DETERMINING THE MARITIME TRANSPORTATION POLICY OF TURKEY

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A Erdoğan and **G Kara,** Maritime Transportation Management Engineering, Istanbul University - Cerrahpaşa, Turkey

SUMMARY

Maritime transportation, Turkey's position in the sector and determining Turkey's maritime transportation policy with the help of SWOT (Strengths, Weaknesses, Opportunities, Threats) - AHP (Analytic Hierarchy Process) integrated method is researched within all details. First of all, the maritime transportation and the position of Turkey in maritime transportation are indicated briefly. The progress and the position of maritime transportation in the world and the status of the maritime transportation in Turkey are all examined. Secondly, the method of the research is shown and SWOT - AHP integrated method is explained. After that, SWOT - AHP method has been performed to select the best alternative. Finally; it has been discovered that *SO* (using strengths to catch opportunities) is the best alternative that can determine Turkey's maritime transportation policy rather than *WO* (using opportunities to avoid weaknesses), *ST* (using strengths to avoid threats) and *WT* (realizing weaknesses to avoid threats).

1. INTRODUCTION

International trade and maritime transportation have begun before the ages and maintained their globality (Jay, 2018; Alavi, 2018). Maritime and trade issues have been globalized throughout history and have evolved accordingly (Gonzalez-Laxe et al., 2016). Maritime transportation and globalization are the factors that influence each other mutually (Graziano et al., 2017). Maritime transportation is a concept that concerns all countries, nations, economies, organizations, businesses and institutions in the world (Pyc, 2016; Ekberg et al., 2015). Maritime transportation is closely related with components like economy, trade, military power, international relations, tourism, law, politics, strategy, management sciences, engineering, business and diplomacy (Fritz and Hanus, 2015; Walker, 2016).

Maritime transportation policy should have a purpose and application that includes larger objectives (Rodrigue et al., 2009). It is necessary to select the objectives carefully in order to have a better maritime transportation policy (Alderton and Saieva, 2013).

In this context, Turkey's international trade and maritime transportation have not developed much due to the economic situation and location even she is surrounded by seas. The use of the seas has a low share of transportation, economy and trade in Turkey (Kose et al., 2018; Soner et al., 2017). There are many institutions, organizations, scholars and statesmen who work to develop and lead the shipping and maritime issues of Turkey that she deserves an advanced position in the world (Celik and Topcu, 2014). But this is not easy for a country that defines itself as a terrestrial country throughout history and maintains its continental culture accordingly. In general, the policies for maritime development should be established and the appropriate ones should be put into effect. In this way, Turkey can show growth in maritime transportation.

There are many methods for a best policy to determine in the field of maritime (Shi and Li, 2017; Celik and Topcu, 2014). A policy that can be identified with the SWOT-AHP model can be a good alternative. A model to be created using the data and analysis related with the maritime transportation will help to determine the maritime transportation policy of Turkey. That model will be able to provide the growth in shipping and maritime.

In order to analyze the available data, many methods of numerical analysis can be used, and different methods such as market analysis, comparative analysis, input-output model, system analysis, statistical analysis, data envelopment analysis or mathematical analysis may be used (Soner et al., 2017). But maritime science is an interdisciplinary science, addressing many different fields and being directly related to human factor. So, SWOT-AHP integrated method makes it more convenient to analyze maritime data and knowledge.

In the SWOT-AHP integrated method, the SWOT analysis and the complementary AHP method are used for the installation of the model. Instead of AHP; other multi-criteria decision making methods such as ANP, TOPSIS, VIKOR and ELECTRE can also be used in other methods of analysis.

In general, transportation refers to the interchange and movement of people or goods from one place to another (Rodrigue et al., 2009). In the era of globalization that we are in, transportation which includes the access and change of information, money and services from one place to another, is expressed by the same concept of logistics (Fritz and Hanus, 2015; Maier, 2014). In practice, transportation and logistics influence the texture of human societies in areas such as economics, engineering, politics, resource utilization, social interaction and recreation (Keeling, 2007). Road transportation, rail transportation, maritime and waterway transportation, pipelines and data cables are important transportation modes (Shi and Li, 2017; Graziano et al., 2017).

The maritime transportation, a sub-unit of transportation, is intertwined with the concept of maritime logistics, and often these two terms are used to refer to similar sectors

(Alderton and Saieva, 2013). Maritime transportation refers to the transportation of things, such as cargo or living things like humans or animals, from one place to another by sea and with sea-going vessels (Graziano et al., 2017; Ekberg et al., 2015). Although maritime logistics has a similar meaning, but the difference is that it also refers to the ongoing part of sea transportation in the land and hinterland of the ports and maritime routes (Lobrigo and Pawlik, 2015). In this context, the maritime logistics system consists of a network that includes private maritime vehicles, visited ports and transportation elements like factories, terminals, distribution points and markets (Corbett et al., 2010).

As mentioned earlier, the maritime transportation provides the transport of things such as cargo, humans and animals. The cargo that is carried by way of sea has a wide range like petroleum derivatives such as crude oil, LNG, CNG, fuel oil; various types of liquids, bulk cargoes and containers containing a wide range of liquids or solids such as cereals, water, ore, wood, timber and sand (Suarez-de Vivero and Rodriguez-Mateos, 2018; Pyc, 2016). Each cargo has its own type of transportation styles and transportation ships. Various classifications are possible according to distance, load, routes and services. Maritime transport can also be grouped into three main classes according to distance as cabotage transportation, shortsea transportation and international (oceangoing) transportation (Alderton and Saieva, 2013).

In terms of continuity and regularity of service, transportation is examined in two groups under the name of liner and tramp transportation (Suarez-de Vivero and Mateos, 2014). Liner transportation refers to the transportation between certain ports, in accordance with the public tariffs, with the ships operating according to the regular schedules (Rodrigue et al., 2009). The distinctive feature of liner transportation is the continuous service it ensures. Therefore, even if the ships do not find sufficient load, they come to the ports in order not to disrupt the program (Ugurlu et al., 2017). The ports that are removed from the program are also announced to the installers and carriers in advance (Alderton and Saieva, 2013). This type of transportation has the highest cost because of the high rate of port time within the voyage (Lobrigo and Pawlik, 2015).

2. TURKEY'S POSITION IN MARITIME TRANSPORTATION

Turkey that is a partly shaped peninsula surrounded by the seas is a country with a coastline of about 8,300 km. There are all kinds of facilities to take advantage of the seas and maritime routes. Her presence in the Mediterranean basin, due to her proximity to the rich oil and gas resources in sectors such as transport and energy, Turkey is a country that should come ahead in the maritime issues.

Turkey's position in maritime transportation is in an effort to reach a considerable position today. Turkey’s maritime transportation fleet is growing day by day and as the economy improves and production increases, Turkey will reach the position it deserves in the world in terms of maritime space (Kose et al., 2018).

The number of Turkish ships in the whole international transportation is 1,522 (633 Turkish flagged ships and 889 foreign flagged ships that owned by Turkish ship owners) with a DWT of 27,241,000 (Trade and Development, 2018). Turkey is 15th in the world that has the ships in terms of DWT (Trade and Development, 2018).

As an example, there are 774 Greek flagged ships and 3,597 foreign flagged ships that are owned by Greek ship owners in the world (Trade and Development, 2018). The Greek ships in the whole international transportation has 330,176,000 DWT (Trade and Development, 2018). Greece has the biggest owned ships in the world in terms of DWT.

As another example, there are 943 USA flagged ships and 1,128 foreign flagged ships that are owned by USA ship owners in the world (Trade and Development, 2018). The USA ships in the whole international transportation has 68,930,000 DWT (Trade and Development, 2018). USA is 8th in the world that has the ships in terms of DWT (Trade and Development, 2018).

At the same time, the conditions provided by the flag of convenience states have a big share in this theme (Rodrigue et al., 2009). Therefore, Turkey and the majority of other countries are using foreign flags because they benefit from them. In 2018, the countries such as Panama, Liberia, Marshall Islands and Hong Kong, the flag of convenience states, are leading the world as a percentage of DWT. Turkey ranks 30th with 0.4% (Trade and Development, 2018).

The flag of convenience states are at the highest level with their incentives, bureaucratic facilities and tax deductions (Alderton and Saieva, 2013). In recent years, developed countries such as Germany, France and England provide such incentives and wishes to become a flag of convenience state (Fan et al., 2014; Maier, 2014). The reason for this is the importance of the flag of a country on international platforms and the desire to get more share from commercial transportation.

After all that, it can be seen that the position of Turkey in the world was inadequate. It can be also said that some of the countries that are in competition with Turkey seem to be ahead of Turkey and some others are behind Turkey. For the determination of Turkey’s maritime transportation policy, many components and inputs are needed. The current global economy, international law, national government policies, international relations and the security of maritime routes are just a few of them. As a result of the analysis of all these components in a suitable way, an appropriate maritime transportation policy can be determined for Turkey. With the help of this, Turkey may

come to the front and become an advanced country in the field of maritime in the future with a convenient and efficient policy.

3. METHODOLOGY

As mentioned, SWOT-AHP integrated method will be used in this study and a 2-stage system will be applied. First, SWOT analysis will be carried out and as a result of this, the strategies of *SO, WO, ST* and *WT* will be determined. In the second stage, the most appropriate strategy as a result of SWOT analysis will be determined by applying AHP.

In SWOT analysis; the strengths, weaknesses, opportunities and threats of Turkey's maritime transportation will be determined. In order to determine these, the past and recent studies on maritime transportation will be examined and the opinions of the experts in the maritime areas will be utilized (Celik and Kandakoglu, 2012). As a result of a SWOT study, the components are compared to each other and one of the four main strategies of *SO, WO, ST* and *WT* is recommended (Arslan and Turan, 2009).

SO strategies are the strategy of a company, organization or policy that is used for obtaining the inherent strength of the situation to be taken advantage of external opportunities (Arslan and Turan, 2009). All managers and policy-makers wish to ensure that their situation or events meet these requirements.

WO strategies are the strategies to use the opportunities offered by the external environment (Arslan and Turan, 2009). This strategy is implemented by taking into account the weaknesses of the situation or event to be analyzed.

ST strategies are the strategies that block the threats from the external environment of the situation or event to be analyzed (Arslan and Turan, 2009). It is a strategy that allows the efforts to reduce or minimize the disadvantages.

WT strategies are strategies for minimizing or avoiding threats from the external environment by taking into account the weaknesses of the situation or event to be analyzed (Arslan and Turan, 2009).

The components of the SWOT matrix indicate the necessary alternatives. The AHP model can be established by using the main criteria as opportunities, threats, strengths and weaknesses and the alternatives as *SO, WO, ST* and *WT* strategies.

4. SWOT ANALYSIS (1st STAGE)

The history of SWOT analysis dates back to the 1960s. It is a decision analysis method that has been used and disposed for decision support for many years (Stahlbock and Voss, 2011). The main objective of the SWOT analysis is to describe strengths, weaknesses, opportunities and threats and to transform weaknesses to strengths and to turn threats into opportunities to create a source of information for strategies (Kececi and Arslan, 2017). The most important aspect of the SWOT analysis is that it allows the organization to evaluate both internal and external situation.

After the SWOT analysis and determination of the directions of the enterprises or businesses, a matrix is created (Joyce, 2015). The created matrix presents the opportunities beyond the enterprise together with the strengths to be used to turn these opportunities into success, the risks that pose the business and the weaknesses that may be dangerous.

With the help of this introduction, Turkey's strengths and weaknesses, opportunities and threats in the field of maritime transportation can be explored and diagnosed in many ways. These can be determined by conducting a scientific survey, documents, reports, publication screening or literature review. As a result of SWOT analysis, the factors that may and will have an impact on maritime transportation can be revealed more concretely.

SWOT analysis can be done in two sub-analyzes (Celik and Kandakoglu, 2012). One of them is the analysis of the internal environment that shows the strengths and weaknesses of the organization. The other sub-analysis is the external environment analysis and that identifies opportunities and threats that may affect the organization.

4.1 DETERMINING STRENGTHS AND WEAKNESSES

If Turkey's maritime transportation's internal environment to be investigated; the subdomain of maritime related institutions, organizations, companies, associations and areas of maritime trade in Turkey should be examined. In addition, the relationship between these institutions, organizations, corporations and companies in sub-areas related to maritime trade should be examined (Alderton and Saieva, 2013).

The maritime shipbuilding market and the institutions providing maritime education can also be considered in internal analysis in Turkey. These also include maritime companies, institutions and organizations that set up maritime legislation. People who are competent in maritime, ministries and maritime law are in direct interaction with the maritime sector (Shi and Li, 2017). These institutions and organizations that make up the maritime legislation provide international and national norms, laws and rules to the shipbuilding sector, the maritime education institutions and the maritime companies (Alderton and Saieva, 2013). The formation of new companies, the construction of new ships, the construction of new ports and marinas, and the opening of new educational institutions are the key elements to be considered in the internal environment analysis (Rodrigue et al., 2009).

After the elements and methods mentioned in the internal environmental analysis, strengths and weaknesses can be determined. The strengths are the features that distinguish the businesses from others and are relatively advantageous compared to their rivals (Alavi, 2018). They express what is good and correct in business.

As a result, strengths of Turkey in the maritime transportation are specified in Table 1. The aim of identifying the strengths is to use these in the most beneficial way and to create strategies in which the existing strengths can be used.

For a business or enterprise, weakness means less effective ways or activities than other competitors or rivals in the field. Generally speaking, weakness is a bad situation when the business is worse than its competitors.

Weaknesses in Turkey's maritime transportation are specified in Table 1 also. The aim of identifying weaknesses is to reduce weaknesses and even turn into weaknesses to strengths by way of the suitable strategies.

4.2 DETERMINING OPPORTUNITIES AND THREATS

The second sub-analysis of the SWOT analysis is the external environment analysis. In this analysis, the enterprise or business receives a number of inputs from the external environment. These inputs are sources such as raw materials, semi-finished products, financial resources, human resources and information resources to be used by the enterprise or business in production (Joyce, 2015). The external world -named as outer world- of the enterprise supplies various elements to the enterprise. Also, the enterprise transfers its outputs to another external environment. As seen here, the enterprise is surrounded by many external environment elements.

The analysis of the external environment is carried out as described above for the enterprises. Similar elements are considered in the application of this analysis to maritime. The analysis of the external environment related to Turkey's maritime policy shows that the level of the other countries in maritime issues and the areas in which they showed progress related to maritime.

Table 1. Weaknesses and strengths of the maritime transportation in Turkey

No	**Weaknesses**	**Source**
W1	Lack Of Historical Part Of Turkish Maritime Trade	Ugurlu et al., 2017; Gokhan, 2016
W2	Economic Problems and Irregularities	Suarez-de Vivero and Rodriguez-Mateos, 2018; Kolesnikova, 2017
W3	Shortage of Academic Staff In Maritime Field	Celik and Topcu, 2014; Akdemir and Atac, 2015
W4	Problems Related to Maritime Zones	Suarez-de Vivero and Mateos, 2014; Karan, 2007
W5	Low Number Of Qualified Educational Institutions and Organizations	Soner et al., 2017; Tsiotas and Polyzos, 2015
W6	Fewness of Owned Fleet Capacity	Tsiotas and Polyzos, 2015
W7	The Age Of The Fleet	Alavi, 2018; Yılmaz et al., 2016
W8	Locality of Turkish Maritime Companies	Celik and Topcu, 2014; Celik et al., 2009b
W9	Ratio of Turkish Flag Ships to Foreign Flagged Ships	Celik and Topcu, 2014
W10	Duration of IMO Rules' Entry Into Force in National Law	Graziano et al., 2017
No	**Strengths**	**Source**
S1	Be Surrounded By Seas	Celik and Akyuz, 2018
S2	Ability To Build Own Marine Facilities (Port, Harbor, Shipyard, Marina etc.)	Walker, 2016
S3	Maritime Population (Maritime Companies, Shipbuilding, Fishing, Sea Tourism, Water Sports, etc.)	Kolesnikova, 2017
S4	Capability To Educate Own Seamen and Seafarers	Ugurlu et al., 2017
S5	Level of Institutions/Organizations Providing Maritime Security and Safety (Naval Forces, Coast Guard, Coastal Safety)	Garamendi, 2015
S6	Applicability Of Turkish Seamen's and Seafarers' Competence Internationally	Ugurlu et al., 2017
S7	Owned Naval Fleet Capacity	Fritz and Hanus, 2015
S8	Number of Yachts Built/Ordered in Shipyards	Soner et al., 2017
S9	Activity in the International Maritime Sector	Kolesnikova, 2017; Kara and Emecen Kara, 2016
S10	Having Young, Dynamic, Qualified and Educated Seamen and Seafarers	Ugurlu et al., 2017; Celik et al., 2009a

As mentioned in the previous sections of the study, countries such as Greece, Liberia and Panama are the flag of convenience countries and these countries facilitate transportation and transportation activities; countries such as Norway, USA and UK have well educated seamen, seafarers and advanced maritime legislation; countries such as China, Singapore, Japan and South Korea are the leading countries in ship building industry, economy, raw materials processing and transportation; countries such as USA, UK, Russia, France and Germany are advanced countries for providing maritime security and safety (Kolesnikova, 2017). These countries are different in all areas of maritime as well as having different characteristics. It is an important right to take advantage of the seas in the world whether or not the country has a sea or ocean coasts (Roe, 2010). For this reason, countries have developed in different areas in order to use this right in maritime domain.

After the elements and methods mentioned above in the external environment analysis, the opportunities and threats for Turkey's maritime transportation can be determined. The opportunity can be defined as any situation that the environment offers to the businesses or enterprises and can be used to achieve the goals successfully (Alavi, 2018). In other words, the opportunity can be expressed as the paths that provide real opportunities for future growth and the most potential to improve the competitive advantage.

The opportunities in Turkey's maritime transportation are set out in Table 2. The maritime domain and economic partners in Turkey cannot create opportunities themselves, however they can develop strategies that will best use these opportunities by identifying the most available of them.

Threats are situations that make it difficult or impossible for the businesses or companies to realize objectives (Alavi, 2018). Environmental factors may adversely affect the future performance of the company. Threats don't always come from outside. There may be situations in which the internal nature of the firm is the source of the threats. The enterprise cannot reduce threats, but may be aware of threats and develop strategies to minimize them, and even turn threats into opportunities. Threats in Turkey's maritime transportation are set out in Table 2 also.

As a result of internal environmental analysis and external environmental analysis, opportunities and threats have been identified with strong and weak aspects of Turkey's maritime transportation.

Table 2. Threats and opportunities of the maritime transportation in Turkey

No	**Threats**	**Source**
T1	Not Providing The Security Of The Seas (Terror, Sea Bandits, Smuggling, etc ..)	Pyc, 2016
T2	Failure To Ensure Safety In The Seas (Cracking Events, Sea Accidents, Ashore, etc.)	Ugurlu et al., 2017; Yılmaz et al., 2016
T3	Pollution In The Marine Zones	Jay, 2018; Kara and Emecen Kara, 2016
T4	Not Enough Capability Of Docking Ships or Yachts in Ports, Harbor and Marinas (capacity, depth and port workforce, etc.)	Bellas, 2014
T5	Economic Depressions in Maritime Sector	Kolesnikova, 2017; Celik and Kandakoglu, 2012
T6	Illegal Migrations By Way Of Sea	Suarez-de Vivero and Rodriguez-Mateos, 2018
T7	More Progress Of The Countries Near In Maritime	Alavi, 2018
T8	Possibility Of Entering Black List Of Turkish Flagged Ships	Celik and Akyuz, 2018
T9	Time Of IMO Rules' Entry Into Force	Walker, 2016
T10	Inability Of Grasping The Maritime Issues From Ministries and People	Fritz and Hanus, 2015
No	**Opportunities**	**Source**
O1	Taking Orders in the Shipbuilding Industry	Graziano et al., 2017
O2	Commercial and Economic Developments	Kose et al., 2018
O3	Development Of Maritime Tourism (Cruise, Coastal Areas, Water Sports, etc.)	Gonzalez-Laxe et al., 2016
O4	Participation in International Institutions and Organizations (BM-IMO, EU-EMSA)	Garamendi, 2015
O5	Increasing The Number And Quality Of The Institutions and Schools Related With Maritime Education	Ugurlu et al., 2017
O6	International Collaborations or Agreements on the Use of Marine Resources	Walker, 2016; Karan, 2007
O7	Taking Pre-positions in Ship Transformation and Recycling Sector	Shi and Li, 2017
O8	Improvement of Coastal Structures (Harbor, Marina, Pier)	Accorsi et al., 2014; Emecen Kara, 2016
O9	Technological Developments And Their Appliance To Maritime Sector	Pyc, 2016
O10	Turkey's EU Membership and Its Positive Effects on Maritime	Fritz and Hanus, 2015

4.3 PRIORITIZATION OF S, W, O AND T'S

Internal and external analyzes were performed and *S, W, O* and *T* factors were determined as *10* criteria based on the most important ones with the help of literature review. After the survey conducted by *103* experts in the maritime field, *76* people received a response. In the light of the opinions of the experts, the *10* most important criteria arising from the sector that determine Turkey's strengths, weaknesses, opportunities and threats in maritime transportation have been selected and reduced to *5* main criteria. At this point, as a result of the literature review on the main SWOT factors the *10* criteria shown in Table 1 and 2 are reduced to *5* main criteria.

The initial *5* factors (The Most Powerful Strengths In Turkey's Maritime Transportation) for the strengths are *S1, S3, S4, S5* and *S6*.

The *5* factors (The Most Powerful Weaknesses In Turkey's Maritime Transportation) determined by the experts for the weaknesses variables are *W1, W2, W3, W4* and *W5*.

The *5* factors (The Most Likely Opportunities In Turkey's Maritime Transportation) determined by the experts for the variable of opportunities are *O1, O2, O4, O5* and *O6*.

The *5* factors (The Most Likely Threats In Turkey's Maritime Transportation.) identified by the experts for the threat variables are *T1, T3, T4, T6* and *T*8.

5. AHP ANALYSIS (2nd STAGE)

Analytic hierarchy process (AHP) method is a mathematical method used to solve complex decision making problems with multiple criteria (Saaty, 1977). By using the AHP method, the priority levels of the factors that constitute the SWOT analysis can be determined. AHP method used in many areas and it has been used with methods such as fuzzy logic and linear programming in the problems of planning, selecting the best alternative and solving disputes (Vaidya and Kumar, 2006).

A feedback network or a reliable hierarchical structure with various types of impacts, such as stakeholders and decision alternatives, needs to be developed in AHP (Saaty, 1990).

The implementation of the AHP method consists of 5 main steps (Saaty, 1990). These steps are; hierarchical structure of the problem, creating binary comparison matrices, calculating the priority values of binary comparison matrices, calculation of consistency ratio and calculation of final priority values.

5.1 HIERARCHICAL STRUCTURE OF THE PROBLEM

In this first step, the problem of research is shown by a hierarchical structure. At the top of the hierarchy the purpose is shown, in the middle (if any, their sub-criteria) the criteria are formed and at the lowest point the alternatives are displayed. The aim here is to select the most appropriate alternative among the other alternatives. There are some points to be considered in the formation of hierarchical structure (Saaty, 1990). Hierarchical structure should represent the problem in the best way. All second factors affecting the problem also should be considered.

Binary comparison starts from the top of the hierarchy and square matrices, called preference matrices, are created by comparisons at each level. It is common for different experts to establish different hierarchies on the same subject (Vargas, 1990).

5.2 CREATING BINARY COMPARISON MATRICES

In the second step, comparison matrices are created. Each element in the matrix is compared in binary with the other by the decision maker. When making paired comparisons, the scale shown in Table 3 is used. The values of *2, 4, 6* and *8* in the scale are known as intermediate values.

Table 3. Scale to be used in AHP analysis (Saaty,1977)

Point	Definition	Explanation
1	*Equal Importance*	*The two activities contribute equally to the purpose.*
3	*Moderate Importance*	*One activity is preferred to a slightly higher degree than the other.*
5	*Strong Importance*	*One activity is strongly preferred over the other.*
7	*Very Strong Importance*	*One activity is strongly preferred and its dominance is readily seen in practice.*
9	*Extreme Importance*	*Evidence of preference for one activity to another has a very large reliability.*
2, 4, 6, 8	*Average Values*	*Values that fall between two successive jurisdictions to use when reconciliation is required.*

The evaluation phase in AHP is based on the concept of double comparison. The elements at one level of the hierarchy are compared in binary with each other according to their contribution or importance to higher-level elements. The total weight of the items at the lowest level of the hierarchy is obtained by the sum of weights found by comparing the items at a level to all the items at a higher level. If the activity in the row during the double comparison is less favourable than the activity in the column, it can be written instead of the corresponding two-sided, *1/3, 1/5, 1/7* and *1/9* in the matrix.

5.3 CALCULATING THE PRIORITY VALUES OF BINARY COMPARISON MATRICES

The pairwise comparison matrices obtained in the third step have priority values. In this context, the pairwise comparison matrices are subjected to normalization process. For this, first of all each value in the matrix is divided by the total number of columns. Thus, the values in the matrix *(0, 1)* are converted to the values in the open range and the sum of each column is 1.

This new matrix obtained is the normalized matrix. By taking the arithmetic average of each row in this matrix, the priority values of the elements compared can be reached.

5.4 CALCULATION OF CONSISTENCY RATIO

In the fourth step, the consistency of comparisons is examined. The binary comparison matrices consist of the personal judgment of the decision-maker. Furthermore, the best way to cope with complexity is consistency and this can be demonstrated by the best analytical approach (Korsakiene, 2004).

For this, the Consistency Ratio (*CR*) values are calculated. When $CR > 0.10$, it is understood that there is no consistency and that comparisons should be reviewed. The value of *CR* is calculated with the help of equation *(1)*:

$$CR = CI / RI \quad (1)$$

The value in the denominator of the formula is the Random Index (*RI*) value. *RI* takes values varying according to matrix size (*n*) and these values are given as ready tables. *RI* values for different n values are shown in Table 4.

Table 4. *RI* values for different units (Labib, 2011).

N	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***
RI	*0.00*	*0.58*	*0.90*	*1.12*	*1.24*	*1.32*	*1.41*	*1.45*
N	***9***	***10***	***11***	***12***	***13***	***14***	***15***	-
RI	*1.45*	*1.49*	*1.51*	*1.54*	*1.56*	*1.57*	*1.59*	-

The expression *CI* in the equation (*1)* is known as the Consistency Index (*CI*). *CI* is calculated by equation *(2)* below:

$$CI = (\lambda_{max} - n) /(n - 1) \quad (2)$$

n in the formula shows the size of the matrix and λ_{max} shows the maximum eigenvector.

5.5 CALCULATION OF FINAL PRIORITY VALUES

In the last step of the method, the final priority values are calculated. In this step, a number of expression processes are carried out, resulting in the final weights for the alternatives. As a result, it is recommended to select the alternative with the highest weight.

5.6 APPLICATION OF AHP

Five criteria developed in relation to strengths were compared in pairs. The evaluations made by three experts whose evaluations were consistent among eight experts *(CR2: 0,121; CR7: 0,125; CR8: 0,129)*, were taken into consideration (The value of CR_i; $i = 1, 2, ..., 8$, indicates the consistency ratio of the i^{th} decision maker.). As a result of the evaluations of consistent decision-makers, the weights of each criterion were obtained by taking arithmetic averages and the final weights were determined. These are respectively *(0,307), (0,081), (0,278), (0,139)* and *(0,194)*. Then, the criteria is reduced to *3* by selecting criteria *1, 3* and *5*, which have the highest weight values. These criteria are determined as the strongest criterions as *S1, S3* and *S5* in the rest of the analysis.

Five criteria developed in relation to weaknesses were compared in pairs. The evaluations made by three experts whose evaluations were consistent among eight experts *(CR1: 0,08; CR3: 0,07* and *CR6: 0,08)* were taken into consideration. As a result of the evaluations of consistent decision-makers, the weights of each criterion were obtained by taking arithmetic averages and the final weights were determined. These are respectively *(0,317), (0,102), (0,186), (0,152)* and *(0,240)*. The number of criteria is reduced to *3* by selecting criteria *1, 3* and *5*, which have the highest weight values. These criteria are determined as the strongest criterions as *W1, W3* and *W5* in the rest of the analysis.

Five criteria developed in relation to opportunities were compared in pairs. The evaluations made by three experts whose evaluations were consistent among eight experts *(CR1: 0,069; CR3: 0,072* and *CR6: 0,063)* were taken into consideration. As a result of the evaluations of consistent decision-makers, the weights of each criterion were obtained by taking arithmetic averages and the final weights were determined. These are respectively *(0,334), (0,096), (0,157), (0,196)* and *(0,215)*. The number of criteria is reduced to *3* by selecting criteria *1, 3* and *5*, which have the highest weight values. These criteria are determined as the strongest criterions as *O1, O4* and *O5* in the rest of the analysis.

Five criteria developed in relation to threats were compared in pairs as well as others. The evaluations made by three experts whose evaluations were consistent among eight experts *(CR1: 0,072; CR5: 0,054* and *CR7: 0,055)*, were taken into consideration. As a result of the evaluations of consistent decision-makers, the weights of each criterion were obtained by taking arithmetic averages and the final weights were determined. These are respectively *(0,239), (0,073), (0,158), (0,391)* and *(0,137)*. The number of criteria is reduced to *3* by selecting criteria *1, 3* and *4*, which have the highest weight values. These

criteria are determined as the strongest criterions as *T1, T3* and *T4* in the rest of the analysis.

After all these evaluations, the final sub-criteria for the *S, W, O* and *T* factors are presented in Table 5 together with their normalized weights:

Table 5. Weight values for sub-criteria

Criterion	***Explanation***	***Weight***
S1	*Be Surrounded By Seas*	*0,394*
S3	*Maritime Population In Turkey (Maritime Companies, Shipbuilding, Fishing, Sea Tourism, Water Sports, etc.)*	*0,356*
S5	*Level of Institutions / Organizations Providing Maritime Security and Safety (Naval Forces, Coast Guard, Coastal Safety) Of Turkey*	*0,249*
W1	*Lack Of Historical Part Of Turkish Maritime Trade*	*0,426*
W3	*Shortage of Academic Staff In Maritime Field*	*0,250*
W5	*Low Number Of Qualified Educational Institutions and Organizations*	*0,323*
O1	*Taking Orders in the Shipbuilding Industry*	*0,448*
O4	*Participation in International Institutions and Organizations (BM-IMO, EU-EMSA)]*	*0,263*
O5	*Increasing The Number And Quality Of The Institutions and Schools Related With Maritime Education*	*0,288*
T1	*Not Providing The Security Of The Seas*	*0,303*
T3	*Pollution In The Marine Zones*	*0,201*
T4	*Not Enough Capability Of Docking Ships or Yachts in Ports, Harbor and Marinas*	*0,495*

After this evaluation process, the SWOT matrix shown in Table 6 was developed with the help of these three most important criteria for each SWOT factor. The aim of this study is to determine the most appropriate strategy for Turkey's maritime transportation policy. Thus, the alternative strategies developed were also shown in the matrix.

SO strategy from these strategies can be named as; "Turkey as surrounded by seas, has the population interested in maritime, has good institutions/organizations that can ensure maritime safety and security, keeps up with the commercial and economic developments in and around the region, takes orders in the shipbuilding industry, goes to international agreements and cooperation's on the use of resources in the surrounding seas can use its strengths to catch opportunities."

WO strategy from these strategies can be formed as; "Turkey as having a short historical background of maritime trade, don't have enough number of academic staff trained in maritime and good quality maritime education centers/institutions, keeps up with the commercial and economic developments in and around the region, takes orders in the shipbuilding industry, goes to international agreements and cooperation's on the use of resources in the surrounding seas can use opportunities to eliminate its weaknesses."

ST strategy from these strategies can be identified as; "Turkey as surrounded by seas, has the population interested in maritime, has good institutions/organizations that can ensure maritime safety and security, prevents security-related incidents in the surrounding seas, expands the ports and marinas to get enough ships and overcomes the economic crisis in the maritime sector can use its strengths to eliminate threats."

WT strategy from these strategies can be composed as; "Turkey as having a short historical background of maritime trade, don't have enough number of academic staff trained in maritime and good quality maritime education centers/institutions, prevents security-related incidents in the surrounding seas, expands the ports and marinas to get enough ships and overcomes the economic crisis in the maritime sector can foresee its weaknesses to avoid threats."

In determining these strategies, the possible combinations of the SWOT matrix and the general characteristics of the four main strategies in the literature were taken into consideration. Combinations of these strategies are intended to prevent or eliminate threats, exploiting or using strengths, eliminating or empowering weaknesses and exploiting or catching opportunities (Weihrich, 1982).

One of these strategies was chosen by using AHP method. At this point, the hierarchical structure of the study was formed as in Figure 1. When the hierarchy is examined, the determination of the appropriate strategy as the "Purpose" is at the top, the criteria as "*S, W, O* and *T*" and their sub-criteria are in the middle and the alternatives as "*SO, WO, ST* and *WT*" are at the bottom.

The experts were asked to compare the main criteria of *S*, *W, O* and *T* in hierarchy in terms of determining the most appropriate strategy. In the comparisons, evaluations of four of the eight experts were consistent *(CR2: 0.059; CR6: 0.030; CR7: 0.037* and *CR8: 0.037)*. The final weights were obtained by taking the arithmetic average of the weights obtained from the binary comparisons of consistent decision makers. These weights are for S, W, O and T respectively *(0,410), (0,105), (0,360)* and *(0,124)*.

Table 6. Strategy components of SWOT matrix

INTERNAL ENVIRONMENT FACTORS ⇨ ***EXTERNAL ENVIRONMENT FACTORS*** ⇩	***STRENGTHS*** ** Be Surrounded By Sea* ** Maritime Population In Turkey* ** Level of Institutions / Organizations Providing Maritime Security and Safety*	***WEAKNESSES*** ** Lack Of Historical Part Of Turkish Maritime Trade* ** Shortage of Academic Staff In Maritime Field* ** Low Number Of Qualified Educational Institutions and Organizations*
OPPORTUNITIES ** Taking Orders in the Shipbuilding Industry* ** Participation in International Institutions and Organizations* ** Increasing The Number And Quality Of The Institutions and Schools Related With Maritime Education*	***SO Strategy*** *Turkey as surrounded by seas, has the population interested in maritime, has good institutions/organizations that can ensure maritime safety and security, keeps up with the commercial and economic developments in and around the region, takes orders in the shipbuilding industry, goes to international agreements and cooperations on the use of resources in the surrounding seas can use its strengths to catch opportunities.*	***WO Strategy*** *Turkey as having a short historical background of maritime trade, don't have enough number of academic staff trained in maritime and good quality maritime education centers/institutions, keeps up with the commercial and economic developments in and around the region, takes orders in the shipbuilding industry, goes to international agreements and cooperations on the use of resources in the surrounding seas can use opportunities to eliminate its weaknesses.*
THREATS ** Not Providing The Security Of The Seas* ** Pollution In The Marine Zones* ** Not Enough Capability Of Docking Ships or Yachts in Ports, Harbor and Marinas*	***ST Strategy*** *Turkey as surrounded by seas, has the population interested in maritime, has good institutions/organizations that can ensure maritime safety and security, prevents security-related incidents in the surrounding seas, expands the ports and marinas to get enough ships and overcomes the economic crisis in the maritime sector can use its strengths to eliminate threats.*	***WT Strategy*** *Turkey as having a short historical background of maritime trade, don't have enough number of academic staff trained in maritime and good quality maritime education centers/institutions, prevents security-related incidents in the surrounding seas, expands the ports and marinas to get enough ships and overcomes the economic crisis in the maritime sector can foresee its weaknesses to avoid threats.*

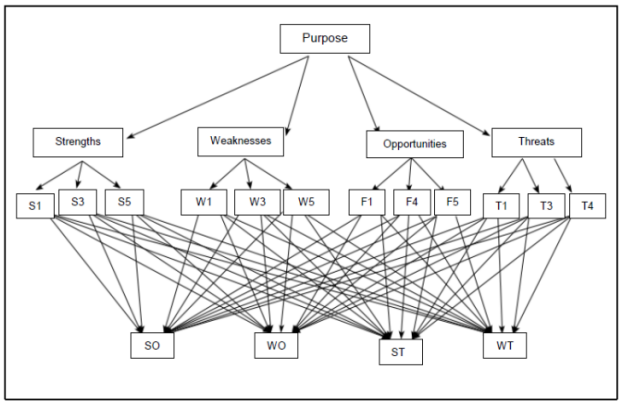

Figure 1. Hierarchical structure for the most appropriate strategy selection.

The weights obtained from the binary comparisons of these four decision makers and these are the final weights that were obtained by taking the arithmetic mean. Arithmetic average is used to combine the weight of many decision makers (Chang, 1996).

The weights of the alternatives and strategies for comparison of each sub-criterion are given in Table 7. This table also provides the link between the alternatives at the bottom of the hierarchical structure and the sub-criteria above them.

Table 7. Weights between alternatives, strategies and criteria

-	S1	S3	S5	W1	W3	W5
SO	0,551	0,290	0,271	0,388	0,330	0,264
ST	0,202	0,190	0,168	0,086	0,397	0,244
WO	0,132	0,244	0,183	0,299	0,127	0,298
WT	0,112	0,273	0,375	0,223	0,144	0,191
-	**O1**	**O4**	**O5**	**T1**	**T3**	**T4**
SO	0,220	0,239	0,338	0,230	0,240	0,300
ST	0,223	0,338	0,231	0,154	0,265	0,158
WO	0,330	0,109	0,263	0,387	0,342	0,185
WT	0,222	0,310	0,159	0,225	0,151	0,354

The priority weights for the alternatives obtained from the combination of the weights of each sub-criterion and the weights of the alternatives are shown in Table 8. The weights shown are the weights that provide the connection between the bottom and the middle of the hierarchy.

Now it is time to establish the connection between the middle and the top of the hierarchy. The priority weights

of the *SO, WO, ST* and *WT* strategy alternatives will be found by combining the priority weights obtained in Table 8 with the weights of the main factors *S, W, O* and *T*. The final priority values for the strategy alternatives are shown in Table 9.

Table 8. A combination of Sub-Criteria and strategy alternatives

-	S1	S3	S5	Priority Weights for Alternatives
S1, S3, S5 Weights	0,394	0,356	0,249	
SO	0,551	0,290	0,271	0,387
ST	0,202	0,190	0,168	0,189
WO	0,132	0,244	0,183	0,184
WT	0,112	0,273	0,375	0,234
-	W1	W3	W5	Priority Weights for Alternatives
W1, W3, W5 Weights	0,426	0,250	0,323	
SO	0,388	0,330	0,264	0,333
ST	0,086	0,397	0,244	0,214
WO	0,299	0,127	0,298	0,255
WT	0,223	0,144	0,191	0,192
-	O1	O4	O5	Priority Weights for Alternatives
O1, O4, O5 Weights	0,448	0,263	0,288	
SO	0,220	0,239	0,338	0,258
ST	0,223	0,338	0,231	0,255
WO	0,330	0,109	0,263	0,252
WT	0,222	0,310	0,159	0,226
-	T1	T3	T4	Priority Weights for Alternatives
T1, T3, T4 Weights	0,303	0,201	0,495	
SO	0,230	0,240	0,300	0,266
ST	0,154	0,265	0,158	0,178
WO	0,387	0,342	0,185	0,277
WT	0,225	0,151	0,354	0,273

Table 9. Final priority values and ranking for strategies

	S	W	O	T	Final Priority Values for Alternatives
S, W, O, T Weight	0,410	0,105	0,360	0,124	
SO	0,387	0,333	0,258	0,266	**0,319**
ST	0,189	0,214	0,255	0,178	**0,213**
WO	0,184	0,255	0,252	0,277	**0,227**
WT	0,234	0,192	0,226	0,273	**0,231**

6. CONCLUSION

In Table 9, it can be seen that the SO strategy has the highest value. The strategies from the highest to the lowest are *SO (0.319), WT (0.231), WO (0.227)* and *ST (0.227)* respectively.

It can be seen that the most appropriate strategy was the *SO* strategy. In other words, a strategy should be adopted to capture opportunities by using strengths for Turkey's Maritime Transportation Policy. Using the *SO* strategy is the usage of the maximum of everything and the strategy to ignore the minimums. For SWOT analysis, this could be defined as the strategy for increasing opportunities or using strengths to catch opportunities.

The weak point of the *SO* strategy is to underestimate the minimums as weaknesses and threats for (SWOT) analysis. It is thought that these can be solved over time. But this may not always be the case. Weaknesses may not be eliminated or the threats that may arise may not be avoided. In this case, other strategies such as *ST, WO* or *WT* strategies should be analyzed and their applicability should be examined.

The reason why this strategy can be identified is the decision makers (experts in the maritime field applying the SWOT and AHP method) thought that the strengths and opportunities related to the maritime transportation are more important than other criteria. In SWOT analysis and AHP method, decision-makers are more interested in maritime strengths and benefiting from opportunities has become more attractive.

For further studies, application of *SO* strategy may be examined in the field of maritime issues in Turkey. Also the same research can be made to any other countries in the world.

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