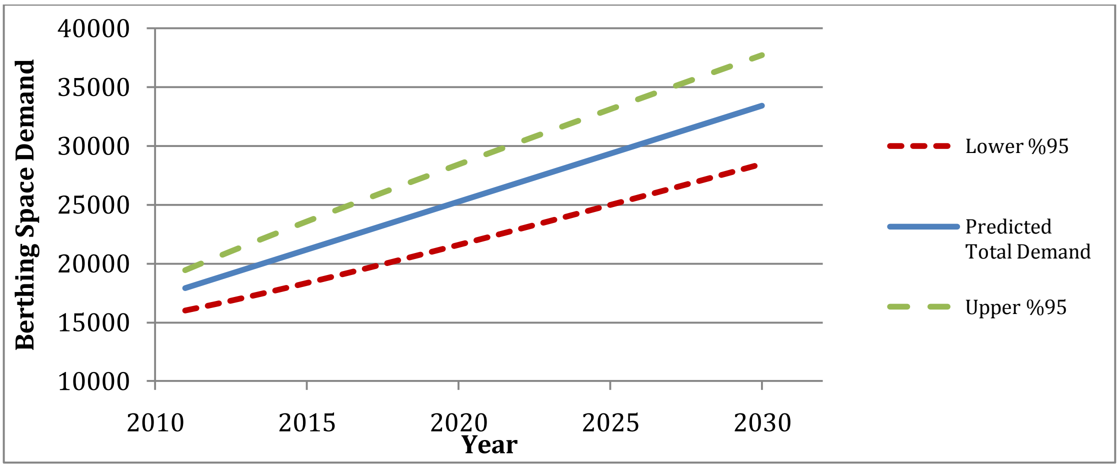

Figure 4. Berthing Space Demand Trends in Turkey Estimated by ARIMA (2010 – 2030)

Distribution of the berthing capacity along the Turkish coastal areas was done using the estimations (see Table 3) produced by ARIMA forecasting method.

BERTHING SPACE DEMAND DISTRIBUTION FOR TURKEY (2010-2030)

Based on environmental, socio-economic and geographic data and the opinions gathered from stakeholders such as marina operators, local communities and government officials an allocation model was developed for the successful allocation of the predicted demand seeking social and economical growth while preserving the coastal environment. Therefore new marina investments were proposed in view of the above given sustainable development principals. In Turkey, existing marinas are mostly located in the most attractive and often the most fragile environments. However, because of the highly fragile nature of coastal environments over exploitation of these areas may have severe consequences on the environment. The uneven utilization of Turkey coasts also causes unequal distribution of investments and tourism expenditures. While popular areas benefit significantly from tourism, remaining areas are mostly neglected. In order to overcome the regional disparities and protect the ecological integrity of the coasts when planning for spatial development of marinas social, economic and ecological development effects were considered. According to these properties, 8 different regions were formed (see Figure 5).

Figure 5. 8 Different Coastal Regions of Turkey

Distribution of the forecasted demand amongst the proposed 8 regions at 2030 was carried out by AHP (Analytic Hierarchy Process) decision making model (Karanci, 2011) (see Table 4). AHP was used to prioritize the coastal regions in order to distribute the berthing space demand aiming sustainable development.

Table 4. New Berthing Spaces Proposed in view of Sustainable Development (2010-2030)

Regions	**Proposed Berthing Spaces**	**Total Berthing Spaces**
Region 1 (Muğla)	1,600	9,904
Region 2 (İzmir – Aydın)	2,000	5,670
Region 3 (Antalya)	1,600	4,930
Region 4 (Eastern Mediterranean)	1,200	2,300
Region 5 (Marmara)	900	1,750
Region 6 (İstanbul)	1,200	3,830
Region 7 (Western Black Sea)	2,400	2,400
Region 8 (Eastern Black Sea)	3,000	3,225
Total	**13,900**	**34,009**

As can be seen from the Table 4, the total yacht berthing space at 2030 for Turkey is proposed to be approximately 34,000.

CONCLUSIONS

In this study forecasts were done by very limited data. So it is especially crucial that the results of the forecasting should be monitored and evaluated at 5 year periods. There is not only lack of crucial data, but most existing data are not readily processed for yacht tourism forecasting and planning. Therefore, there is not only a need for data collection studies also need for useable data for the coastal tourism at Turkey.

For the future studies, sustainable development plans should be integrated with GIS for a spatial recognition of the coasts and uses. It is also recommended to re-design the prioritization process with the opinions gathered from the users of the yacht tourism system.

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