INTERNATIONAL COOPERATION ON AIRBORNE FOREST FIREFIGHTING: OPPORTUNITIES FOR TURKEY AND GREECE

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Approval of the Graduate School of Social Sciences

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ABSTRACT

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This study aims to determine the cooperation opportunities on airborne firefighting among Turkey and Greece in the Aegean Coast. To this aim, the current systems of Turkey and Greece are analyzed. Information about forest populations, fire history, fire risks/intensity maps, airborne firefighting vehicles, and related infrastructure including runways and water pools and the allocation of vehicles of both countries are gathered.

Related critical performance indicators are defined and their values for the current systems of Turkey and Greece are evaluated. Mathematical programming models for optimal re-allocation of the resources in decentralized and centralized decision making scenarios are examined. A game theory based approach is used for finding the possible cooperative allocation options. Finally, the potential benefits and disadvantages are explained for cooperation.

Keywords: *Humanitarian Logistics, Airborne Firefighting, International Cooperation, Turkey, Greece*

ÖZET

ORMAN YANGINLARIYLA HAVADAN MÜCADELEDE ULUSLARARASI İŞBİRLİĞİ: TÜRKİYE VE YUNANİSTAN İÇİN FIRSATLAR

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Bu çalışma, Türkiye ve Yunanistan arasındaki Ege sahillerinde, havadan yangın söndürme üzerine işbirliği olanaklarını belirlemeyi amaçlamaktadır. Bu amaçla, Türkiye ve Yunanistan'ın güncel sistemleri incelenmiştir. Her iki ülkenin orman nüfusları, yangın geçmişleri, yangın riskleri/yoğunlukları, havadan yangın söndürme araçları, pistleri, su havuzları ve araç yerleşimide dahil olmak üzere, ilgili altyapı bilgileri

toplanmıştır. İlgili kritik performans göstergeleri tanımlanmıştır. Ayrıca Türkiye ve Yunanistan'ın bugüne kadarki mevcut sistem değerleri hesaplanmıştır. Merkezi olmayan ve merkezi senaryolarda, kaynakların optimal yeniden yerleştirilmesi konusundaki karar verme süreci, matematiksel programlama modelleriyle incelenmiştir. Her iki ülke için işbirliği içinde olunan, optimal yerleştirme seçenekleri, oyun kuramı yaklaşımıyla, ortaya çıkarılmıştır. Sonuç olarak, işbirliğinin potansiyel faydaları ve dezavantajları açıklanmıştır.

Anahtar Kelimeler: *İnsani Lojistik, Havadan Yangın Söndürme, Uluslararası İşbirliği, Türkiye, Yunanistan*

To My Family

I would like to dedicate this thesis to my family. I would like to express endless thanks to my mother Nuray Bal, my father Selim Bal and my little brother Yiğit Bal for their exhaustless patience, loves, supports and existence. I couldn't achieve this without them.

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GLOSSARY

AHP: Analytic Hierarchy Process

CNV: Current Number of Vehicles

EFFIS: European Forest Fire Information System

EU: European Union

FAO: Food and Agriculture Organization

GAMS: General Algebraic Modeling System

GDF: General Directorate of Forestry

GFMC: Global Fire Monitoring Center

GIS: Geographical Information System

GSCP: General Algebraic Modeling System

IAT: Initial Attack Time

ICS: Incident Command System

IFFN: International Forest Fire News

KPI: Key Performance Indicators

OGM: Orman Genel Müdürlüğü

SWOT: Strengths, Weaknesses, Opportunities and Threats Analyses

TEV: Total Economic Value

THK: Türk Hava Kurumu

UNECE: United Nations Economic Commission for Europe

UN-ISDR: United Nations International Strategy Disaster Reduction

CHAPTER I

INTRODUCTION

Countries all over the world have become interrelated because of the economic systems and the global trade. Almost all geographic regions have become suppliers of raw materials and manufacturing bases in specific sectors. This structure is similar in the whole world. Logistics is a key element in the continuity of the global economy and business processes. In parallel with the growth of global economy, logistics sector grew rapidly in the last decade. Nowadays, both countries and companies are investing in their infrastructure and improving their business processes, not only considering their financial success but also to provide better service to their citizens and customers in case of any disasters. Humanitarian and emergency logistics are getting more attention as the potential benefits are realized.

Forests are one of the most important issues for human life and ecology. Nearly one third of world's total area is covered with forests. Population of forests is decreasing every day due to the effects of human activities. For many countries forest fires are one of the main problems in this declining process. Some forest ecosystems have evolved in response to frequent fires. But most others are negatively affected by wildfire. With the effects of global warming, forest fires, caused by natural reasons (such as lightening, thunders and access heat) or man-made reasons, become even more important. Every

year forest fires destroyed over 350 million hectares of forests. Forest fires cause the losses of human and animals' life or injuries. The economic destruction of forest fires are significant both in terms of the amount of forests destroyed and the cost of suppression (www.fao.org, last accessed 14/6/2010). Especially for Mediterranean basin countries, forest fires are the main causes of forest destruction. The effect of forest degradation on tourism is also significant, especially in Albania, Croatia, Greece, Macedonia and Turkey (Fire Management: Global Assessment, 2006). The countries under forest fire risk and having huge amount of forest population and have their own fire fighting organizations and resources. These countries fight with forest fires every year. Only some countries are managing this process well and most of them are having serious problems. Sometimes they fail to handle fighting with large forest fires because of the lack of responsibilities, resources, experience and common definitions. In this situation, these countries need help from others. Figure 1.1 shows the global wind land fire network map in the world. There are some agreements and templates about cooperation between countries but these are not managed well at all times because of political frictions and changes. It is obvious to say that generally in case of large fires, neighbor and geography close countries help each other. Fire is a disaster which needs a quick intervention or emergency scenarios like all disasters. Quick interventions provide the protection of forests and decrease suppression costs before the fire becomes large and extended.

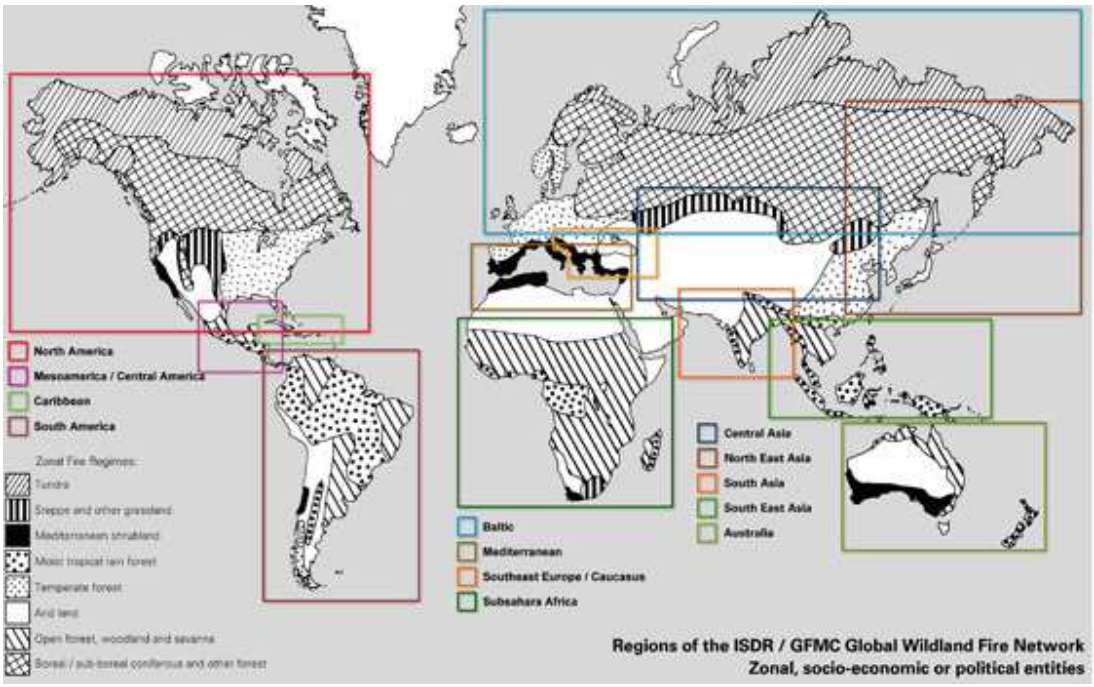


Figure 1.1: United Nations-International Strategy Disaster Reduction (UN-ISDR) / Global Fire Monitoring Center (GFMC) Global Windland Fire Network Map

Source: http://www.fire.uni-freiburg.de/GlobalNetworks/globalNet.html last accessed 20/02/2011

From the humanitarian and emergency logistics perspective, fighting against fires is getting more important, especially under the first degree fire risk regions. In the lights of destruction effects of forest fires, cooperation and collaboration on the firefighting management is a crucial approach, especially among the neighboring countries. European Forest Fire Information System (EFFIS) rank the geographical regions of Europe according to their forest fire risks in Figure 1.2. Red zones are representing first degree (high) fire risk areas, yellow ones are representing second degree (moderate) and

green areas are representing third degree (low) risk. All European countries including Turkey and Greece are under first degree fire risk during summer time and they are fighting against large fires nearly every year. Especially the red colored areas in Figure 1.2 are in the Mediterranean Sea coasts where weather conditions are similar among countries.

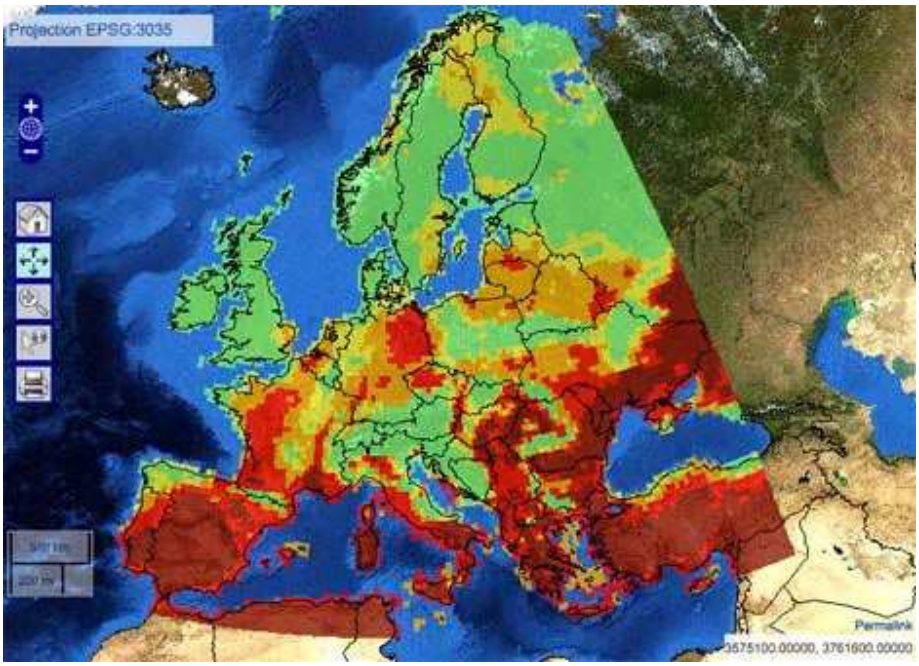


Figure 1.2: Fire Risk Map of Europe in 2010

Source: http://effis.jrc.ec.europa.eu/current-situation last accessed 03/06/2010

In recent years, there is an increasing rate in collaboration. A list of such collaboration agreements with details is available in Appendix 1. There are, for example, various bilateral agreements for;

- joint fire suppression,
- arrangements for regional training courses,
- regional networks for the exchange of information and experience,
- regional fire management plans.

However, these agreements have management problems due to;

- the lack of global terminology,
- standardization,
- political awareness.

In Europe; the countries such as Turkey, France, Greece, Italy, Spain and Portugal are under first degree fire danger and facing with several forest fires every year, especially in summer times. Table 1.1 shows number of forest fires, total burned areas and average total burned areas between 1998 and 2008 in these countries.

Table 1.1: Forest Fires in Some Mediterranean Countries (1998-2008)

Years	TURKEY		FRANCE		GREECE		ITALY		SPAIN		PORTUGAL	
	Area (ha)	Number (#)	Area (ha)	Number (#)	Area (ha)	Number (#)	Area (ha)	Number (#)	Area (ha)	Number (#)	Area (ha)	Number (#)
1998	6.764	1.932	20.880	5.600	92.901	1.842	140.432	10.155	133.643	22.445	158.369	34.676
1999	5.804	2.075	17.605	5.170	8.289	1.486	61.989	7.235	82.217	18.237	70.613	25.477
2000	26.353	2.353	23.700	5.600	145.033	2.581	114.648	10.629	188.586	24.312	159.553	34.109
2001	7.394	2.631	17.000	4.103	18.221	2.535	76.427	7.134	66.075	19.631	107.057	26.942
2002	8.513	1.471	20.850	900	6.013	1.141	40.768	4.594	107.472	19.929	124.365	26.492
2003	6.644	2.177	74.000	4.100	3.517	1.452	91.803	9.697	149.224	18.628	425.658	26.195
2004	4.876	1.762	12.500	2.028	10.267	1.748	60.176	6.428	134.171	21.394	128.937	21.970
2005	2.821	1.530	17.356	1.871	6.437	1.544	47.575	7.951	179.929	26.261	338.262	35.698
2006	7.762	2.227	8.542	2.426	11.235	2.132	58.535	8.340	151.208	28.345	168.542	24.812
2007	11.665	2.829	7.400	2.322	225.734	1.983	227.729	10.639	82.048	10.915	31.450	18.722
2008	23.577	2.135	17.244	13.832	39.895	11.612	6.001	2.781	66.329	6.486	29.152	1.481
10 Years Total	112.173	23.122	237.077	47.052	567.542	30.056	926.083	85.583	1340.902	216.583	1741.958	276.574
Country Forested Area (ha)	21.3 million		3.5 million		2.6 million		14.5 million		13.5 million		6.5 million	
Rate of Burned Area to Forested Area(%)	0.527 (112.173/21.3M)		6.774		21.829		6.387		9.933		26.799	

Source: http://www.ogm.gov.tr/statistics last accessed 31/01/2011

European countries are losing lots of timber, forest area, ecology and human life with forest fires and spending millions of dollars for suppression or reforestation works. Meanwhile, Turkey and Greece are main actors of forest firefighting activities in Europe. For sure, they are helping each other in disaster situations; like in the big Athens fire in 2007; Turkey sent a Canadair CL-215 water bomber plane to help fire fighters near to the capital of Greece. This cooperation did not happen just in forest fire disasters. In 1999, Turkey and Greece sent rescue teams to each other's earthquake disasters and rescued lots of people's life heroically. This collaboration resumes for a while after 1999 with some training courses and workshops. These disasters and the collaboration after that also triggered the countries to increase political and public relations between them. In addition to political and public bonds arousal, their economic and social situations increased at the same time too (Lindsay, 2000).

In case of severe disasters, Turkey and Greece are willing to provide aid to each other. However, the aid is generally for short term and does not trigger any long term cooperation. Countries are designing and managing their own disaster response systems. In this thesis, we analyze the opportunities for cooperation among Turkey and Greece for forest fire especially in the Aegean Region.

As a result, our goals in this thesis are to analyze;

1. current forest fire history,
2. risks,

3. services,
4. resources on airborne firefighting of Turkey and Greece.

For this aim; we calculate the efficiency and the performance of current resources with respect to initial attack time and distance parameters. Then, we find the non-cooperative system's optimal resource requirements for Turkey and Greece. We calculate the efficiency and the performance of these non-cooperative systems. After all, we find the cooperative system's optimal resource requirements and calculate the efficiency of cooperative system's optimal resource requirement. Finally, we create a game theoretical approach in order to find optimal solutions in cooperative system for Turkey and Greece.

The organization of this thesis as follows: In Chapter 2, we review the literature; in Chapter 3, we define the problem, assumptions and methodology; in Chapter 4, we study on non-cooperative systems; in Chapter 5, we study on cooperative systems and in Chapter 6, we provide the concluding remarks and further research directions.

CHAPTER II

LITERATURE REVIEW

In this chapter, we review the literature under two main topics; forest fires and the cooperation. Under the first topic we analyze the causes of forest fires and fire history of Turkey and Greece. Under cooperation topic of, we review the need for cooperation, national and international cooperation issues.

2.1 FOREST FIRES

In this section, we discuss the information on forests, forest fires, forest fire management and initial attack.

The term of wildfire representing to all uncontrolled fires that burn surface vegetation (grass, weeds, grain fields, brush, chaparral, tundra, and forest and woodland); often these fires also involve structures. In addition to the wildfires, several million hectares of forest populations are intentionally burned each year under controlled conditions to

accomplish some reforestation or other land-use objective or for hazard reduction (http://encyclopedia2.thefreedictionary.com/forest+fire last accessed 16/06/2010).

Time is very crucial for starting to extinguishing activity in case of a forest fire or other types of fires. The name of this specific time is called as the initial attack. Martell et al. (1984) argues that initial attack means that trying to cut in the fires at most in 30 minutes when they are small enough. Forest fire managers and decision makers engage in lots of activities that help to decrease fire losses especially in the start of fires were caused by people or natural reasons (such as arson and lightening). Thus, forest surveillance is used to detect fires when they are small and when initial attack is able to contain fires. While the fire is small, it is easy to handle and the routing of fire teams and suppression resources. Therefore, one of the most important and essential component of forest fire management systems is the initial attack. It is designed to start the firefighting action quickly on newly reported fires. The initial attack force can successfully control and extinguish most forest fires less than 30 minutes with one aerial vehicle. However, if the force cannot control the fire in 30 minutes with aerial vehicles, the fire is declared as an extended attack fire. This may simply involve the continuous work and operation by the initial attack force or in a few cases; hundreds of firefighters and many aircrafts may work for several weeks in order to combat a fire that burns over the tens thousands of hectares. Properly designed and well managed initial attack system is vital in order to cover such fires as it is supposed to be.

The aerial vehicles are very important for forest fire management since they are the fastest forest firefighting vehicles. If they are located and managed properly, they can reach to fires before all land vehicles and they extinguish forest fires in less than 30 minutes.

Simulation models for agencies and other organizations are searched with respect to the initial attack time. Friedi, Gilles and Spero (2006) work on stochastic simulation models of initial attack on wild land fire that can be designed in order to reflect the complexity of the environmental, administrative, and institutional context in which wild land fire protection agencies operate.

For supply better management of initial attack teams and all other resources for an extended fire, Halpern, Sarısamlis and Wand (1982) present a semi-empirical method for the analysis of manning policies in firefighting. The method, uses an activity network approach to define the fire ground command operations and a structured interview to obtain data.

Firefighters are important as much as aerial vehicles and trucks in order to extinguish a large forest fire. Boychuk and Martell (1988) propose a model for deciding the number of hired firefighters in a season. The model aims to minimize the total cost of hiring and loses due to fires.

Several projects and models are created for countries under forest fire risk. Bonazountas et al. (2005) present the results of a research project aimed at modeling forest fire events and producing fire risk maps for Greece by using Geographical Information System (GIS), C++ and mathematical models. Ertuğrul (2005) states that in the last decade; the number of fires and dispersion of fire areas have been seen a big problem especially in the developing countries since they have been recorded. The author also claimed that, there are an increasing number of large fires. A fire is classified as large if the total area burned is greater than 200 hectares.

In addition, researchers analyze the resources of regions and countries. Martell et al. (1984) aim to help forest fire managers of the Ontario Ministry of Natural Resources and evaluate initial attack resources. A relatively simple simulation model of the variety of fires that occur in the province of Ontario and the resources are used to fight them, was developed. The model was useful in planning of the acquisition of air tankers and the future use of air tankers. Besides, it is beneficial in the allocation of air tankers and fire fighters for initial attack purposes.

As we have mentioned before, the response time is very crucial in the case of forest firefighting activities. Thus, the location planning of forest fire fighting facilities and vehicles are important (Çatay et al., 2008).

Developments for facility location problems, Dawei and Yanjie (2009) describe and set up a model for emergency service facility location problem which is based on the greatest time satisfaction. Then, a hybrid solving strategy according to the model characters is proposed based on particle swarm optimization.

Helping researchers for the work on the facility location model strategies problems; ReVelle (1989) was published as a review of a selected set of location papers and a research agenda. The reviewed location models were divided into three categories such as basic deterministic covering models, deterministic models which consider the value of additional covering servers, and probabilistic models which allow randomness in server availability.

In literature, there are also studies for the resolution of deployment and reallocation problems. Maclellan and Martell (1996) make an aircraft deployment study on Ontario Ministry of Natural Resources again that operates a fleet of nine CL-215 water bomber air tankers for forest fire control. The aircrafts are based on a small number of air ports that serve as home bases from where they are deployed to a larger set of airports that serve as initial attack bases for firefighting operations each day. They support regional fire and forest managers in order to derive subjective air tanker deployment rules that specified the number of air tankers to be deployed at each initial attack base each day. Authors developed a mathematical programming model for selecting a home base

strategy. The model aims to minimize the average annual cost of satisfying daily air tanker deployment demands.

Optimized reinforcement and learning strategies are also developed for forest fire managers. Wiering and Dorigo (1998) describe a methodology for constructing an intelligent system that aims to support the human expert's decision making in fire control. The idea is firstly based on implementing a fire spread simulator and searching for good decision policies by reinforcement learning. Reinforcement learning algorithms optimize policies by letting the agents interact with the simulator and learn from their experiences. Finally, authors observe different problems and propose solutions for solving them.

Taber (2007) describes emergency response simulation research project with academics, software developers, and organizational pilot sites. E-learning software was designed and developed for an emergency response simulation with supporting collaborative tools. In spite of the concentration on paramedics and firefighters, this research is transferable to other organizations, and it highlights the importance of collaborative learning.

Martell et al. (1998) argues that the forest fire management systems share much more in common with urban fire, police and ambulance systems. But the spatial and temporal

variability of forest fire occurrence processes and the comparatively long distances over which forest fire management takes place special challenges to operational researchers. The author defines the basic structure of a forest fire management system and the decision making problems faced by fire or forest managers. The author describes how research operations has been applied to forest fire prevention, detection, deployment and initial attack dispatch in decision making problems; large fire management, strategic planning and fuel management. Besides, author identifies new challenges that are amenable to operational research approaches.

Information systems and mathematical modeling programs are used for forest fire control. Dimopoulou and Giannikos (2002) argue the development of an integrated system for forest fire control after fire newly starts. The system consists of a Geographical Information System module, a mathematical programming module and a simulation module.

2.1.1 CAUSES OF FOREST FIRES

The main cause of the forest fires is the human activity and that stands for the 95% of all forest fires. The causes of Turkey's forest fires in 2009 were negligence (carelessness); accident corresponded to 54%, deliberate 8%, lightning 19% and the reason for remaining 19% were recorded as unknown. Figure 2.1 shows the distribution

of forest fire causes of Turkey in 2009 (Forest Fires in Europe 2009 Report, 2010). Appendix 2 and 3 provide detailed information about the total burned area, number of fires, and their casus between 1999 and 2009.

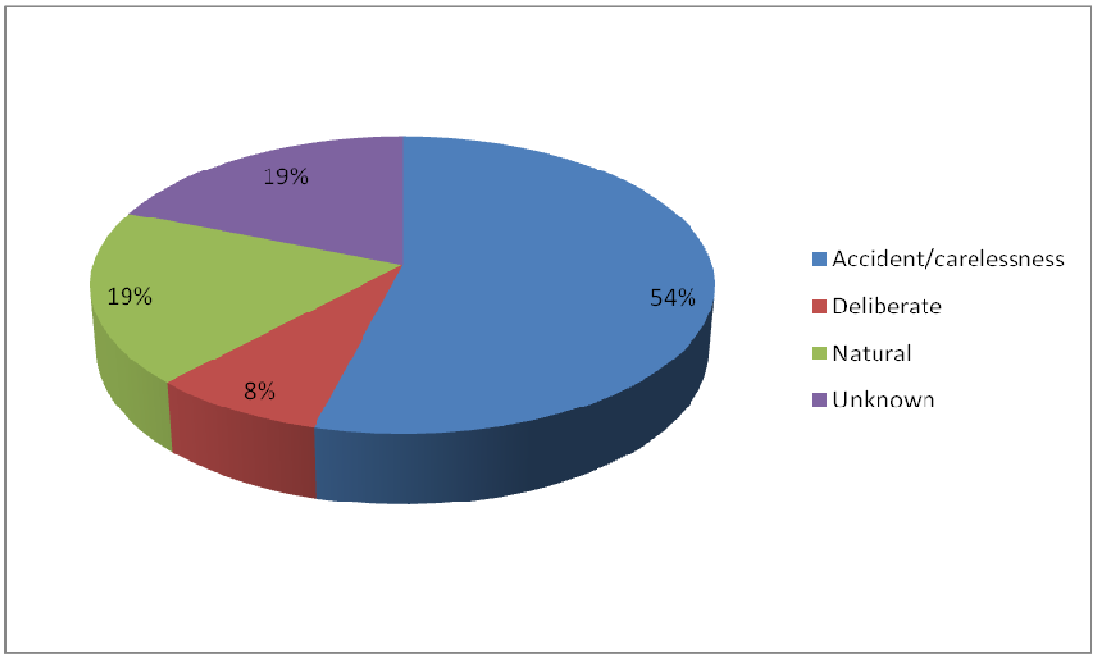


Figure 2.1: Distribution of Forest Fire Causes in Turkey 2009

Source: Forest Fires in Europe 2009 Report, 2010

Some of the other activities can be defined as the burning of waste and for pasture renewal (firing the grass for renewal the field), arson (deliberate forest fire) when it gets out of control, pyromania (a physiologic illness which describes enjoining deliberate forest fires), (illegal) clearing of land to change land usage and choice in order not follow existing obligations to avoid fire. The causes of fires are generally reported as

unknown fires but unknown fires are accepted in human cause fires or arson. Arson is the principal cause of most fires and needed much attention for forest protection. Other reason of forest fires is lightening. Approximately 5% of fires begin from lightening and lots of them are extinguished from heavy rains after lightening (Fire Management: Global Assessment, 2006).

2.1.2 FIRE SITUATION IN TURKEY

In this section, we discuss Turkey's fire situation. We mention Turkey's forest areas, fire risk, effects of tourism and economy, prevention activities, sources and the location of these sources.

Turkey is a country with a land mass of 77 million hectares, and 21 million hectares is forested. It is corresponding to 26% of whole area. Also, 51% of forests are composed of productive areas (timber and wood production) while the remaining 49% is composed of rather unproductive areas (Forest Fires in Turkey Report, 2010). About 12 million hectares of forested land are subjected to forest fires and it is corresponding 57% of all forested area (Bilgili, 1999). Forest fires have special positions that become a primary reason which damages the forests in Turkey as it is almost same for other countries. Turkey is located in Mediterranean and Aegean climate region. The forests, which are usually located at the coastal band areas, (Aegean and Mediterranean) are

under severe risks of fire threats. The coastal band of 1,700 km begins at Eastern Mediterranean coasts and covers all Aegean and Marmara coasts. The area covering 160 km depth of the coastal band is a fire sensitive region. Turkey's fire season is in between October and June especially in the touristic areas. Figure 2.2 shows distribution of 2009 forest fire numbers and burned areas according to monthly data in Turkey. You can see the details of city distributions of number of fires and burned areas in Appendix 4. Approximately 96% of the total number of forest fires occurred during the fire season in 2009. When we look at the number of forest fires per month in 2009, we see that 25% of them have occurred in July, 20% in August, and 13% in June. The distribution of burned area by months was 57% in August, 19% in July and 10% in June (Forest Fires in Europe 2009 Report, 2010).

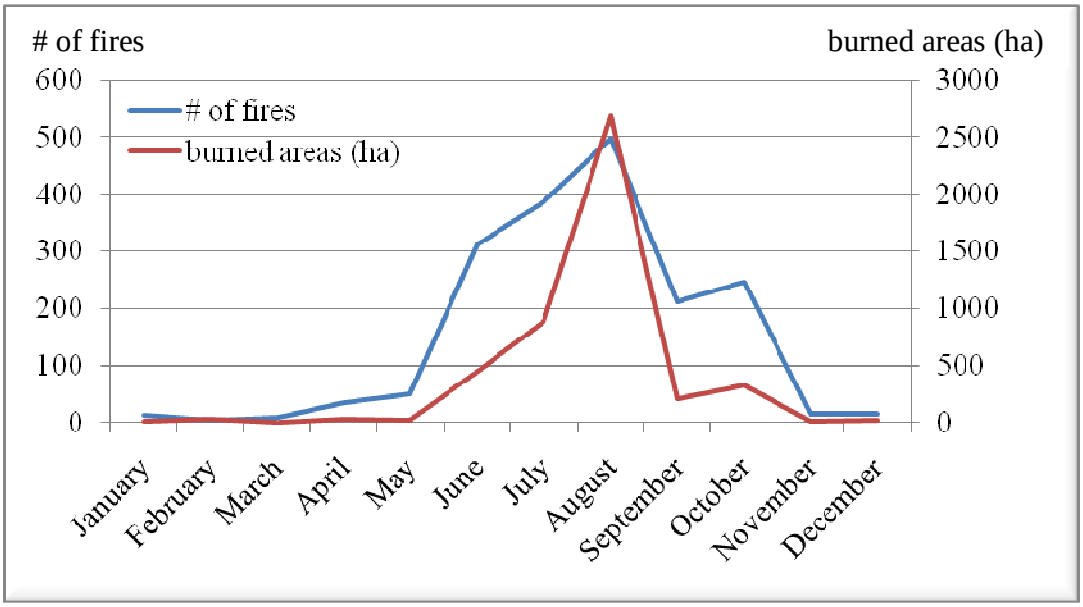


Figure 2.2: Monthly Distribution of Turkey's Number of Fires and Burned Areas in 2009

Source: http://www.ogm.gov.tr/statistics last accessed 31/01/2011

Figure 2.3 shows the forest fire sensitivity areas of Turkey. Level 1 area is under the first degree fire risk which is showing with red in our sensitivity map. They are especially in the coastal band regions with hot and dry weather conditions in summers e.g. Marmara, Aegean and Mediterranean. Level 2 areas are under the second degree fire risk which is showed with purple in our sensitivity map. They are especially in the entrails of the country e.g. Thracian, West Anatolia and Middle of Black Sea. Orange colored regions represent Level 3 fire risk areas. Green colored regions represent Level 4 and 5 fire risk areas. Also, yellow zones describe the sizes of burned areas.

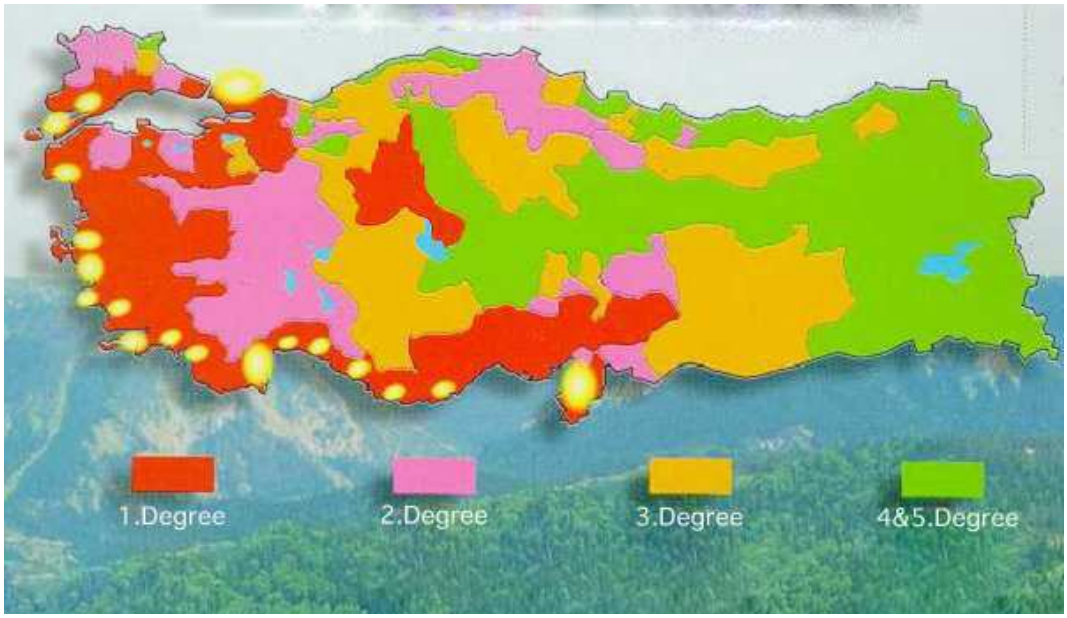


Figure 2.3: Sensitivity Map of Turkey

Source: Forest Fires in Turkey Report, 2010

In the sensitivity map, 7 million hectares of forested areas were at fire danger of level 1 and it is corresponding to 35% of all forested area, while 5 million hectares of sensitive areas were at fire danger of level 2 and it is corresponding to 25% of all forested area (Forest Fires in Europe in 2008 Report, 2009).

In Figure 2.4, we provide the ratios of total area and forested area of regions. Black sea is the first region owning 26% forested area of all country. But warm and wet weather conditions including the summer times put the region in 4&5 degree in our sensitivity map. Mediterranean is the second region with 22% forested area and under the first degree fire risk in our sensitivity map. Aegean is the third region with 17% forested area and under the first degree fire risks as same as the Mediterranean. Then, Marmara is the fourth region with 14% and is under the first and second degree fire risk. Marmara generally have the warm and neither dry nor wet weather conditions like Black sea. On the other hand, as mentioned in causes part, human population is the biggest danger for forest fires and Marmara region keeps the city of İstanbul in its borders. İstanbul is the most crowded city in Turkey having approximately 15 million people and it highlight the reason of the biggest yellow mark over İstanbul. Other regions regarding the distribution of percentages are; South Eastern with 10%, Central Anatolia with 9% and Eastern Anatolia with 2%.

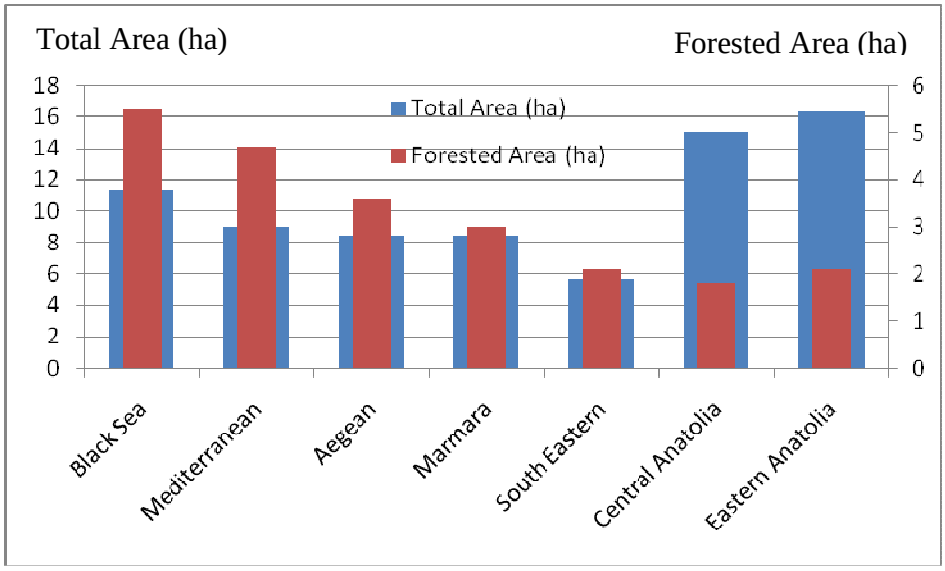


Figure 2.4: Forest Population and Total Area Distribution by Regions in Turkey

Source: Forest Fires in Turkey Report, 2010

Consequently, there is an increasing concern in the damages caused by forest fires because of its impacts on tourism, economy and environment. Fire management is a federal responsibility in Turkey and the General Directorate of Forestry (GDF) [Orman Genel Müdürlüğü (GDF)] is the responsible body. Forest fire management strategies in Turkey are based on three basic principles:

1) Preventive measures (education and consciousness).

2) Early warning, rapid and active intervention, strong suppression.

3) Reforestation of burned areas (Forest Fires in Europe 2009 Report, 2010).

Education and awareness raising campaigns have been carried out to increase the consideration for forest fires and particularly with the aim of:

- Making people to be aware of the problem of forest fires.
- Training in the primary, secondary and high schools.
- Training the forest fire fighting teams, technical personnel, forest villagers, shepherds, hunters and soldiers (Forest Fires in Europe 2009 Report, 2010).

The responsibilities are divided into geographical zones under the city forest enterprises. There is a national database on forest fire and information gathered on the location and by doing so; the causes of fire are stated in this database. It is used for improving prevention and suppression techniques. For example, forest fire prevention efforts are mounted on media awareness campaigns.

The fire suppression plans are based on early detection of fires, quick initial attack and strong suppression. Forest fire statistics have been kept in Turkey since the year of 1937. According to these statistics, 72,316 forest fires occurred and 1,549,506 hectares of green area were burned until the present day. The average annual numbers of forest fires and burned green areas in the most recent decade are 2,100 and 13,736 hectares respectively. The average annual numbers of forest fires and burned green areas are 1,096 and 23,477 hectares respectively in the last 10 years for Aegean Region. The distribution of cities in a detailed manner and the number of fires and burned areas are in Appendix 5 (www.ogm.gov.tr/statistics last accessed 24/06/2010).

According to Bilgili (1999), 71% of the fires are controlled at less than 5 hectares and account for only 8% of the area burned. In contrast, only one percent of the fires exceed 200 hectares in size, but these fires account for 37% of the total area.

The studies concerning the destruction of forest fires for Turkey were examined by practitioners. International Forest Fires News (IFFN, 2005) published a paper that presents an approach to calculate the fire damage of Turkey in a forest area from the forest economics standpoint. The damage was calculated by using the presented paper and the one which was determined by the State Forest Directory were compared for a burned area in Kumluca State Forest Enterprise, Antalya.

On the other hand, research and evaluations on various areas continued. For instance, locations of resources and distance from supply points (water resources) were evaluated for Turkey. Temiz and Tecim (2009) describes the areas in this study that can cope with forest fire effectively are determined according to the distance from water resources, distance from streams and distance from settlement areas criteria by using Boolean Analysis and Analytic Hierarchy Process (AHP).

For our study area, İzmir Forest Administration Chief Office contributed the data a lot. Next, the results are visualized on a digital map. Besides, the results of the Boolean analysis and AHP analysis are compared.

From another perspective, economic destructions of forest fires briefly researched by International Forest Fire News (IFFN, 2005) reviewed that, the Total Economic Value (TEV) concept briefly for Turkish forestry as far as possible from the social economic and environmental points of view. Moreover, information systems were also used for Turkey. International Forest Fires News (IFFN, 2005) argues that evaluates fire risk and danger using Geographical Information Systems (GIS) at Manavgat forest conservancy. Estimates with historical data help researchers for calculations of forest fire moistures. International Forest Fires News (IFFN, 2005) presents fire danger for fire prone areas in southern and western part of Turkey. Authors also elaborated a case study and calculated fuel moisture contents for 13 different regions based on daily weather data for the last 11 years during the fire seasons (April to October).

According to a different research, a brief country report was published in International Forest Fires News (IFFN, 2005) and mentioned; fire regimes, ecological role of fire, human influenced fire regimes, burning statistics and causes. Also, Ertuğrul (2005) describes that the situation of forest fires on region where the fire problem arise, can be taken under control thanks to the measures because, planned cautions can be observed that they have been mentioned.

After the review of Turkey's fire situation in detail, we investigate and analyze the fire situation from the point of Greece which is one of the main actors of this cooperation system as well as Turkey.

2.1.3 FIRE SITUATION IN GREECE

In this section, we discuss Greece's fire situation. Their forest areas, average fire data, prevention activities, sources and performances' of those sources.

Approximately 2.5 million hectares of area which is corresponding to 20% of surface is forested in Greece. Especially at lower elevations close to the sea, the forests are still in danger due to the ever increasing frequency of wild fires. In a long-term fire analysis between 1995 and 1999 (Xanthopoulos, 2000) showed that forest fires in Greece burned, in average, 11,500 ha per year until 1973.

From the provisional results of 2009, it seems that the burned area level has remained low in comparison to the results of previous years. Summer of 2009 was mild without extreme weather conditions except the last 10 days of August in which severe fire weather conditions were experienced. During that time (21st August) the largest fire occurred, burning about 13,000 ha in the northeast part of the Region of Attica in wild land/urban interfaces where more than 100 houses were partially damaged. Because of this fire, the Region of Attica became the most damaged region of the year and because of some other fires that also occurred in the Sterea Region of Greece at the same time. This region is second in the ranking of damages this year (Forest Fires in Europe 2009

Report, 2010). Table 2.1 shows the distribution of 2009 forest fires by regions in Greece.

Table 2.1: Distribution of 2009 Forest Fires by Regions in Greece

FOREST ADMINISTRATION AUTHORITIES	Total # of Fires	# of fires <1 ha	# of fires 1-5 ha	# of fires 5-100 ha	# of fires 100-500 ha	# of fires > 500 ha	Total Burned Area (ha)
ATTIKIS	-	-	-	-	-	-	16942.62
SOUTH GREECE	227	172	21	31	2	1	9152.12
IONIAN ISLANDS	106	74	17	14	1	0	2912.17
EAST MAC. THR.	62	50	5	6	0	1	2434.9
PELOPONISOU	202	178	17	5	2	0	1270.11
KRITIS	35	26	6	3	0	0	855.45
SOUTH AIGAIOU	8	6	1	1	0	0	676.35
THESSALIAS	72	46	11	14	1	0	452.2
NORTH AIGAIOU	25	19	6	0	0	0	226.17
WEST GREECE	54	52	2	0	0	0	163.33
IPEIROU	160	140	15	5	0	0	141
CENTERAL MACEDONIA	50	41	3	1	5	0	81.3
WEST MACEDONIA	62	56	4	2	0	0	34.6
TOTAL	**1063**	**860**	**108**	**82**	**11**	**2**	**35342.32**

Source: Forest Fires in Europe 2009 Report, 2010

Prevention activities are made by Fire Service which is a governmental organization and responsible on forest firefighting in Greece since 1998. The government fully supported the Fire Service both inward and financially. Greece has one of the largest airborne firefighting resources in the world in comparison to the size of the country (Forest Fires in Europe 2008 Report, 2009). The personnel involved in suppression efforts comprise about 15,000 people, of which 9,500 are permanent personnel of the Fire Brigade

(especially for city forest fires which are not classified for forest fires) which also deals with structural fires, and 5,500 are seasonally hired personnel just for the forest fire suppression activities (Forest Fires in Europe 2009, 2010). The Fire Brigade of Greece owns about 1,560 engines, which are involved in both structural and forest fire suppression efforts, and a few smaller engines owned by Municipalities of high risk areas were involved occasionally in some incidents. The aerial means were used in 2009 campaign are indicated in Table 2.2.

Table 2.2: Aerial Vehicles of Greece in 2009

STATED OWNED			
AIRCRAFTS	LARGE	CL-215	13
		CL-415	8
	SMALL	PEZETEL	18
		GRUMMAN	3
HELICOPTERS		H/P PK 117	3
		SUPER PUMA	2
		TOTAL	**47**
HIRED			
HELICOPTERS		H/P MI-26	4
		H/P AIKORSKY 64	5
		H/P KA-32	5
		TOTAL	**14**
		GENERAL TOTAL	**61**

Source: Forest Fires in Europe 2009 Report, 2010

Despite of all these resources, fire management is still in a bad condition in Greece because of the lack of appropriate funding for fire prevention and poorly managed

forests and fire prevention system. Even, during meteorologically difficult fire seasons, it can only be expected to worsen. A stunning example clearly indicates this situation as an instance that three Army pilots and seven firefighters were died in 1994 when their UH-1H "Huey" helicopter hit power lines on its way back from a fire and in 1993 and 2000 two more CL-215s were lost and four more pilots died. The loss of a PZL M-18 on Corfu Island in 2000 costs the life of another pilot (Xanthopoulos, 2000).

Because of this negative fire fighting activities, Greece always needed help. During the fire campaign for the fire that occurred on 21st August 2009, the mechanism of international assistance was activated. Thus, the assistance which was received is summarized in Table 2.3.

Table 2.3: Countries of Helping Greece in 2009 Forest Fires

COUNTRY	Aircraft Type	Number	Total Flight Work (hh:mm)
Italy	CL-415	2	33:13
EU FFTR	CL-215	2	18:19
South. Cyprus Rum Side	KA-32	1	13:30
France	CL-415	2	12:26
Turkey	CL-215	1	02:35
Spain	CL-215T	2	00:00
TOTAL		**9**	**80:03**

Source: Forest Fires in Europe 2009 Report, 2010

The poor results of the last few years obviously demonstrate that there is a need for improvement, especially regarding to the knowledge and organization of the whole effort. As we have mentioned, Greece has serious fire problems. Especially in terms of airborne forces, the country should probably be rated first in the world. Also, there is a need for better prevention. Xanthopoulos (2000) states that Greece Fire Service needs to improve its initial attack capability. In addition, the “Fire Service” should evaluate its pre-suppression planning in order to maximize the effectiveness of its forces, especially the aerial ones.

Despite of the impact of Greece’s poor performance and large number of fleet: Greece has numerous islands in the Aegean Sea. Islands are far away from each other and the coastal band of mainland. Besides, wind and the other factors of high seas are the others affects of enlargements of forest fires and they bloc the fire extinguishing activities especially aerial ones.

After the review Greece’s forest fire situation in detail, we focus on our main topic of cooperation issue within Turkey and Greece.

2.2 COOPERATION OPPORTUNITY BETWEEN COUNTRIES

In this section, we discuss the cooperation topic; the need for cooperation, national cooperation and international cooperation issues. We examine cooperation because; we think that Turkey and Greece are close enough to each other. Although, Greece has lots of islands in the Aegean Sea, these islands are much closer Turkey's Aegean Region coastal band. As we mentioned in "Fire Situation in Greece" section; Greece has vital problems with the airborne firefighting activities. Also, when there is a disaster situation, neighbors are helping each other spontaneously e.g. earthquakes, forest fires, floods and avalanche. There are number of examples in cooperation issue.

Cooperation is defined as the process of working together, which can be accomplished by regional, national or international agents. In the simplest form, it includes all involved parties which work in harmony.

During extreme fire situations, countries may be short of fire suppression resources, including command and coordination personnel, trucks or aircrafts. Moreover, countries may have not enough experience or knowledge to fight with huge fires or may require technical or tactical support. For these situations, countries cooperate with each other and try to reduce the bad impacts of forest fires.

After the definition of cooperation and cooperation causes of countries in large forest fire disasters, we continue with details of cooperation needs.

2.2.1 NEED FOR COOPERATION

In this section, we discuss why countries or regions need cooperation on airborne firefighting activities. We explain essential cooperation issues, goals of enhancing international cooperation and fields which extremely need cooperation in the fire fighting activities.

Forest fires do not respect country borders, and most of countries cannot handle fires due to the lack of capacity or capability, especially in case of large fires. Effective cooperation is a main component in regional and global plans to improve the fire management. The share of effective fire management knowledge and experience was limited in the past but this has been increasing rapidly in recent years (International Cooperation on Forest Fire Management, 2005). The catalyst for this change was the bilateral (involving two countries) and multilateral cooperation between bordering countries. Also, lack of political issues may be the reason not only for lack of institutional coordination in fire management. Another main area of collaboration is capacity building in fire management. Capacity building is a big gap for forest fire management. There isn't any international association for forest fire management and

countries try to do their capacity building activities alone. There are no standardizations in this issue. Lack of knowledge and share of this information are causes undeveloped capacities, facilities and fleets.

Improved cooperation within and between regions is seen as a need for many countries. Regional plans for fire management are needed, including the identification of cooperation mechanisms. The review of forest fire cooperation outlines priority activities, methodologies, tools and standards that must be addressed in order to improve national and international cooperation in fire management.

The following issues are essential for cooperation in fire management;

- access and suitable transfer of knowledge for fire management activities,
- capacity-building in high quality scientific research,
- harmonization of terminology and definitions for better understanding and development of a multilingual global fire management terminology,
- global fire monitoring, assessment and reporting standards,
- advanced international training courses for fire management issues are essential (Fire Management: Review of International Cooperation, 2006).

The goals of enhancing international cooperation in fire management are;

- to adopt a new and common language and principles in fire management as a basis,
- to understand the issues related to fires, their important causes on environmental and human impacts,
- to create synergies by increasing collaboration among countries and coordinating individual actions,
- to achieve greater integration of policies, plans, management and monitoring among sectors,
- to develop global and international policy and fire management support systems,
- to implement relevant international agreements, conventions, declarations, processes and voluntary agreements in regional, national and local policies and actions,
- to create a framework and mechanisms for international donor support to fire management stakeholders in need (Fire Management: Review of international cooperation, 2006).

In recent years, the rate of collaboration between countries within regions and between regions is increasing. There are numbers of bilateral and multilateral agreements for joint fire suppression, regional training courses and several regional networks for the exchange of information and experience and some regional fire management plans. The details of the agreements are available in Appendix 1.

Cooperation is a break with two topics; intranational and international cooperation. In next two sub sections, we discuss the national and international cooperation issues in detail. We chose the term intranational to avoid the confusion with national cooperation. The aim of under the intranational topic is cooperation between one country's regions.

2.2.2 INTRANATIONAL COOPERATION

In this section, we discuss national cooperation issues among the regions and the institutions of a country. The issues include institutional responses problems, national agreements, lack of clear definitions and standardizations and the importance of the national cooperation on international cooperation.

Countries are have wide range of institutional responsibility structures for fire management, distance from the national forest departments and headquarters, number of authorities are concerned about fires. In some countries, there are agreements among the national institutions for the coordination in large emergency situations. But, the lack of a clear definition of responsibilities and coordination between the various national institutions was identified by many countries as severe constraints on effective fire management (Fire Management: Global Assessment, 2006).

In order to develop effective international cooperation agreements, there is a big need for close cooperation and coordination at the national level, provincial and local agencies must involve in fire management. Collaboration between agencies involved in fire management.

It is recommended that the roles of all institutions and agencies involved in national fire management are;

- improving interagency collaboration through the involvement of all in the preparation of the national fire management plan and establishment of mechanisms to promote cooperative approaches,
- defining responsibilities clearly and without overlaps,
- resolving overlapping or conflicting policies or legislation (Fire Management: Global Assessment, 2006).

2.2.3 INTERNATIONAL COOPERATION

In this section, we discuss international cooperation issues. We provide examples of international cooperation agreements, broad areas of international cooperation, common terminology, templates and a SWOT analysis for the international cooperation.

In many languages, there is no clear and well-defined global fire terminology. Multilanguage fire terminology is a must for enhancing international dialogue and cooperation in fire management. Currently, there is an online English glossary including the basic terms in English. This is not useful for other countries. Also, incomplete German, French and Spanish terminologies are available.

In order to create a sustainable forest management, international cooperation is essential to increase the utility and productivity, to seek new and additional resources and provide access to the modern technologies that are needed in many developed countries. The milestone of an effective global fire management strategy is the increased international cooperation between countries (Maintaining International Commitment to Sustainable Forest Management, 2005). There is an increasing collaboration between countries. In some regions such as South Asia, collaboration in fire management is limited, but in other regions such as North America, Australia and some parts of Mediterranean cooperation level is strong. The regional analyses report a total of 22 international emergency response agreements, 16 international agreements on other matters and 6 national inland agreements dealing with forest fires globally. Bilateral and other agreements for joint fire suppression or the exchange of fire crews are in force in several places, especially in border areas, for example Canada with the United States; China with Russia; among some countries of Mesoamerica; Mexico with the United States; Mongolia with China and Russia; Russia with Finland; and Russia with the Islamic Republic of Iran. Moreover, ad hoc agreements have been formulated to

respond to emergency situations, such as in Brazil and Colombia in 1998 (Fire Management: Global Assessment, 2006).

There are four main clusters in the international cooperation;

- development of international standards, methods and systems for fire early warning, monitoring, prevention, suppression, impact assessment and reporting
- training and technology transfer,
- support to policy, legal, institutional and planning frameworks,
- research (Fire Management: Review of International Cooperation, 2006).

Internationally agreed databases and reporting procedures are not in place. Both databases and procedures are important in decision support at national, regional and global levels as well as in assessment of needs and impacts. Besides a global database, information flow should be ensured from national and regional levels to a global clearing house for receiving, processing fire data, connected with a network of national fire management agencies. Advanced international training courses for fire management specialists working at high level positions should support the development of a culture international cooperation. Some countries may require international cooperation and support in developing their national fire policies. Between 2000 and 2006 years, a number of projects have supported the development of national policies, legislation and strategies, mainly through bilateral technical cooperation projects. The development of the Regional Strategy on International Cooperation in Wildland Fire Management in

Latin America and the Caribbean with sub-regional strategies for South America, Central America and the Caribbean, supported by Food and Agriculture Organization (FAO) in 2004–2006, may serve as a guiding example for other regions (Fire Management: Review of International Cooperation, 2006). Similarity of conditions in countries within a region should encourage the development of fire research projects in which resources will be economized and shared and synergies will be created.

In this context, “The International Wildland Fire Management Agreements Template” (as adapted by the 2003 International Wildland Fire Summit and regularly updated by FAO) is a guiding document. The main focus of this template is how to manage the future of international wildland fire management and share problems and solutions of these problems. The International Wildland Fire Management Agreements Template stated that a template and information on cooperation in wildland fire management to countries may interest in relationships and agreements with other countries which are facing same issues. The International Wildland Fire Management Agreements Template is intended to enhance current international coordination and cooperation by providing information on the following: mutual assistance, cooperative assistance, technical exchanges, technical assistance, disaster assistance and responsibilities for both sending and receiving countries. All these issues are clearly explained in this template. In addition to bilateral or multilateral agreements, it will be important to adopt the Incident Command System (ICS) as a unified standard procedure for multinational cooperation in wildfire incidents. This procedure should regulate the details of cooperation in order

to ensure efficient communication and cooperation among personnel from two or more countries (Fire Management: Review of International Cooperation, 2006).

Jurvelius (2004) stated that there are 20 emergency response international agreements. The article focuses on some legal aspects of forest fire management, namely international agreements and national legislation dealing with forest fires in Appendix 1. Finally cooperation within the Mediterranean on fire management could be a more effective way of preventing major damages by wildfires.

The possibilities to be explored (Forest Fires in the Mediterranean Region: Prevention and Regional Cooperation Workshop, 2008) are as follows;

- to promote regional cooperation on wildfire management in the Mediterranean,
- to promote the use of information systems for the prevention of forest fires,
- to discuss the causes of fires in the Mediterranean, including the role of arson.

Molina (2008) states the strengths, opportunities, weaknesses and threats analysis (SWOT) of wildfire legislation and policy for the Mediterranean region. Table 2.4 presents the SWOT analysis.

Table 2.4: SWOT Analysis of Wildfire Legislation and Policy for the Mediterranean Region

Strengths	**Weaknesses**
All countries have specific policies for wildland fires	Suppression-oriented actions at the expense of prevention
Development of information systems	Lack of a cross-sectoral approach
Improvement of the extinction efficiency	Traditional burning practices were made illegal without prior educational programmes
Opportunities	**Threats**
Political will on coordination	Need of enhanced community-based cooperation

Papageorgiou (2008) states that needs of main principles in forest fire fighting managing activities in future:

- Need for official cooperation and agreements among the neighboring countries are imperative.
- Mutual assistance should not only be based on aerial resources but also on ground forces knowledge, experience and training.
- Collaboration should cover not only for suppression but also prevention and detection.
- A number of Coordination Centers must be established. They should operate in selected areas.

Hollis (2010) describes that the findings of point towards the emergence of an alternative form of European security governance that addresses the lack of authority in European Union (EU) security policy.

International cooperation example of Turkey and Greece in 1999 is reviewed by Ganapati, Kelman and Koukis (2010). They focus on the role of the 1999 earthquakes in enhancing the collaboration between Greece and Turkey over the past decade.

2.3. DATA SOURCES

In this section, we discuss the data sources used in the thesis. We share this information since related data is limited and also it is difficult to obtain the same type of data over years and over countries/regions. The main sources of data are Food and Agriculture Organization (FAO) and Forestry Department Publications of FAO, Global Fire Monitoring Center (GFMC), United Nations-International Strategy for Disaster Reduction (UN-ISDR), General Directorate of Forestry (GDF) and International Forest Fire News (IFFN).

FAO is in collaboration with countries, governments and other international partners to develop strategies to enhance international collaboration on wild land fires that

advances knowledge, increases access to information and resources and explores new approaches for collaboration at all levels. FAO is coordinating a multi-stake holder process towards a framework of priority principles of fire management, within which to provide policy, legal, regulatory and other enabling conditions for and strategic issues towards more holistic approaches.

The GFMC provides a global portal for wildland fire documentation, information and monitoring and is publicly accessible through the internet. The regularly updated global wildland fire products of the GFMC are generated by a worldwide network of cooperating institutions.

UN-ISDR is a framework, adapted by the Member States of United Nations in 2000, aiming to guide and coordinate the efforts of a wide range of partners to achieve substantive reduction in disaster loses and build resilient nations and communities as an essential condition for sustainable development.

UN-ISDR is the secretariat of the ISDR system. The ISDR system comprises numerous organizations, states, intergovernmental and non-governmental organizations, financial institutions, technical bodies and civil society, which work together and share information to reduce disaster risk. ISDR provides these services; coordinate, advocate, campaign, inform, organize, encourage, promote and provide.

GDF is responsible for all forestry activities since 1985. Their main duties are to promote forests from; natural disasters, fires, arsons and other harmful activities.

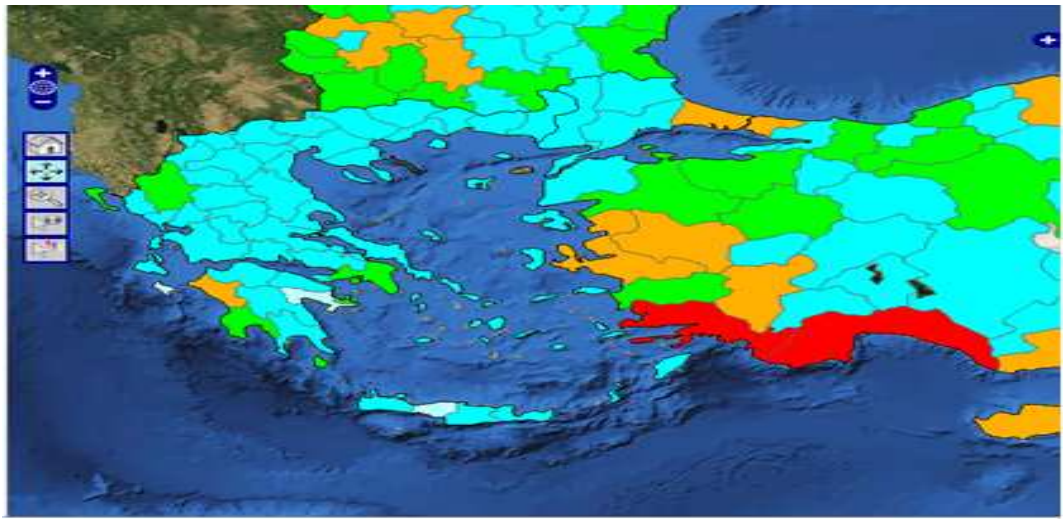
IFFN is an activity of the FAO/United Nations Economic Commission for Europe (UNECE) Team of Specialists on Forest Fire and the GFMC. IFFN is published on behalf of UNECE Timber Committee and the FAO European Forestry Commission.

CHAPTER III

PROBLEM DEFINITION, ASSUMPTIONS AND METHODOLOGY

The forest fires and resulting damages are important problems for Turkey and Greece. Both countries are fighting against fires every year and they have been trying to take precautions against the loss of forests, ecology, houses, money and human life for many years. Generally, they are using their own aerial vehicles but sometimes they demand and get help from their neighbors. Especially, Greece extended their aerial vehicle fleet in the past years but couldn't stop the fires despite these works.

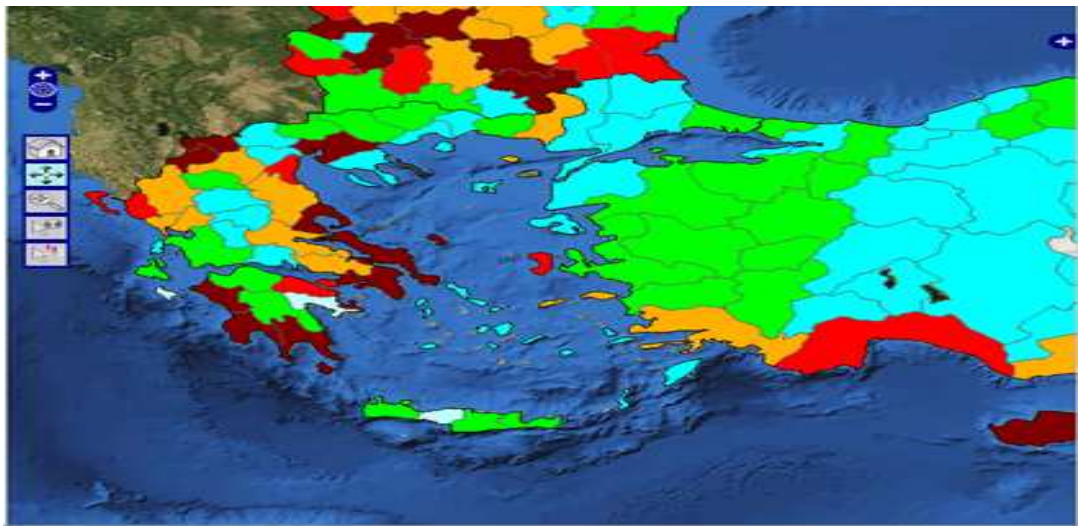
Figure 3.1 shows the number of fires in the regions of Turkey and Greece in 2007. Blue colored regions had the lowest number of fires and brown colored regions had the highest number of fires. It is worth to note that Greece has mostly blue colored regions, few green colored regions and one orange colored region. In contrast, Turkey has higher number of fires compared to Greece. Turkey has many orange and red colored regions.



Legend: No fires > 0-50 51-100 101-250 251-500 > 500 fires

Figure 3.1: Number of Fires Map in 2007

Source: http://effis.jrc.ec.europa.eu/fire-history last accessed 05/05/2010



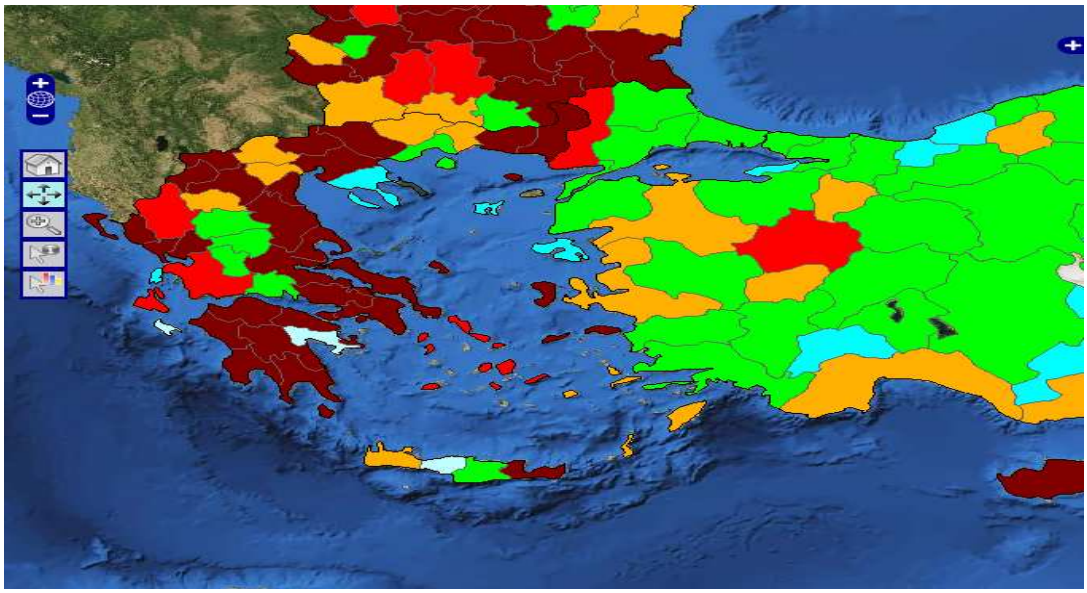
Legend: No fires ≤ 100 ha 101-750 750-1500 1500-3000 >3000

Figure 3.2: Burned Areas Map in 2007

Source: http://effis.jrc.ec.europa.eu/fire-history last accessed 05/05/2010

Figure 3.2 shows the total burned areas in the regions of Turkey and Greece in 2007. Similar coloring scheme is used in this map as well; blue color represents the lowest and brown color represents the highest burned areas. In Figure 3.1, we mentioned about the low number of fires for Greece and comparatively high number of fires for Turkey. However, it is showed in the total burned areas map that Greece could not manage their low number of fires well because, colors of Greece in this map are mostly brown, few red, lots of orange and mostly green. On the other hand, Turkey has mostly green colored regions with respect to high number of fires.

Lastly, we can see the same situation in the average fire size map in Figure 3.3.Average fire size of a region is computed by the ratio of total burned area to the number of fires in that region. Just like total burned areas' map, average fire sizes' map proves our problem well.



Legend: No fires > 0-1 ha 1-5 ha 5-10 ha 10-20 ha > 20 ha

Figure 3.3: Average Fire Size Map in 2007

Source: http://effis.jrc.ec.europa.eu/fire-history last accessed 05/05/2010

In short, this is a long term problem for all countries which are under high forest fire risk. Cooperation and collaboration is a must for these countries. Therefore, we choose Turkey's Aegean Region and 21 islands of Greece in order to create a cooperative system and make profits for both countries regarding to elaborate collaboration options in Figure 3.4. We have Aegean Region in Turkey and Greece's 21 islands in the Aegean Sea for this cooperative system because of these mainlands are closer to each other and suitable for cooperation on airborne firefighting activities. Moreover, countries are under first degree forest fire risk. Also, we have a motto for this cooperation between Turkey and Greece, as İzmir Chamber of Commerce President Ekrem Demirtaş mention

before (http://www.porttakal.com/haberler/gundem/ege-de-savas-ucaklari-ucmasin-717415.html last accessed 10/02/2011).: “Stop dog fight, start forest fire fight in the Aegean Sea.” For this study, we determine some Key Performance Indicators (KPI); such as initial attack time and distance (30 minutes and 95.6 kilometers respectively) and reachable areas in initial attack time and distance.

Figure 3.4: Scope of the Research

With this information we create our research questions:

1. What are the distributions of current vehicles in Turkey and Greece?
2. What are the impacts of current distributions with respect to our metrics?
3. How both countries can manage their problems with alone works?

4. What is happened if countries move together?
5. Under which conditions cooperative system provide benefits for both countries?

In order to find these questions answers, we searched the historical data, identified the risky zones and analyzed the aerial firefighting vehicles, including power consumptions and technical specifications. We considered the runways for Aegean Region. Then, we used all these data to resolve the airborne firefighting problem by using initial attack method and cut in the fires as quickly as possible. In addition, we analyzed the current system with fixed metrics and estimates about the subject which were developed. We tried to measure the efficiency of firefighting that benefit from current resources and develop a mutual cooperation system. We dealt with the reallocation for aerial firefighting, prevention and suppression in the Aegean region for both countries. By the application of this system, we tried to create an effective and efficient fire fighting system for reducing the total burned area, loss of human and animal lives, costs and environmental destruction.

In all these studies, we use these assumptions:

- All vehicles are identific.
- All vehicles' maximum speeds are 250km/h.
- There is a single forest fire occuring in one demand point or in covered areas.
- Forest populutions in covered areas are not demand points. But also, reachable and covered.

- There are 146 in Turkey and 21 in Greece possible demand and supply nodes. These points are taken with respect to initial ataack time and distance for well-organized cooperation.
- All vehicles are waiting with full loaded water capacity for quickest initial attack time. With respect to this assuption, we did not consider any located pools and water resources. We became concerned with extinguish the fires with initial attack time, not try to block for enlargement of a fire.

After literature review and problem definition parts, we start to design our systems. First, we define non-cooperative systems and then, we define cooperative systems. In non-cooperative systems, we analyze the current situations of both countries and try to find their optimal locations. In cooperative systems, we combine the data about countries and try to find best cooperative location system for both countries. Under cooperative system issue, we specify the cooperation; leader follower and two player game theory systems.

CHAPTER IV

NON-COOPERATIVE SYSTEMS

In this chapter, we discuss the non-cooperative systems of Turkey and Greece. We analyze the current system of each country and measure their initial attack performance. We then develop suggestions in two directions the cooperation of the aerial vehicles for an improved initial attack time and the optimal number and locations of vehicles for 30 minutes initial attack strategy. We develop these suggestions with the help of the mathematical models.

4.1. SITUATION OF TURKEY IN NON-COOPERATIVE SYSTEMS

In this section, we discuss Turkey's organizational structure of firefighting prevention activities. We explain the organizational structure, regional directorates, initial attack teams, training facilities, land sources, aerial sources and location of these sources.

GDF is conducting forest fire fighting actions in Turkey. Organization system was prepared in order to facilitate efficient forest firefighting. In that respect, observation

and communication are the most core elements of forest firefighting. There are 775 lookout towers for observation purposes. Besides, the forests are kept under the every hour observation during the forest fire season by means of these towers in all districts (Forest Fires in Turkey, 2010) GDF performs the detection, prevention and suppression activities with 27 regional directorates and their city chieftainships. Figure 4.1 shows the regional directorates under the regional directorates.

Figure 4.1: Forestry Region Directorates in Turkey

Source: www.ogm.gov.tr last accessed 19/07/2010

There are 525 initial attack teams organized for fighting against forest fires in Turkey. There are 15-30 functioning fire fighters in each team. A total of about 10,000 forest

fire workers are employed in these forest fire seasons. Also, there are two training facilities for the workers (www.ogm.gov.tr last accessed 20/06/2010). Concerning the efforts to decrease the fire damages, 1,316 km forest road, 365 km fire safety road and 8 km lookout tower roads were newly constructed (Forest Fires in Europe 2009 Report, 2010).

In 2009, the used ground and aerial vehicles include;

- 1.117 fire trucks, 168 bulldozers, 497 water tanks, 132 graders, 110 trailers, 25 loaders, 230 caravans,
- 438 vehicles, 686 motorcycles, 6 administrative helicopters (owned by forestry organization),
- 20 various type of leased helicopters, 15 leased Dromader aircrafts and 4 leased CL-215 Canadair (Forest Fires in Europe 2009 Report, 2010).

All bulldozers, fire trucks and other service vehicles are being tracked by the "Vehicle Tracking System" since 2007. This system improves the efficiency in fire fighting. Usage of automatic fire-detection system was extended in several regional forest directorates. The system provides rapid detection of forest fires through visible range optical cameras. For the purpose of shortening the periods of forest fire attacks in forested areas where water sources are scarce, fire pools and ponds are constructed. The aim is to construct fire pools and ponds every other five kilometers length in fire sensitive areas. In 2009, 295 million $US were spent for forest fire fighting related

activities including prevention and suppression. This amount includes the purchasing costs of different kinds of fire fighting means (Forest Fires in Europe 2009 Report, 2010).

Also, Turkey has some problems in forest firefighting activities. One pilot and one forest guard (in total 2 persons) lost their lives in a fire fighting helicopter accident while fighting against forest fires. Turkey helps other countries in forest firefighting disasters, one amphibious aircraft (CL-215 Canadair) was sent to Greece for the purpose of fighting forest fires which occurred around Athens in 2009 for operational of mutual assistance (Forest Fires in Europe 2009 Report, 2010).

In the Aegean Basin, Turkey has both asphalt and soil runways that they are supplying planes with water and fuel. Asphalt runways are located in İstanbul/Samandıra, Çanakklae, İzmir/Selçuk, Muğla/Milas, Bursa/Yenişehir, Balıkesir and Antalya. The soil runways are located in Manisa/Akhisar, Gördes, İzmir/Kemalpaşa, Bergama and Manisa/Alaşehir. Among the soil runways, just Manisa/Akhisar runway can supply planes both fuel and water other runways can only supply water.

The exact locations of airborne vehicles are as follows; there are 1 Cessna and 4 Dromader water bomber planes groups located on İstanbul/Samandıra, Çanakkale and İzmir/Selçuk Airports, CL-215s were located Muğla/Bodrum and Antalya Airports and

helicopters were located Çanakkale, Manisa/Akhisar, İzmir/Kemalpaşa, Muğla/Marmaris, Muğla/Fethiye, Antalya/Düzlerçamı, Adana, Kahramanmaraş/İskenderun, Balıkesir, Denizli, Muğla/Milas, Antalya/Manavgat, İstanbul, İzmir/Gümüldür, Mersin/Bozyazı, Karabük, Bursa, Aydın/Kuyucak, Antalya/Finike are shown in Figures 4.2 and 4.3.

Figure 4.2: Locations of Dromader and Canadair CL-215 Water Bomber Planes

Source: www.ogm.gov.tr last accessed 19/07/2010

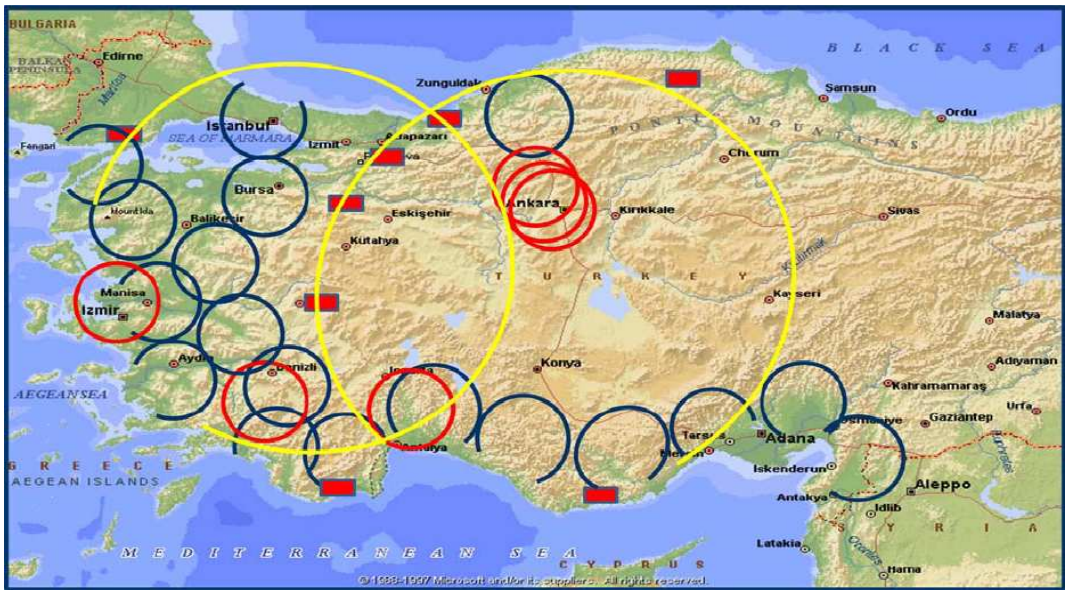


Figure 4.3: Locations of Administrative, Hired Helicopters and Reserve Water Tanks

Source: www.ogm.gov.tr last accessed 19/07/2010

4.1.1. ANALYSIS OF CURRENT SITUATION IN TURKEY

In this section, we discuss Turkey's current performance. We decide the supply and demand points. We show calculations of initial attack time, initial attack distance and initial attack map. After that we calculate total covered area in Turkey with the help of Google Maps Area Calculator Tool and then we prove this area in Gökçeada. We report the performance and efficiency results for the current system of Turkey.

According to the report of Forest Fires in Europe 2009 (2010); in the fire season of 2009, Turkey was successful one in terms of number of fires and burned area compared to the last ten years. The number of fires, burned area and burned area per fire decreased compared with 2008. In Turkey, 1,793 forest fires occurred in 2009 which burned 4,679 ha forest area. In terms of large fires, one event was larger than 500 ha (1,090 ha) and there were four events between 100 and 500 ha (199, 259, 237, and 335 ha). Approximately 82% of the ignitions were controlled before it was spread (less than 1 ha).

The burned area, the number of fires and average fire size for the period of 1998-2009 are shown in Figures 4.4, 4.5 and 4.6.

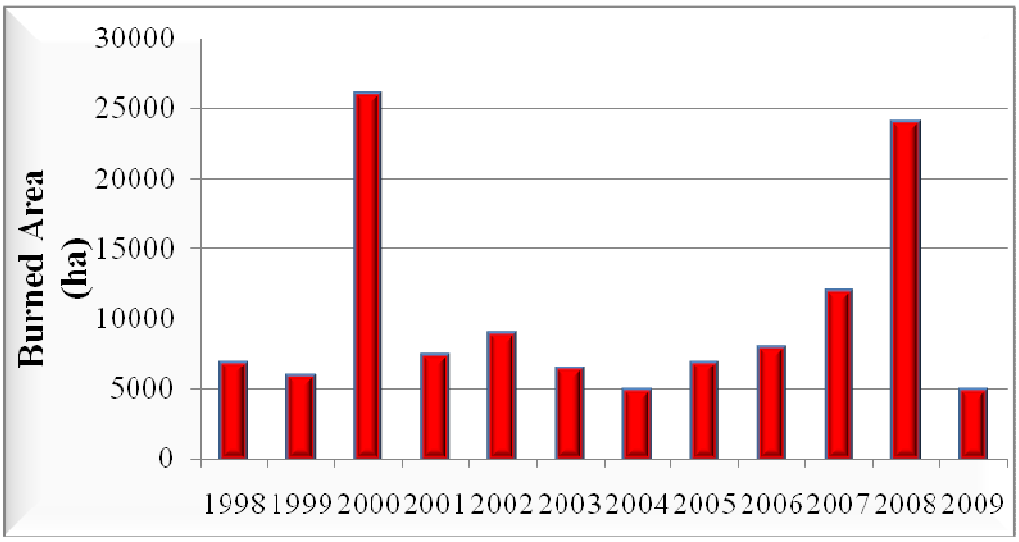


Figure 4.4: Burned Areas in Turkey (1998-2009)

Source: Forest Fires in Europe 2009 Report, 2010

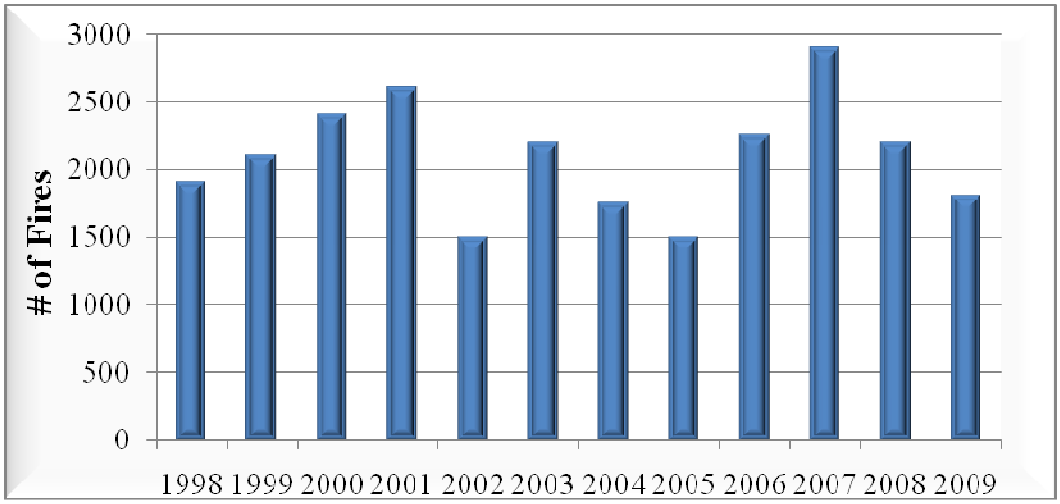


Figure 4.5: Number of Fires in Turkey (1998-2009)

Source: Forest Fires in Europe 2009 Report, 2010

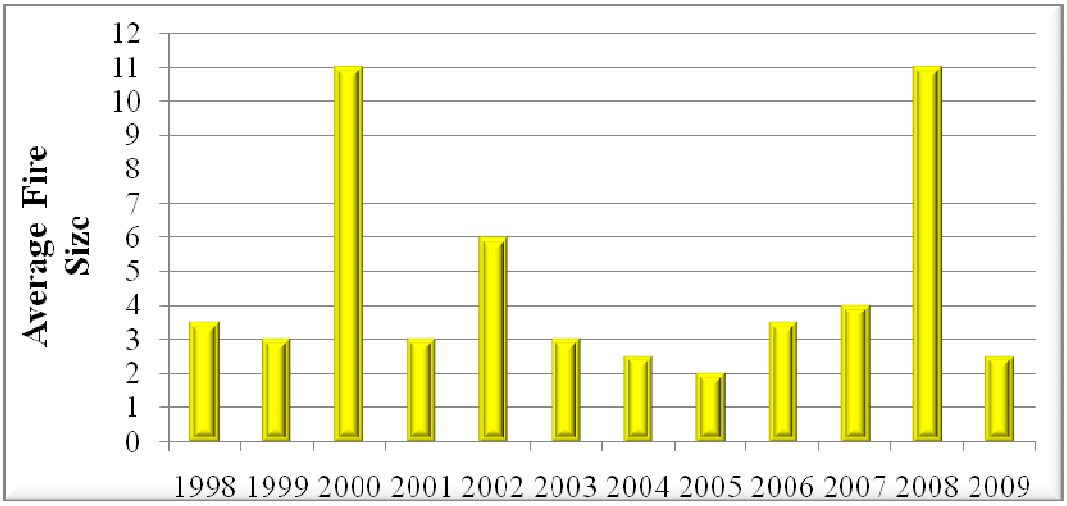


Figure 4.6: Average Fire Sizes in Turkey (1998-2009)

Source: Forest Fires in Europe 2009 Report, 2010

We select the Aegean Region as a targeted area and there are 11 supply points (Selçuk, Gümüldür, Kemalpaşa, Akhisar, Milas, Kuyucak, Denizli, Marmaris, Fethiye, Bodrum, and Bursa) and 146 demand points in this region. You can see the locations of the supply points in Figure 4.7.

All nodes are possible candidate supply and demand points in our study except Bursa (Bursa is out of Aegean Region, but can cover 6 points in Aegean Region). Supply points are possible candidate vehicle location nodes and demand nodes are also demand points with respect to forest fire historical data. Covering means, one supply point can reach one demand point in initial attack time or distance (30 minutes and 95.6 kilometers respectively).

Figure 4.7: Locations of Selected Aerial Vehicles in Turkey

For example, Bursa is out of Aegean Region borders but covering our 6 demand point. Additionally, İstanbul, Çanakkale, Balıkesir, Finike and Antalya supply points are avoided because; they can't cover any demand points in Aegean Region. Besides, some of the demand points are avoided for the reason that we could not find where they are located in Google Earth. Then, we calculate these demand points and their covering ratios by using some basic formulas. While implementing these formulas, we analyze all aerial vehicles' technical specifications. You can see the detailed technical specifications of the vehicles in Appendix 6.

Both in literature and in practice, the initial attack time is 30 minutes, our aerial vehicle's preparation time takes 7 minutes to be able to take off and their maximum flight speed is 250km/h. We get this information from GDF pilots and İlhami Alkan who is former manager of Protection Department in GDF, by personal interviews.

So, that means that we just have; $30 - 7 = 23\ minutes$ to fly to the fire area.

Then, we know that the maximum speed of the aerial vehicles is 250 km/hour.

So, our vehicles can fly; $250\ km$ in one minute.

If we have 23 minutes for initial attack and our vehicles can fly 4.16 km in one minute.

We can cover maximum $23\ min \times 4.16\ km = 95.68\ km$ far away from demand points.

In the light of this information, we prepare an initial attack map for Turkey's all coastal band area. In this map, we calculate these squares with this formula: we have maximum 95.68 km initial attack distance for 30 minutes.

With respect to these calculations, we show the area reachable by aerial vehicles in 30 minutes by circles, in Figure 4.8. In this figure, green squares are corresponding to helicopters, purple ones are Canadair CL-215 amphibious planes and green-red fragmental ones are Dromader water bombers.

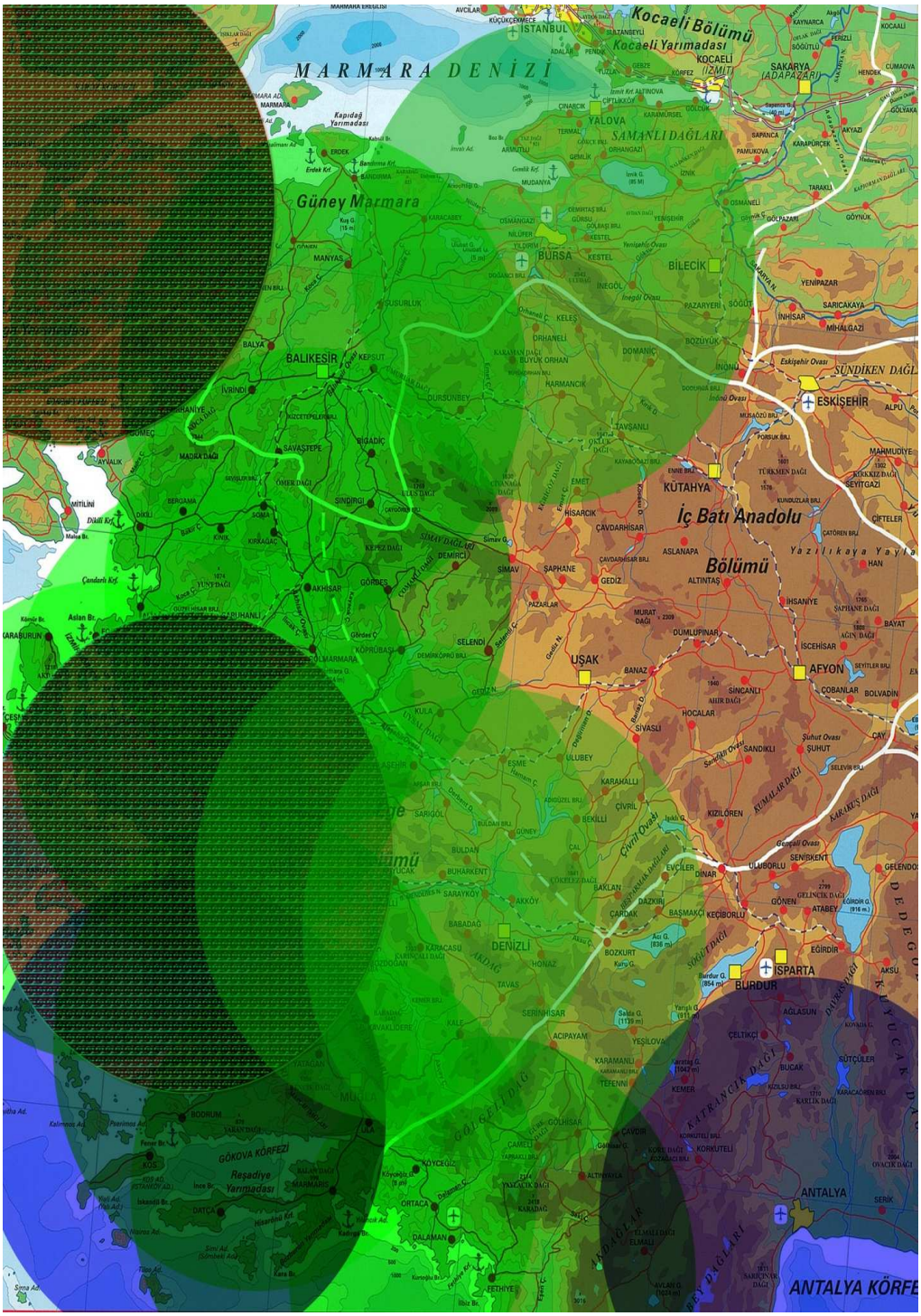


Figure 4.8: Initial Attack Map

We calculate the total covered area with “Google Maps Area Calculator Tool” as approximately 127,726 km^2 (31,562 hectares) for Asian continent. All Aegean Region’s total area is approximately 80,000 km^2. You can see the details of the map in Figure 4.9.

Figure 4.9: Total Covered Area

Source: Google Maps Area Calculator Tool

To be ensuring that “Google Maps Area Calculator Tool” is working correctly, we calculate the area of Gökçeada. Gökçeada’s total area is approximately 280 km^2 and the tool calculates is as 283.97 km^2. You can see the details of the map in Figure 4.10.

Figure 4.10: Gökçeada Area Calculation

Source: Google Maps Area Calculator Tool

As we mentioned before, we found 11 supply points and 146 demand points for Aegean Region with the help GDF. Then, we calculated the initial attack distance by the given parameters. Next, we measured the efficiency ratio of these 11 supply points for Aegean Region's demand points. Besides, we have to add supply point outside of Aegean Region Bursa because it can cover the demand points in the Aegean Region. We calculated the distance between supply points and demand points with Google Earth. Our key findings for the current system of Turkey are as follows:

- These 11 supply points can cover 125 of 146 demand points. This means 85.62% of the demand

points are within the initial attack range of at least one supply point with maximum covering asuumptions.

- These 11 supply points can serve to 2.160 hectares of 2.257 hectares burned areas in the demand points with the efficiency of 96% 97,399 ha.
- These 11 supply points can cover 451 fires of 502 fires with the efficiency of 90% and cannot extinguish 51.5 fires with the inefficiency of 10%.
- Supply points allocated vehicles and number of covered demand points are as follows: Kuyucak; 58 demand points with 1 helicopter, Milas; 47 demand points with 1 helicopter, Denizli; 46 demand points with 1 helicopter, Kemalpaşa; 42 demand points with 1 helikopter, Akhisar; 39 demand points with 1 helicopter, Marmaris; 39 demand points with 1 helicopter, Selçuk; 39 demand point with 1 Cessna discovery plane and 4 Dromader water bomber, Bodrum; 29 demand points with 2 Canadair CL-215 amphibious planes, Gümüldür; 27 demand points with 1 helicopter, Fethiye; 22 demand points with 1 helicopter and Bursa; 6 demand points with 1 helicopter.
- Tire, Söke, Çine, Koçarlı, Karpuzlu, Germencik, Muğla, Yaraş, Ula and Selimiye are demand points covered by 6 different supply points. On the other hand, Kozak, Demirci, Selendi, Çivril, Baklan, Çardak, Sivaslı, Değirmisaz, Hisarcık, Örencik, Emet,

Domaniç, Tunçbilek, Tavşanlı, Balıköy, Kiçir, Aksaz, Seki and Eşen are the covered only by a single supply point.

- 21 demand points are far away from initial attack distance and time from all supply points. These demand points are mostly belong to Kütahya, Uşak and Afyon regions but when we look at Kütahya's forest population is bigger than İzmir, Denizli, Manisa and Aydın. When we consider the climate and human population differences between İzmir and Kütahya, Kütahya seems to be out of the risky zone for all authorities but demand points of these three cities are creating our inefficiency rate of 14.38%.

Table 4.1: Turkey's Current Performance Analyses

	Total (A)	**Covered (B)**	**Covered Ratio (A/B)**
Demand Points (number)	146	125	85
Burned Area (ha)	2.257	2.160	96
Number of Fires	502	451	90

As you see in the Table 4.1, Turkey has some covering problems with the current allocation of the vehicles depending on historical data. In the next section, we try to suggest a reallocation of vehicles using a mathematical model optimal solution options for Turkey.

4.1.2. OPTIMAL SYSTEM RECOMMENDATIONS FOR TURKEY

As it is shown in the previous section, although Turkey has 11 aerial vehicles in the region, not all demand points are covered within 30 minutes. In this section, we discuss our optimal system recommendations and reallocations of vehicles. First, we find the optimal vehicle number with respect to the distances between demand and supply points. Then, we show the covering performance of this new system. Finally, we find a new reallocation with optimal number of vehicles using distance.

Locations of demand and supply points in excel macro model are shown in Figure 4.11. We find the coordinates of supply points. For each demand point, we assign a coordinate considering the center of the demand region. We compute the distances between each demand and supply points pair. For this purpose, we develop the Excel Macro given in the Appendix 7.

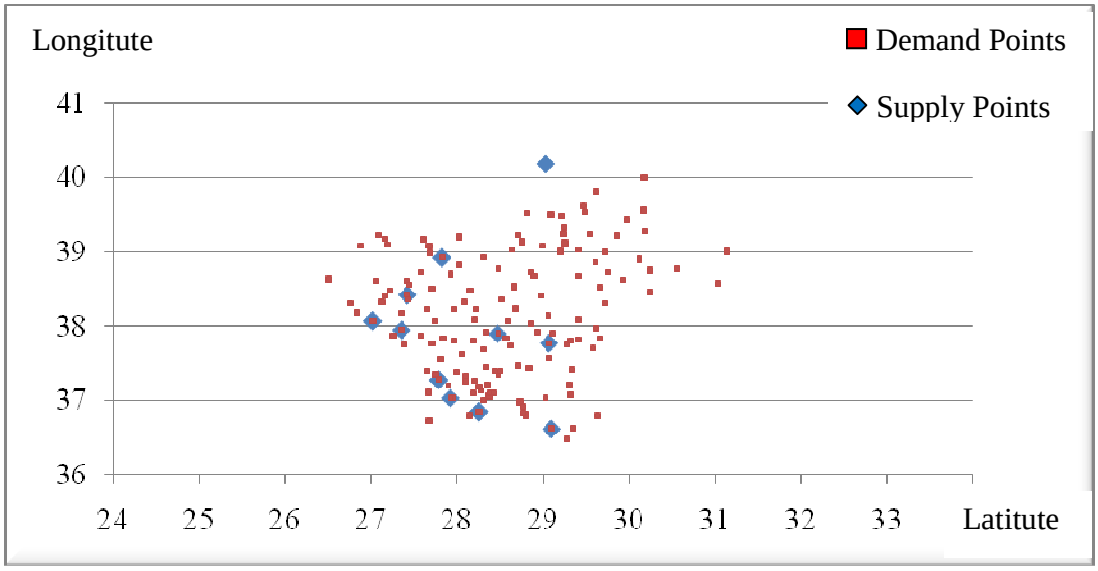


Figure 4.11: Distributions of Demand and Supply Points in Turkey

Our first topic is the Turkey's optimal number of vehicles. Thus, we try to find out Turkey's optimal supply points numbers by using distances between supply and demand nodes. We use the Location Covering Mathematical Model (M1) given below:

M1 (Location Covering Model)

Sets:

$V = set\ of\ nodes\ in\ Turkey$

Parameters:

$d_1ij = distance\ between\ node\ i\ and\ j,$ $i(V, j(V$

$IAD = Initial\ Attack\ Distance$ (95.6 *kilometers*)

Decision variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\min Z = \sum_{i \in V} x_i \qquad (M1.1)$$

Subject to:

$$\sum_{\left(i \mid d_{ij} \leq IAD\right)} x_i \geq 1 \qquad \forall j \in V \qquad (M1.2)$$

Objective function of this model is aims to cover all demand points in IAD (95.6 km) subject to at least one covering for all demand points. We assume that there is only one fire not frequency fires.

With this model, optimal number of vehicles is found with respect to our initial attack distance (95.6 km). We solve this model using General Algebraic Modeling System

(GAMS). The results of the model display, Turkey can reach all demand points with 7 aerial vehicles. As you remember, we mentioned it before as Turkey has 11 aerial vehicle supply points. It means that Turkey has 4 excess capacities. Of course with 11 supply points Turkey can perform better in prevention activities. However, there is a charge of possession and usage for each aerial vehicle. Some of these vehicles are rental from Türk Hava Kurumu (THK) and some others have private owners. In addition to the central coats; wages of the pilots, fuel cost, maintenance costs of runways and facilities are also supplement costs for Turkey.

Locations of these 7 supply points are at Domaniç, Menemen, Selendi, Dumlupınar, Sarıçay, Yaraş, and Kelekçi. These locations are shown in Figure 4.12.

Figure 4.12: Optimal Locations of the Vehicles in Turkey

By changing the IAD parameter in M1.1, we prepare Table 4.2. In this table, first column shows the optimal number of vehicle for the initial attack distance and corresponding initial attack time given in second and third columns. According to the table, in current situation with 11 supply points, Turkey has 65 km and 22.6 minutes initial attack distance and time respectively. The increase to 86 km and 27.7 minutes respectively with if there are 7 supply points.

Another significant point of this table is that we decreased the initial attack time and distance from 30 minutes and 95.6 km to 27.7 minutes and 86 km. These numbers are Turkey's best times and distances regarding 7 supply points. As you see, model was found in 31 minutes and 100 km with respect to 6 supply point and 31 minutes is out of scope of initial attack time.

Table 4.2: Number of Vehicles, Initial Attack Distance and Time Table for Turkey

# of Vehicle	**Initial Attack Distance (km)**	**Initial Attack Time (min)**
1	394	101.7
2	219	59.6
3	183	51.0
4	129	38.0
5	114	34.4
6	100	31.0
7	**86**	**27.7**
8	81	26.5

9	76	25.3
10	68	23.3
11	**65**	**22.6**
12	63	22.0
13	60	21.4
14	57	20.7
15	56	20.5
16	54	20.0

After that, we try to prove our location covering model result of 7 supply points by Maximal Covering Model (M2) by using GAMS. We measure our optimal location covering model's percentage of maximal covering. The model is demonstrated below:

M2 (Maximal Covering Model)

Sets:

$V = set\ of\ nodes\ in\ Turkey$

Parameters:

$b_ij = burned\ area\ of\ demand\ node\ j,$ $j(V$

$d_ij = distance\ between\ nodes\ i\ and\ j,$ $i(V, j(V$

$t_ij = setuptime + d_ij/(vehicle\ speed)$ $i(V, j(V$

$$IAT = Initial\ Attack\ Time\ (30\ minutes)$$

$$CNV = Current\ Number\ of\ Vehicles$$

Decision variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

$$y_j = \begin{cases} 1 & if\ demand\ node\ j\ is\ covered\ at\ least\ once \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\max Z = 100 \times \frac{\sum_{j \in V} b_j y_j}{\sum_{j \in V} b_j} \qquad (M2.1)$$

Subject to:

$$\sum_{(i \mid c_{ij} \leq LAT)} x_i \geq y_j \qquad \forall j \in V \qquad (M2.2)$$

$$\sum_{i \in V} x_i = CNV \qquad \forall i \in V \qquad (M2.3)$$

The objective function of this model is aims to find percentage of covering performance for all demand points subject to CNV parameter. We added new parameters and decision variables into this model. We assembled the distance between supply and demand nodes distance to minutes with t_{ij} parameter and also, we added b_j parameter in order to represent the burned areas of demand nodes. Finally, we added current number of vehicles to the model for measure percentage of maximal covering with respect to number of vehicles.

According to the results of model, Turkey's maximal covering percentage is found 100% with 7 supply points which is an expected result. When we solve the model setting CNV parameter as 6 supply points, the result is found out as 99.9%.

This is important to point out that we do not consider the land resources, ridge ways, strategically areas (touristic areas or settlements), allocation of land resources (trucks, excursus and initial attack teams), water pools and forest population or type of forests while making these specifications. Therefore, we just use initial attack distance and historical fire data, risky zones and candidate vehicles. As you can imagine, there are lots of other factors which are affecting forest fires like; open spacing areas (taking too much wind and it makes forest fires bigger and hard to extinguish by aerial vehicles), types of forests (some type of trees may burn easier) and distance to water resources (aerial vehicles must to refill their water tanks, more closer forest fires to the water resources means more sorties for planes and shorter extinguish), topographic structure (mountains and canyons pose more danger for aerial vehicles especially for planes) and weather conditions (in hot and dry weather conditions fires may enlarge easily and of course oppositely, rainy weather conditions help forest fire managers to extinguish forest fires easily and quickly).

After finding Turkey's optimal vehicle numbers, locations and performance, we continue with Greece part. In the next section, we examine current resources of Greece.

4.2. SITUATION OF GREECE IN NON-COOPERATIVE SYSTEMS

In this section, we discuss Greece's fire fighting activities and organizational structure briefly. We explain Greece's resources, their demand points and locations of supply points. First, discuss about Greece's current resources and compute the performance of Greece with respect to our performance indicators.

Fire Service is a governmental organization and responsible for the forest fire fighting in Greece since 1998. General Secretariat for Civil Protection (GSCP) state organization involved in forest fires. It was established by law in 1995 and was gradually organized in the late 1990s. It is a part of the Ministry of Interior and has a coordinating role for all types of disasters, including forest fires. In this area, it provides support to Fire Service by local authorities (regions, prefectures and municipalities) in regard to equipment (water trucks, dozers, etc.) and auxiliary personnel (Forest Fires in Europe 2009 Report, 2010).

Both Fire Service and the GSCP try to mobilize volunteers who will help in firefighting and other disasters. The effort to date has had some results, and the number of volunteers offering serious help in firefighting is estimated at around 500 people (Forest Fires in Europe 2009 Report, 2010).

Furthermore, the Army generally supports firefighting activities upon request. During difficult periods, soldiers undertake the task of surveillance and mop-up of fires that have been brought under control, reducing the number of firefighters needed to remain on site for this task. It also offers heavy equipment such as dozers upon request. The police are also involved in forest fire related activities. For example, they provide traffic

control and, when needed, coordinate the evacuation of villages, camps, etc. They also cooperate with the Fire Service in arson investigations. The police often undertake surveillance of suspects in order to catch them in the act of arson (Forest Fires in Europe 2009 Report, 2010).

Greece has 51 regions in their mainland including islands which are shown in Figure 4.13. Greece has 61 aerial vehicles for airborne fire fighting activities. To the best of our knowledge, there is no scientific, governmental or international report indicating the allocation of these vehicles among the regions of Greece.

Figure 4.13: Regions of Greece

In order to find current rational allocation we wrote an Allocation Estimation Model (M3). Model aims to locate vehicles to sites so that the total amount of positive and negative errors is minimized. In the model, we select average fire numbers belong to 2007 for fire parameters from EFFIS. For brown regions, the highest value is taken 40 ha and for light blue regions the lowest value is taken 0 ha.

M3 (Allocation Estimation Model)

Sets:

$i(V\ set\ of\ regions$

Parameters:

$fire_i = average\ burned\ area\ at\ region\ i$

$$fire_i = \frac{Lowest\ Value\ of\ Average\ Fire\ Size + Highest\ Value\ of\ Average\ Fire\ Size}{2}$$

$b = total\ number\ of\ vehicles\ to\ be\ located$

$$c = \frac{\sum_{i \in V} fire_i}{b} = averaga\ burned\ area\ per\ vehicle$$

Decision Variables:

$$x_i = number\ of\ vehicles\ assigned\ to\ region\ i$$

$$ep_i = positive\ error\ at\ region\ i$$

$en_i = negative\ error\ at\ region\ i$

Objective Function:

$$\min z = \sum_{i \in V} ep_i + en_i \qquad (M3.1)$$

Subject to:

$$c\,x_i + ep_i - en_i = fire_i \qquad i \in V \qquad (M3.2)$$

$$\sum_{i \in V} x_i = b \qquad (M3.3)$$

$$x_i \ integer \qquad (M3.4)$$

The objective function of this model is aims to minimize positive and negative numbers in regions and locate vehicles subject to total number of vehicles to locate. In the optimal allocation of M3, 5 of 61 aerial vehicles of Greece are in the 21 islands for our scope. But still, we need detailed locations of these 5 vehicles. These 5 vehicles are assigned to island groups in Figure 4.13. Each group has number of islands and EFFIS determined these islands with same color in the group. A single color for island groups assigned, hence we cannot differentiate fire histories of islands. We connect with Gavril

Xanthopoulos (2010) and ask him the possible locations of vehicles to regions in Greece. He told us his best knowledge which there are 4 or 5 vehicles in islands and locations are changing every year with respect previous years' fire data.

We used M3 for allocating 61 aerial vehicles to 51 regions based on the fire data of the regions. Now, we modify M3 and use the model for allocating 5 aerial vehicles to 21 islands in the best possible way. Since we have no island based fire data, we develop a fire score ratio for each island. We assume that the fire risk of an island group can be allocated to the islands based on the total areas of the islands. We calculate fire scores ratio using by EFFIS 2007 in Figure 3.3 map average fire data and total areas of islands. As you see in the Figure 3.1, 3.2 and 3.3 islands which have been grouped are indicated by same colors and data. It means that islands are in the Aegean Sea are grouped in each other and indicated with a region number. In Figure 4.13; Limnos and Lesvos islands have number 32. Chios and Skyros are 31. Andros, Tinos, Kea, Kythnos, Milos, Mykonos, Paros, Naxos, Los and Amargos are number 39. Ikaria and Samos are number 33. Kalymnos, Kos, Rhodes and Karpathos are number 40. We calculate total areas of islands in order to specify fire data of each island and to find real locations of vehicles.

Let;

$k = 1, \dots, 5$ *be island groups*

s_k = *set of islands in group* k

$j = 1, \dots, 21$ *be islands*

$a_i = area\ of\ island\ i$

$f_k = fire\ risk\ of\ group\ k$

$b_k = island\ group\ fire\ score$

$d_i = total\ area\ fire\ ratio\ of\ island\ i$

$b_k = (\sum_i (i \in s_k) a_i) / f_k \qquad (k$

s_k

We solve the same model for 21 potential supply points (total areas under 100 km^2 islands are elated) with new fire ratio of each island considering the total areas and find real locations of vehicles. In the optimal solution; 2 of 5 vehicles are located in the Chios Island, other 3 vehicles are located in Ikaria, Samos and Rhodes islands shown in Figure 4.14.

Figure 4.14: Locations of Greece Current Vehicles

After the allocation of the aerial vehicles to islands, we analyze current system of Greece and compute the performance.

4.2.1. ANALYSIS OF CURRENT SITUATION IN GREECE

In this section, we discuss Greece's current vehicles, locations of these vehicles, maps of this locations and current performance measurements about Greece's forest fire prevention activities.

During 2009, 1,063 forest fires were recorded; the majorities with a burned area lower than 1 ha. This number is still provisional and is likely to raise when compilation of figures is complete; however the number of forest fires is likely to remain relatively low in comparison to the results of previous years. The burnt area was also low, 35,342 ha, of which 74% occurred in wooden areas (Forest Fires in Europe 2009 Report). Figures 4.15, 4.16 and 4.17 show the forest fire data between years of 1980-2008 in Greece.

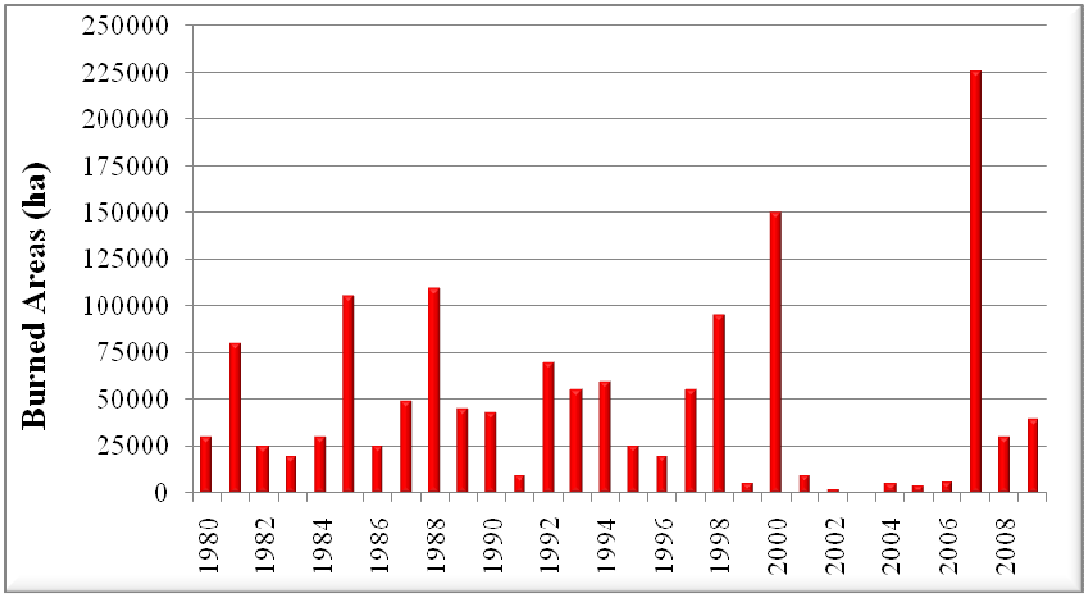


Figure 4.15: Burned Areas in Greece (1980-2008)

Source: Forest Fires in Europe 2009 Report, 2010

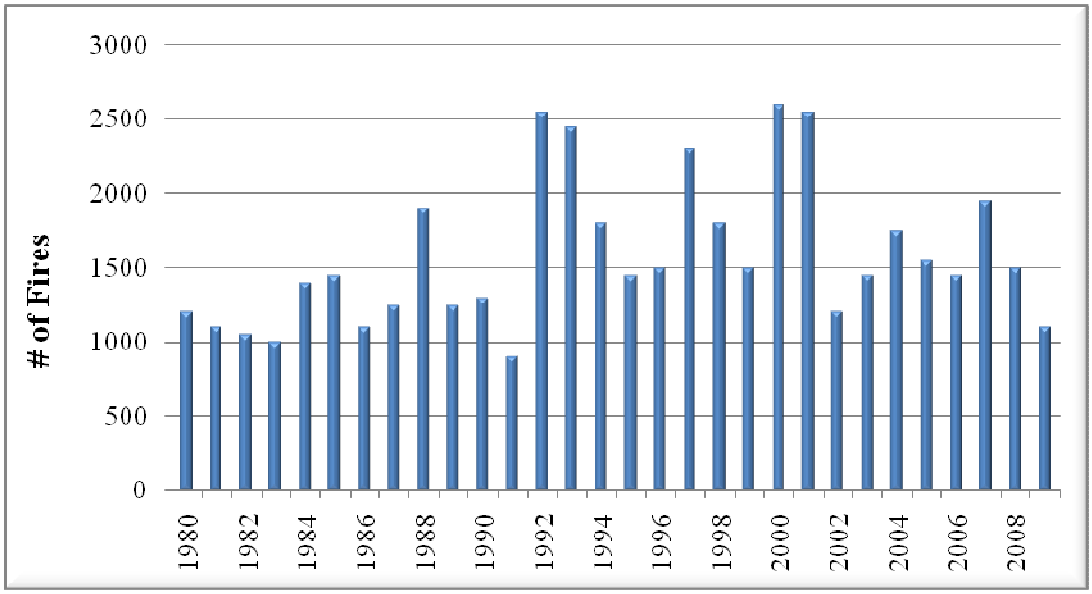


Figure 4.16: Number of Fires in Greece (1980-2008)

Source: Forest Fires in Europe 2009 Report, 2010

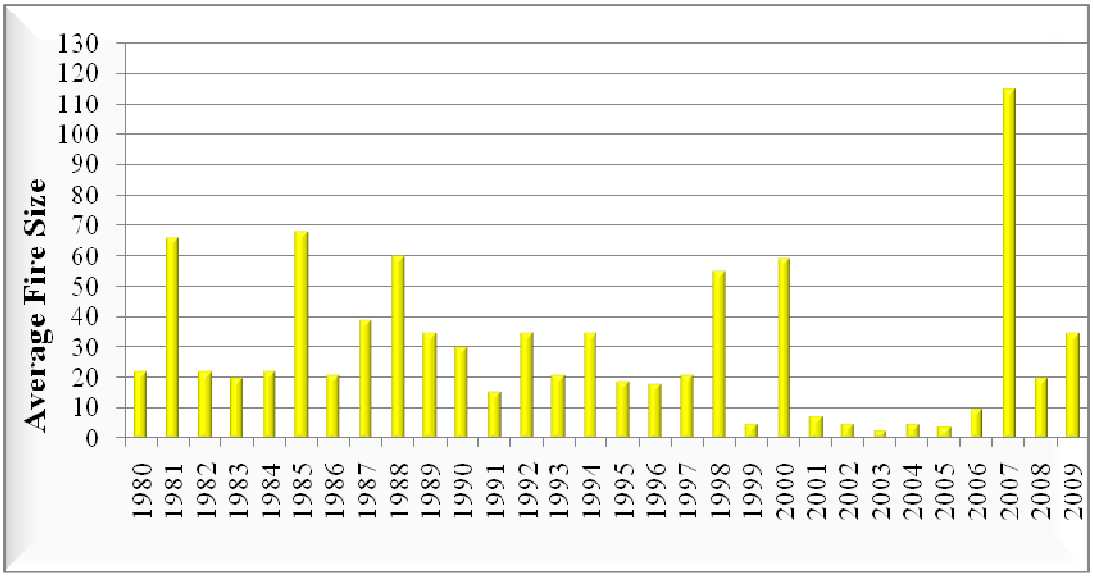


Figure 4.17: Average Fire Sizes in Greece (1980-2008)

Source: Forest Fires in Europe 2009 Report, 2010

As we have mentioned before in Turkey's Current part, we have an initial attack time and distance corresponding to this time. This time is 30 minutes but we have a setup time (7minutes) for aerial vehicles. So, we have 23 minutes to be able to fly. That means, 95.6 km is the initial attack distance for on aerial vehicle. With these parameters, we measure the current performance of 5 supply points in initial attack time:

- 5 supply points can cover 13 of 21 demand points and can't cover 8 demand points with the efficiency of 62%,
- 5 supply points can extinguish 5,050 ha of 9,850 ha forest fires and cannot extinguish 4,800 forest fires with the efficiency of 51%,

- 5 supply points can serve 325 of 525 numbers of fires and can't serve 200 fires with the efficiency of 62%.

Table 4.3: Greece's Current Performance Analyses

	Total (A)	**Covered (B)**	**Covered Ratio (A/B)**
Demand Points (number)	21	13	62
Burned Areas (ha)	9.850	5.050	51
Number of Fires	525	325	62

As you see in the Table 4.3, Greece has serious problems in prevention. They cannot serve nearly to half of their forest fires. In this way, an optimal system recommendation is fatal for Greece. Now, we continue our research by defining Greece's optimal system recommendation options.

4.2.2 OPTIMAL SYSTEM RECOMMENDATIONS FOR GREECE

In this section, we discuss optimal reallocation of current vehicles and optimal number of vehicles to cover supply points in 30 minutes. We use maximal covering model for optimally locating 5 vehicles in 21 potential locations. Considering the burned area criterion, we aim to maximize this since its score is lower than the criteria scores.

Greece has 5 aerial vehicles in 4 supply points (islands) but as you see in the Greece's current section this location doesn't work productive enough. Locations of these vehicles can cover with 51% of burned areas. When we solve the Maximal Covering Model (M2) with 5 vehicles for Greece we see that result is 98%. Detail of model is given below:

Sets:

$V = set\ of\ nodes\ in\ Greece$

Parameters:

$b_ij = burned\ area\ of\ demand\ node\ j,$ $j(V$

$d_ij = distance\ between\ node\ i\ and\ j,$ $i(V, j(V$

$t_ij = setuptime + d_ij/(vehicle\ speed)$ $i(V, j(V$

$IAT = Initial\ Attack\ Time\ (30\ minutes)$

$$CNV = Current\ Number\ of\ Vehicles$$

Decision variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

$$y_j = \begin{cases} 1 & if\ demand\ node\ j\ is\ covered\ at\ least\ once \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\max Z = 100 \times \frac{\sum_{j \in V} b_j y_j}{\sum_{j \in V} b_j} \qquad (M2.1)$$

Subject to:

$$\sum_{\left(i \middle| c_{ij} \leq IAT\right)} x_i \geq y_j \qquad \forall j \in V \qquad (M2.2)$$

$$\sum_{i\,(V} x_i = CNV \qquad \forall i \in V \qquad (M2.3)$$

Next, we find Greece's optimal vehicle number with Location Covering Model (M1) so that all demand points will be covered. Model is same as Turkey's Location Covering Model and it is followed like that:

Sets:

$V = set\ of\ nodes\ in\ Greece$

$d_1ij = distance\ between\ nodes\ i\ and\ j, \qquad i(V, j(V$

$$IAD = Initial\ Attack\ Distance\ (95.6\ kilometers)$$

Decision variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\min Z = \sum_{i \in V} x_i \qquad (M1.1)$$

Subject to:

$$\sum_{\left(i \middle| d_{ij} \leq IAD\right)} x_i \geq 1 \qquad \forall j \in V \qquad (M1.2)$$

Greece's optimal vehicle number is 7. Optimal locations of vehicles are: Limnos, Skyros, Chios, Paros, Kalymnos, Rhodes and Karpathos islands as shown in Figure 4.18. Opposite of the Turkey, Greece has lack of capacity. Because according to our assumptions, Greece has 5 aerial vehicles in the islands. So, it is obvious that, this result is again supported our cooperation idea. Turkey has idle capacity and Greece has lack of capacity. Therefore, they can combine their resources and both may be advantageous in from this partnership.

Figure 4.18: Optimal Locations of the Vehicles in Greece

In the Table 4.4, we present the trade-off between number of vehicles and initial attack time in Greece. Greece can cover all demand points in 36 minutes with 5 vehicles. In

the optimal result, vehicle number increases to 7 and cover time decreases to 30 minutes. Also, initial attack distance decreases from 121 km to 96 km.

Table 4.4: Number of Vehicles, Initial Attack Distance and Time Table for Greece

# of Vehicle	Initial Attack Distance (km)	Initial Attack Time (min)
1	274	72.9
2	178	49.8
3	140	40.7
4	129	38.0
5	**121**	**36.1**
6	109	33.2
7	**96**	**30.0**
8	92	29.1
9	91	28.9
10	80	26.2
11	66	22.9
12	65	22.6
13	57	20.7
14	44	17.6
15	43	17.3
16	35	15.4

After non-cooperative systems' results, we observe that Turkey has more vehicles than the optimal and Greece oppositely has less than the optimal. In the next section, we examine the cooperative system options.

CHAPTER V

COOPERATIVE SYSTEMS

In this chapter, we discuss several cooperative system alternatives for Turkey and Greece. These alternatives are:

i. A centralized system
ii. Leader-follower systems
iii. Two players game theory approach

5.1. CENTRALIZED SYSTEM

In this section, we discuss centralized cooperative systems. We find optimal vehicle numbers and locations of these vehicles. In this system, we didn't consider any country borders or optimal vehicle numbers while the countries are acting non-cooperative.

In order to calculate distances between Turkey's and Greece's demand points, we combine the distances in Microsoft Excel Macro and obtain a distance matrix. The distance matrix is available in Appendix 8. We use the Location Covering Model (M4) with the combined data for finding the optimal of vehicles number and their locations. The model is given below:

Sets:

$V^{TR} = set\ of\ nodes\ in\ Turkey$

$V^{GR} = set\ of\ nodes\ in\ Greece$

V^{GR}

Parameters:

$t_ij = setuptime + d_ij/(vehicle\ speed)$ $i(V, j(V$

$$IAT = Initial\ Attack\ Time\ (30\ minutes)$$

Decision variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\min Z = \sum_{i \in V} x_i \qquad (M4.1)$$

Subject to:

$$\sum_{(i \mid d_{ij} \leq IAT)} x_i \geq 1 \qquad \forall j \in V \qquad (M4.2)$$

According to the results of model, optimal number of vehicles in cooperative system is found 13. As you remember current situation Turkey and Greece has 11 and 5 vehicles respectively. In total 11+5=16 vehicles they have for now. When we return optimal vehicle numbers of both countries, results are both 7. In total, 7+7=14 vehicles are needed for an optimal system if countries try to handle their fire fighting activities alone. With respect to our optimal number of vehicle in centralized cooperative system; we decreased vehicle numbers from 16 to 13 in current and 14 to 13 for optimal numbers when countries are alone. These 13 supply points must be located in Limnos, Skyros, Chios, Paros, Kalymnos, Karpathos, Kozak, Bozdağ, Karacasu, Yaraş, Köyceğiz, Tavşanlı and Sinanpaşa and are shown in Figure 5.1.

Figure 5.1: Locations of Cooperative System Vehicles

If countries use their currently available vehicles in a centralized system, (16) initial attack distance and time are found 80 km and 26 min respectively. If they use their optimal number of vehicles (14) which are found by us, initial attack distance and time are found 84 km and 27 minutes respectively. Combined location covering model is found number of optimal vehicles as 13, initial attack distance and time are 88 km and 28 minutes respectively. With these results countries reached 100% of covering. Detailed trade-offs between number of vehicles and initial attack times are shown in Table 5.1.

Table 5.1: Number of Vehicles, Initial Attack Distance and Time in Combined Systems

# of Vehicle	Initial Attack Distance (km)	Initial Attack Time (min)
1	499	127.0
2	330	86.3
3	271	72.1
4	217	59.2
5	168	47.4
6	141	40.9
7	138	40.2
8	129	38.0
9	121	36.1
10	111	33.7
11	104	32.0
12	97	30.3
13	**88**	**28.2**
14	**84**	**27.2**
15	82	26.7
16	**80**	**26.2**

According to the model, 7 of 13 vehicles are located in Turkey. As you remember, we show that Turkey's and Greece's optimal vehicle numbers are both 7. Centralized model results indicates that Turkey reached 100% coverage with 7 vehicles and Greece is reached this with 6 vehicles lower than their optimal vehicle number. A comparison of non-cooperative and centralized systems is given in Table 5.2.

Table 5.2: Analyses of Performances Turkey, Greece and Centralized System

	SITUATION	# of Vehicles	Initial Attack Time (min)	Covering (%)
TURKEY	Current	11	22	100
	Optimal	7	28	100
GREECE	Current	5	36	98
	Optimal	7	30	100
CENTRALIZED	Current	16	26	100
	Optimal	13	28	100

In next section, we analyze leader follower systems for both Turkey and Greece.

5.2. LEADER FOLLOWER SYSTEMS

In this section, we discuss cooperation issue with respect to countries leaderships. We separate these sections into two topics. First one is Turkey as a leader country and Greece as a follower, other one is that Greece is a leader and Turkey is a follower. In order to do this, first we fixed the leader countries' optimal vehicle number. Then, we determine the follower countries' vehicles and locations of all these vehicles with respect to our cooperative system vehicle number of 13.

5.2.1 TURKEY AS A LEADER

Turkey needs 7 vehicles for optimal covering. When we fix the number of optimal vehicles as 7 for Turkey, the model gave us 6 vehicles for Greece with respect to combined system optimal vehicles as 13. Later, we just add a constraint to centralized system model which fix vehicles of leader countries.

Turkey needs 7 vehicles for optimal covering. When we fix the optimal number of vehicles as 7 for Turkey, the model gave us 6 vehicles for Greece with respect to combined system optimal vehicle number of 13. Possible locations are found like this: Çay, Tavşanlı, Eşme, Köyceğiz, Yaraş, Bozdağ and Kozak for Turkey, Limnos, Skyros, Chios, Paros, Kalymnos and Karpathos for Greece are shown in Figure 5.2.

Figure 5.2: Locations of Turkey Leader System

Also, model gave another optimal allocation result for Turkey as a leader system. When we fix the Turkey's optimal vehicle number as 8, model find a feasible solution with 13 vehicles. With respect to model, if Turkey uses 8 vehicles, Greece needs 5 vehicles for maximal covering. Other options (i.e. like 9 or higher optimal vehicle numbers) for Turkey are found infeasible.

In order to find the best option, we changed our model for an objective function. We add time constraint to objective function for find results' Total Flight Minutes (M5). Detail of objective function is below:

$$\text{Min } Vx_i + \sum_{i,j} (Vt_{i,j} \times y_{i,j}) \qquad (M5.1)$$

In this objective function, we multiplied t_{ij} and y_{ij} in order to find flight minutes of vehicles to all demand points. Besides, we multiplied x_i with M a very large number in order to figure out most important supply points. With respect to results of function, if Turkey uses 7 vehicles and Greece uses 6 vehicles; the maximum flight time of this allocation is found as 3.016 minutes. The other option of Turkey 8, Greece 5 vehicles is found as 3.034 minutes. As you see, 7-6 result is better than 8-5 result for flight time. Meanwhile, we can say that if Turkey will be a leader, the optimal solution is 7-6 vehicles for Turkey and Greece.

5.2.2. GREECE AS A LEADER

Greece needs 7 vehicles for optimal covering same with Turkey. When we fix the optimal number of vehicles as 7 for Greece, the model gave us 6 vehicles for Turkey with respect to combined system optimal vehicle number of 13. We try other options like Greece uses 8 and higher than 8 numbers of vehicles but results are found infeasible. The locations of these vehicles are Limnos, Lesbos, Skyros, Samos, Paros, Kalymnos and Karpathos for Greece. Tavşanlı, Dumlupınar, Sarayköy, Yaraş, Köyceğiz and Kavakalan for Turkey are shown in Figure 5.3.

Figure 5.3: Locations of Greece Leader System

Also, we measured maximum flight time of this allocation like Turkey. If Greece uses 7 vehicles and Turkey uses 6 vehicles; maximum flight time of this solution is 3.180 minutes.

We found 3 options for leader and follower systems. In two of them, Turkey has leader situation and in the other one, Greece takes the leadership. For all scenarios, leader countries are reached their optimal covering vehicle numbers of 7 and follower countries cover their all demand points under optimal number of vehicles of 7. In the lights of this information, the leader- follower system's best solution is seen that Turkey should be leader with 7 vehicles and Greece should follow him with 6 vehicles. Because, as we mentioned, our maximum flight time's objective function is found that these results are in Table 5.3.

Table 5.3: Total Flight Minutes of Leader Follower Systems

Turkey (vehicles)	Greece (vehicles)	Total Flight Time (min)
7	**6**	**3016**
8	5	3034
6	7	3180

As you see in the table, Turkey has the minimum flight time (3,016 min) with 7 vehicles and Greece with 6 vehicles. The second minimum flight time (3,034 min) is again belonged to Turkey with 8 vehicles and Greece with 5 vehicles. The worse scenario is belonged to Greece (3,180 min) with 6 vehicles and with 7 vehicles Turkey.

5.3. TWO PLAYERS GAME THEORY SYSTEM

Game theory is formally a branch of mathematics and was developed to deal with conflict of interest situations in social science. Game theory is not strictly speaking about games although the interactive process that characterizes most games is certainly part of the subject matter of game theory. When we use the word of game, we are referring to any social situation involving two or more players are unconnected or interdependent. The entire structure of game theory is the key assumption that players in a game are utility maximizers. Thus, utility maximizers means that a player in a interactive situation will act to bring about the most preferred of possible outcomes, given the constraint that other players are also acting in the same way. Game theory is especially used by military planners to solve difficult tactical or logistical problems. Game theory is not used for just military purposes. Besides, sociologists, political scientists and international relations specialists saw the relevance of game theory for studying the processes underlying coalition formation, an important area of concern in each of these disciplines (Zagare, 1984).

In order to find options of our players, we develop a new model. The inputs of this model are the vehicle numbers to be located in Turkey and Greece. The outputs of the model are locations of these vehicles and the resulting initial attack times for both countries. Note that in this model a vehicle located in one country cover a demand point

in the other country. The objective of the model is to minimize the worst initial attack time of a demand point. The model (M6) is given below:

M6 (Game Theory Location Model)

Sets:

$V^{TR} = set\ of\ nodes\ in\ Turkey$

$V^{GR} = set\ of\ nodes\ in\ Greece$

V^{GR}

Parameters:

$d_ij = distance\ between\ nodes\ i\ and\ j, \qquad i(V, j(V$

$t_ij = setuptime + d_ij/(vehicle\ speed) \qquad i(V, j(V$

$t_{max} = maximum\ time\ vehicles\ can\ fly$

$tr = number\ of\ vehicles\ to\ be\ located\ in\ Turkey$

$gr = number\ of\ vehicles\ to\ be\ located\ in\ Greece$

Decision Variables:

$$x_i = \begin{cases} 1 & if\ a\ chopper\ is\ located\ at\ i \\ 0 & other\ wise \end{cases}$$

$$y_{ij} = \begin{cases} 1 & if\ demand\ node\ j\ is\ served\ from\ i \\ 0 & other\ wise \end{cases}$$

Objective Function:

$$\min Z = maxall \qquad (M6.1)$$

Subject to:

$$\sum_{i(V} y_{ij} \geq 1 \qquad \forall j \in V \qquad (M6.2)$$

$$tr = \sum_{i \in V^{\dagger}TR} x_i \qquad (M6.3)$$

$$gr = \sum_{i \in V^{\dagger}GR} x_i \qquad (M6.4)$$

$$y_1ij \leq x_1i \qquad i(V, j(V \qquad (M6.5)$$

$$t_1ij * y_1ij \leq maxtr \qquad i(V, j(V^{\dagger}TR \qquad (M6.6)$$

$$t_1ij * y_1ij \leq maxgr \qquad i(V, j(V^1GR \qquad (M6.7)$$

$$maxtr \leq maxall \qquad (M6.8)$$

$$maxgr \leq maxall \qquad (M6.9)$$

Results of model shows minimum initial attack time with given vehicle numbers for both countries. We run this model for all pairs 4 ≤ Turkey ≤ 16 and 1 ≤ Greece ≤ 16. We report the results in Table 3.4.

Table 5.4: Initial Attack Times of Countries in Game Theoretical Approach

Turkey	Greece																													
		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
		TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR
	4	43	50	43	42	40	38	38	38	37	34	36	34	36	33	36	30	36	29	36	26	36	24	36	23	36	21	36	20	36	18	36	16
	5	38	50	38	42	35	38	36	36	33	34	33	33	31	31	31	30	31	29	31	26	31	24	31	23	31	21	31	20	31	18	31	16
	6	37	50	33	42	33	38	33	34	32	32	31	30	29	30	29	29	29	26	29	25	29	24	29	23	29	21	29	20	29	18	29	16
	7	31	50	30	42	28	38	28	34	31	30	30	28	29	26	27	27	27	26	27	24	27	23	27	21	27	20	27	18	27	17	27	16
	8	29	50	27	42	27	38	27	34	27	28	27	27	27	25	26	26	26	25	25	24	25	23	25	23	25	21	25	20	25	18	25	16
	9	27	50	26	42	25	38	24	34	26	28	26	27	25	26	25	25	25	24	24	24	24	23	24	21	24	20	24	19	24	18	24	16
	10	25	50	24	42	24	38	24	34	24	28	24	27	24	25	24	25	24	23	24	23	24	23	24	21	23	20	23	18	23	17	23	16
	11	23	50	23	42	23	38	23	34	23	28	23	27	23	25	23	25	23	23	23	23	23	21	23	20	23	18	23	17	23	17	23	16
	12	23	50	23	42	23	38	23	34	23	28	23	27	23	25	23	25	23	23	23	21	23	20	22	21	22	20	22	18	22	17	22	16
	13	23	50	23	42	22	38	22	34	22	28	22	27	23	25	22	25	23	22	22	22	22	21	21	21	21	20	21	18	21	17	21	16
	14	21	50	21	42	21	38	21	34	21	28	21	27	21	25	21	25	22	22	21	21	21	20	21	19	21	18	21	17	21	17	21	16
	15	21	50	21	42	21	38	21	34	21	28	21	27	21	25	21	25	21	22	21	21	21	20	21	19	20	20	20	18	20	17	20	16
	16	21	50	20	42	20	38	20	34	20	28	20	27	20	25	20	25	21	22	21	21	21	20	20	20	20	18	20	17	20	17	20	16

Yellow numbers shows vehicle numbers of countries. Red and blue columns show the initial attack time of Turkey and Greece respectively.

We made three different analyses based on this general table. First one indicates the gain of minutes if Greece increases the number of vehicles by one while Turkey has fixed number of vehicles. Second one demonstrates the same for Turkey. Final one points out the gain of minutes if both country increases vehicles in same time. Positive numbers shows the gain of minutes and negative ones are loss of minutes. Results are shown in Table 5.5, 5.6 and 5.7 respectively.

Table 5.5: Gain of Minutes when Turkey Fixed Their Vehicles

Turkey	Greece																															
		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
		TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR
	4			0	8	3	4	2	0	1	4	1	0	0	1	0	3	0	1	0	3	0	2	0	1	0	2	0	1	0	2	0	2
	5			0	8	3	4	-1	2	3	2	0	1	2	2	0	1	0	1	0	3	0	2	0	1	0	2	0	1	0	2	0	2
	6			4	8	0	4	0	4	1	2	1	2	2	0	0	1	0	3	0	1	0	1	0	1	0	2	0	1	0	2	0	2
	7			1	8	2	4	0	4	-3	4	1	2	1	2	2	-1	0	1	0	2	0	1	0	2	0	1	0	2	0	1	0	1
	8			2	8	0	4	0	4	0	6	0	1	0	2	1	-1	0	1	1	1	0	1	0	0	0	2	0	1	0	2	0	2
	9			1	8	1	4	1	4	-2	6	0	1	1	1	0	1	0	1	1	0	0	1	0	2	0	1	0	1	0	1	0	2
	10			1	8	0	4	0	4	0	6	0	1	0	2	0	0	0	2	0	0	0	0	0	2	1	1	0	2	0	1	0	1
	11			0	8	0	4	0	4	0	6	0	1	0	2	0	0	0	2	0	0	0	2	0	1	0	2	0	1	0	0	0	1
	12			0	8	0	4	0	4	0	6	0	1	0	2	0	0	0	2	0	2	0	1	1	-1	0	1	0	2	0	1	0	1
	13			0	8	1	4	0	4	0	6	0	1	-1	2	1	0	-1	3	1	0	0	1	1	0	0	1	0	2	0	1	0	1
	14			0	8	0	4	0	4	0	6	0	1	0	2	0	0	-1	3	1	1	0	1	0	1	0	1	0	1	0	0	0	1
	15			0	8	0	4	0	4	0	6	0	1	0	2	0	0	0	3	0	1	0	1	0	1	1	-1	0	2	0	1	0	1
	16			1	8	0	4	0	4	0	6	0	1	0	2	0	0	-1	3	0	1	0	1	1	0	0	2	0	1	0	0	0	1

Table 5.6: Gain of Minutes when Greece Fixed Their Vehicles

Turkey	Greece																															
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR
4																																
5	5	0	5	0	5	0	2	2	4	0	3	1	5	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
6	1	0	5	0	2	0	3	2	1	2	2	3	2	1	2	1	2	3	2	1	2	0	2	0	2	0	2	0	2	0	2	0
7	6	0	3	0	5	0	5	0	1	2	1	2	0	4	2	2	2	0	2	1	2	1	2	2	2	1	2	2	2	1	2	0
8	2	0	3	0	1	0	1	0	4	2	3	1	2	1	1	1	1	1	2	0	2	0	2	-2	2	-1	2	-2	2	-1	2	0
9	2	0	1	0	2	0	3	0	1	0	1	0	2	-1	1	1	1	1	1	0	1	0	1	2	1	1	1	1	1	0	1	0
10	2	0	2	0	1	0	0	0	2	0	2	0	1	1	1	0	1	1	0	1	0	0	0	0	1	0	1	1	1	1	1	0
11	2	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	2	1	1	0	2	0	1	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	-1	1	-2	1	-1	1	0	1	0
13	0	0	0	0	1	0	1	0	1	0	1	0	0	0	1	0	0	1	1	-1	1	-1	1	0	1	0	1	0	1	0	1	0
14	2	0	2	0	1	0	1	0	1	0	1	0	2	0	1	0	1	0	1	1	1	1	0	2	0	2	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	-2	1	-1	1	0	1	0
16	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	1	-1	0	2	0	1	0	0	0	0

Table 5.7: Gain of Minutes when Greece and Turkey Increases Their Vehicles at the Same Time

		Greece																													
		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
		TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR
Turkey	4																														
	5			5	8	5	4	5	0	2	4	4	0	3	1	5	3	5	1	5	3	5	2	5	1	5	2	5	1	5	2	5	2
	6			1	8	5	4	2	2	3	2	1	1	2	2	2	1	2	1	2	3	2	2	2	1	2	2	2	1	2	2	2	2
	7			6	8	3	4	5	4	5	2	1	2	1	0	0	1	2	3	2	1	2	1	2	1	2	2	2	1	2	2	2	2
	8			2	8	3	4	1	4	1	4	4	2	3	2	2	-1	1	1	1	2	2	1	2	2	2	1	2	2	2	1	2	1
	9			2	8	1	4	2	4	3	6	1	1	1	2	2	-1	1	1	1	1	1	1	1	0	1	2	1	1	1	2	1	2
	10			2	8	2	4	1	4	0	6	2	1	2	1	1	1	1	1	1	0	0	1	0	2	0	1	1	1	1	1	1	2
	11			2	8	1	4	1	4	1	6	1	1	1	2	1	0	1	2	1	0	1	0	1	2	1	1	0	2	0	1	0	1
	12			0	8	0	4	0	4	0	6	0	1	0	2	0	0	0	2	0	0	0	2	0	1	1	2	1	1	1	0	1	1
	13			0	8	0	4	1	4	1	6	1	1	1	2	0	0	1	2	0	2	1	1	1	-1	1	1	1	2	1	1	1	1
	14			2	8	2	4	1	4	1	6	1	1	1	2	2	0	1	3	1	0	1	1	1	0	0	1	0	2	0	1	0	1
	15			0	8	0	4	0	4	0	6	0	1	0	2	0	0	0	3	1	1	0	1	0	1	0	1	1	1	1	0	1	1
	16			0	8	1	4	1	4	1	6	1	1	1	2	1	0	1	3	0	1	0	1	0	1	1	-1	0	2	0	1	0	1

In table 5.5, 5.6 and 5.7 first columns are empty because of there is no computable data before these columns. In Table 5.5, if we look at Turkey and Greece has 7 and 5 vehicles respectively cell; table shows -3 numbers for Turkey. That means when Turkey fix vehicle number on 7 and Greece increase vehicle numbers one by one, Turkey loses 3 minutes from this situation. Similarly, in Table 5.6 if we look at Turkey and Greece has 8 and 12 vehicles respectively cell, table shows -2 numbers for Greece. That means when Greece fix vehicle number on 12 and Turkey increase vehicle numbers one by one, Greece loses 2 minutes from this situation.

After these calculations, a comparison table with decentralized minutes (performances of countries have their own system) and centralized (performance of cooperative system) is prepared. In this table, decentralized (non-cooperative system) minutes and centralized (cooperative system) minutes are presented, and differences between them are shown. Table 5.8 is given below:

Table 5.8: Comparison of Minute Gains between Centralized and Decentralized Systems

			Decentralized Greece																											
			73		50		41		38		37		34		31		30		29		27		23		23		21		18		18		16	
		Centralized	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
		Countries	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR	TR	GR
Decentralized Turkey	38	4	43	50	43	42	40	38	38	38	37	34	36	34	36	33	36	30	36	29	36	26	36	24	36	23	36	21	36	20	36	18	36	16
	35	5	38	50	38	42	35	38	36	36	33	34	33	33	31	31	31	30	31	29	31	26	31	24	31	23	31	21	31	20	31	18	31	16
	31	6	37	50	33	42	33	38	33	34	32	32	31	30	29	30	29	29	29	26	29	25	29	24	29	23	29	21	29	20	29	18	29	16
	28	7	31	50	30	42	28	38	28	34	31	30	30	28	29	26	27	27	27	26	27	24	27	23	27	21	27	20	27	18	27	17	27	16
	27	8	29	50	27	42	27	38	27	34	27	28	27	27	27	25	26	26	26	25	25	24	25	23	25	23	25	21	25	20	25	18	25	16
	26	9	27	50	26	42	25	38	24	34	26	28	26	27	25	26	25	25	25	24	24	24	24	23	24	21	24	20	24	19	24	18	24	16
	24	10	25	50	24	42	24	38	24	34	24	28	24	27	24	25	24	25	24	23	24	23	24	23	24	21	23	20	23	18	23	17	23	16
	23	11	23	50	23	42	23	38	23	34	23	28	23	27	23	25	23	25	23	23	23	23	23	21	23	20	23	18	23	17	23	17	23	16
	23	12	23	50	23	42	23	38	23	34	23	28	23	27	23	25	23	25	23	23	23	21	23	20	22	21	22	20	22	18	22	17	22	16
	22	13	23	50	23	42	22	38	22	34	22	28	22	27	23	25	22	25	23	22	22	22	22	21	21	21	21	20	21	18	21	17	21	16
	21	14	21	50	21	42	21	38	21	34	21	28	21	27	21	25	21	25	22	22	21	21	21	20	21	19	21	18	21	17	21	17	21	16
	21	15	21	50	21	42	21	38	21	34	21	28	21	27	21	25	21	25	21	22	21	21	21	20	21	19	20	20	20	18	20	17	20	16
	20	16	21	50	20	42	20	38	20	34	20	28	20	27	20	25	20	25	21	22	21	21	21	20	20	20	20	18	20	17	20	17	20	16

In this table, numbers in the white colored cells show the initial attack time of decentralized systems in minutes. Orange colored numbers are the number of vehicles. Furthermore, the important part of this table is red, yellow and green colored numbers. Red colored numbers displays that, country would prefer decentralized (non-cooperative) system instead of centralized (cooperative) one. That means red colored cells are not preferred. On the other hand, yellow colored numbers points out that country would prefer centralized system instead of decentralized system. That means yellow cells are profitable for one country. The last color is green. Numbers in green cells show that both countries would prefer centralized system instead of decentralized system. In green cells both Turkey and Greece decrease their initial attack minutes under their own performances (decentralized). In Table 5.8, Turkey and Greece has 4 and 5 vehicles respectively cells are both green. That because, Turkey decreases initial attack time from 38 in decentralized system to 37 in centralized system and Greece decreases from 37 to 34. Both countries are decreasing their initial attack time with centralized system and preferring cooperation instead of decentralized system.

Countries total vehicle number is 16 and with respect to Table 5.8, the best option is 9 and 7 vehicles with 25 and 26 minutes for Turkey and Greece respectively. Of course, there are lots of solutions but some of them are higher than initial attack time and others exceed the total vehicle number.

After all, we created two game theoretical approaches. One of them represents the difference between countries decentralized systems' performance and centralized systems' performance is shown in Table 5.9. In order to find this difference, first we looked countries gain minutes with respect to centralized system. For example, in this table Turkey has 5 vehicles and Greece has 5 vehicles which point is exposed by 1-1 numbers. The initial attack time denotes 33 and 34 minutes respectively. First, we took Turkey's 4 vehicle performance is: 37 minutes. The difference between 4 and 5 vehicles for Turkey is $37 - 33 = 4$ minutes in a centralized system. After that we looked Turkey's decentralized systems' performance. If Turkey increases their vehicles 4 to 5, gain of minute on initial attack time is: 38 and 35 respectively. So, gain of minutes in decentralized system for Turkey is $38 - 35 = 3$ minutes. As you see, we signified the number of 1 in the 5 vehicles for Turkey and 5 vehicles for Greece. This number is derived from difference between centralized and decentralized systems in gain of initial attack minutes.

$$Gain\ of\ central.syst. - Gain\ of\ \ decentral.syst. = Total\ gain\ of\ minutes$$

With respect to these calculations and formula: $4 - 3 = 1$ minute proves that our total gain in Turkey is 5 and in Greece are 5 regarding the vehicles situation. Greece's 1 minute total gain is calculated with same formula like all situations in the table.

Table 5.9: Incremental Gains through Cooperation

		Greece																																					
	# of vehicles	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
Turkey	4				-15		-5		-100		3		-100		-100		-100		-100		1		-100		-100		-100		-100		-100		-100
	5	-100		-100	-15	-100	-5	-100	-1	**1**	**1**	0	-2	2	-100	2	-100	2	-100	**2**	**1**	2	-100	2	-100	2	-100	2	-100	2	-100	2	-100	2	-100
	6	-100		-100	-15	-100	-5	-100	1	-100	1	-100	-1	-2	-3	-2	0	-2	2	-2	-1	-2	-100	-2	-100	-2	-100	-2	-100	-2	-100	-2	-100	-2	-100
	7	-100		-100	-15	-100	-5	-100	1	-100	3	1	-3	-100	1	-1	-2	-1	0	-1	0	-1	-100	-1	2	-1	-1	-1	-100	-1	1	-1	-100		
	8	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	0	-2	**0**	**0**	1	-1	1	-100	1	-100	1	-100	1	-100	1	-100	1	-100		
	9	-100		-100	-15	1	-5	**2**	**1**	-100	5	-100	-2	1	-2	**0**	**0**	**0**	**0**	0	-2	0	-100	**0**	**2**	0	-1	0	-100	0	-100	0	-100		
	10	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	1	-100	-2	-100	-100	-100	2	-1	-1	-1	-100	-1	1	-1	-100		
	11	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	1	-100	-2	-100	-2	-100	1	-100	0	-100	-2	-100	0	-100	-100		
	12	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	1	-100	0	-100	-3	1	-1	1	-1	1	-100	**1**	**1**	1	-100		
	13	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	2	-100	-2	-100	-3	**0**	**0**	0	-1	0	-100	**0**	**1**	0	-100		
	14	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	2	-100	-1	-100	-3	-100	1	-100	-1	-100	-2	-100	0	-100	-100		
	15	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	2	-100	-1	-100	-3	-100	1	1	-3	1	-100	**1**	**1**	1	-100		
	16	-100		-100	-15	-100	-5	-100	1	-100	5	-100	-2	-100	-1	-100	-1	-100	2	-100	-1	-100	-3	-100	0	-100	0	-100	-2	-100	0	-100	-100		

Positive numbers represent the gain of minutes, in other words, it explains profitable cooperation situations. The negative numbers represent that loss of minutes, in other words, non-profitable cooperation situations. The biggest difference between situations is represented with -100. Also there are two colors in this table. Yellow numbers show that just one country is positive (gain minute) but, the other one is presented as zero in the cooperation situation. Green numbers tell that both countries' gain minutes are positive and both of them are disposed for green cells situations. In this table, possible locations are shown with green cells and most valuable ones are 9-4 and 5-10 vehicle location options respectively for Turkey and Greece. In these cells, gain of minutes is found as 3 in total.

Second table is about share of cooperative vehicles costs and owning expenditures. We think that in the decentralized system, one country takes all financial obligations for one vehicle and decreases its initial attack time with this vehicle and costs of this vehicle. But in the centralized system countries, the financial obligations are divided for one vehicle. So, they can decrease their initial attack times with one-half vehicles and costs of this vehicle in decentralized system. If we will be more precise, increasing one vehicle in decentralized system is corresponding to increasing two vehicles in centralized system with same cost of 1 vehicle. For example, if we look at that Turkey has 9 and Greece has 3 vehicles situation in Table 5.10; you will see the 2 and 3 respectively. With increasing vehicle numbers from 8 to 9, the gain of Turkey is $27 - 26 = 1$ minutes in decentralized system. As we said before, 1 vehicle in decentralized equals to 2 vehicles in centralized systems and Turkey gains $28 - 25 = 3$

minutes with increasing its vehicle number from 7 to 9 in a centralized system. With the same formula of previous table, our gained total initial attack minutes are found like $3 - 1 = 2$ minutes. All numbers are found with this logic and calculation is entirely in Table 5.10. Of course, these two vehicles can be locate one in Turkey one in Greece but the total minute gains are found when they are located in one country.

Table 5.10: Incremental Gains through with one-to-two

		Greece																																	
	# of vehicles	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
Turkey	4						3		-100		3		-100		-100		-100		-100		2		-100		-100		-100		-100		-100		-100
	5						3		3		3		0		-100		-100		-100		2		-100		-100		-100		-100		-100		-100
	6	-100		-100		-100	3	-100	5	-100	5	-100	1	3	-1	**3**	**0**	**3**	**3**	**3**	**2**	3	-100	3	-100	3	-100	3	-100	3	-100	3	-100
	7	-100		-100		-100	3	-100	5	-100	7	**3**	**1**	-100	1	**1**	**2**	1	-1	**1**	**1**	1	-100	**1**	**3**	**1**	**1**	1	-100	**1**	**3**	1	-100
	8	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	**2**	**0**	2	-1	**3**	**0**	3	-100	3	-100	3	-100	3	-100	3	-100	3	-100
	9	-100		-100		**2**	**3**	**3**	**5**	-100	9	-100	4	3	-1	**1**	**1**	1	1	2	-1	2	-100	**2**	**3**	**2**	**1**	2	-100	2	-100	2	-100
	10	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	1	-100	0	-100	-100	-100	2	**0**	**1**	0	-100	**0**	**3**	0	-100
	11	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	1	-100	0	-100	-2	-100	3	-100	1	-100	0	-100	1	-100	-100
	12	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	1	-100	2	-100	-1	**2**	**0**	1	-2	1	-100	**1**	**3**	1	-100
	13	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	2	-100	1	-100	-3	**1**	**1**	1	-1	1	-100	**1**	**3**	1	-100
	14	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	2	-100	2	-100	-2	-100	2	-100	0	-100	-1	-100	1	-100	-100
	15	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	2	-100	2	-100	-2	-100	2	1	-2	1	-100	**1**	**3**	1	-100
	16	-100		-100		-100	3	-100	5	-100	9	-100	4	-100	0	-100	1	-100	2	-100	2	-100	-2	-100	1	-100	0	-100	0	-100	1	-100	-100

Same as previous table, positive numbers show that the gain of minutes in initial attack oppositely negative numbers displays loss of minutes. However, Yellow colored numbers are representing one country that is gaining minutes but the other one is zero. Green colored numbers are representing both countries which are decreasing their initial attack times and gaining minutes simultaneously. Because of the there are no equilibrium point, we find an multiple equilibrium point with respect to decreasing initial attack times, optimal vehicle number and maximum vehicle number for both countries.

In the table, most valuable cells are: 9-4 vehicles for Turkey and Greece respectively with gain of 8 minutes, 6-9 vehicles with 6 minutes, 9-3, 6 -10 and 9-12 vehicles with 5 minutes. As we told before, there are 16 vehicles in total for both country and 9-12 vehicles location option is eliminated for this reason. Additionally, we found optimal location vehicle number as 13. With respect to optimal location vehicle number, best suitable option in the table is shown as 9 vehicles in Turkey and 4 vehicles for Greece. Also, the maximum minute gain is found in this point. For sure, all other options can be chosen with respect to situations and agreements between countries. But, in present day conditions and studies of this thesis prove that best option is 9-4 vehicles. We indicate that countries have some problems in handling fires and managing vehicles. There are lots of big fires in every year and absolutely more vehicles are better in forest fire extinguishing activities. Finally, in order to strength the tactical configuration, operational scenarios should be produced.

CHAPTER VI

CONCLUSIONS

In conclusion, countries have borders but natural disasters don't respect these borders. One of the most important and dangerous natural disaster is forest fires which is threatening most of the countries in whole world. Besides, humanitarian, emergency and disaster logistics are crucial parts of logistic management. This study aims to combine all these issues and create new approaches for forest fire fighting.

We found that Turkey and Greece both needs 7 vehicles for optimal covering in non-cooperative systems. In cooperative system, 13 vehicles are found enough for 100% covering. Also, in leader follower systems we found the needed vehicle numbers and locations of these vehicles. Finally, in two player game theory, we recommend a equilibrium point for most beneficial cooperation.

In certain situations, countries would prefer to work together instead of being alone. This can supply countries with low costs, strong organizational structures and political developments. Until now, most countries are working alone especially for the reasons of political obstacles. However, recently, cooperation and collaboration between countries

increased. In future, there will be growing inclination of that need for all neighboring countries. Taking early precautions will be significant and valuable in disaster management.

In this study, first, we searched and found forest populations of countries, fire risks and historical fire data. Additionally, we figured out their current resources and locations of these sources. Then, we measured these vehicles and locations' current performance. We made optimizations for both countries in order to find their best optimal vehicle numbers and possible locations of these vehicles. Next, we combined countries demand points and number of vehicles and find best optimal vehicle numbers and locations of these vehicles in cooperative system. In the cooperative system, we evaluated countries in two parts. First one is Turkey as a leader country and Greece as a follower while the other one is the opposite of this approach. Finally, we defend two game theoretical approaches which both countries can gain beneficial results.

In the future researches of this study, we may add to the financial parameters for cost analysis. Besides, there is a need for a methodology for forest fire management. Country numbers or the borders of the region can be increased. More vehicle types can be considered. Important points (with respect to, forest populations, under high risk areas, tourism and settlement areas, tree types and geographic conditions) are can be considered and added the study. Also, double covering for these important points can be beneficial.

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APPENDICES

Appendix 1: Examples of Emergency Response International Agreements

Parties to the agreement	Name and date of the agreement	Purpose of the agreement
Spain / Portugal	Protocol between the Kingdom of Spain and the Republic of Portugal regarding technical co-operation and mutual assistance on civil protection, 1993.	Preparation and execution of projects on scientific and technical co-operation regarding civil protection.
France / Spain	Agreement on mutual assistance between the French and Spanish firefighting and assistance services, 1960.	Facilitate mutual aid and prompt sending of assistance in case of emergencies occurring in border areas.
Morocco / Spain	Agreement on technical co-operation and mutual assistance in civil protection, 28 December 1992.	To improve scientific and technical research, and to provide mutual aid in case of catastrophes or emergencies.
Argentina / Chile	Agreement between the Republic of Argentina and the Republic of Chile on co-operation in cases of catastrophes, 1997.	Co-operation between the Parties shall be in the following areas: 1. Exchange of information in order to prevent catastrophes and their effects 2. Exchange of information and experiences regarding action in cases of emergencies 3. Exchange of technological information to apply in cases of emergencies

		4. Elaboration and development of programmes, projects and joint plans for emergencies 5. Development of plans for mitigation and operative coordination to face common risks 6. Collaboration in cases of emergencies through: a) Provision of personnel and means of assistance b) Use of means of technical assistance and logistics c) Supply of medical care and food at the request to mitigate the effects of emergencies.
Argentina / Chile	Agreement on the protection of border forests against fires, 1967.	Establish an effective system of co-operation for the protection of the common forests of the border area covered by the Agreement, including a mechanism to prevent, verify and extinguish fires.
Finland / Russian Federation	Agreement by and between the Government of the Finnish Republic and the Government of the Russian Federation about Co-operation to avert disasters and to prevent their consequences, 1994.	To foster co-operation in the following areas: 1. development of actions and methods that increase the contracting parties' possibilities of averting disasters, to notifying them and to prevent their consequences; 2. notification of disasters that have adverse effects across state borders; 3. mutual assistance to

		prevent the consequences of disasters.
Mexico / United States of America	Wildfire protection agreement between the Department of the Interior and the Department of Agriculture of the United States of America and the Secretariat of Environment, Natural Resources, and Fisheries of the United Mexican States for the common border, 1999.	The purpose of this Agreement is to: 1. enable wildfire protection resources originating in the territory of one country to cross the US/Mexico border in order to suppress wildfires on the other side of the border within the zone of mutual assistance in appropriate circumstances; 2. give authority for Parties to cooperate on other fire management activities outside the zone of mutual assistance.
New Zealand / United States of America	Wildfire Arrangement between the Department of the Interior and the Department of Agriculture of the United States of America and the National Rural Fire Authority of New Zealand, 2001.	To provide a framework within which one Participant may request and receive wildfire suppression resources from the other Participant and to encourage co-operation on other fire management activities.
China / Russia	Agreement on Joint Control of Forest Fire between the Government of the People's Republic of China and the Government of Russian Federation, 1995.	To improve forest fire control in border areas, to share experience in forest fire control, and to help each other to prevent forest fires and to reduce losses there from.
United States of America / Australia-New Zealand	International Agreement between the US Department of the Interior, Bureau of Land	To facilitate mutual assistance in wildland firefighting between Australia, New Zealand

	Management, US Department of Agriculture, Forest Service for the National Multi-agency coordination group for and on behalf of the Government of the United States of America, and the Secretariat of the Department of Natural Resources and Environment for itself and as agent of the Crown in the right of each Australian State and Territory and the Crown in the right of New Zealand, 2000.	and the United States of America.
Canada / United States of America	Northwest Wildland Fire Protection Agreement, 1998.	To promote effective prevention, presuppression and control of forest fires in the Northwest wildland region of the United States and adjacent areas of Canada, by providing mutual aid in prevention, presuppression and control of wildland fires, and by establishing procedures in operating plans that will facilitate such aid.
Canada / United States of America	The North-eastern Interstate ForestFire Protection Compact Public Law #129 – 81st Congress.	Promotion of effective prevention and control of forest fires in the north-eastern region of the United States and adjacent areas in Canada by the maintenance of the adequate forest fire fighting services, and by

		providing mutual aid in fighting forest fires among the states or provinces of the region.
Mongolia / Russia	Draft Agreement on Co-operation for Forest and Steppe Fire Protection between Russian Federation and Mongolia.	Improve fire protection in the forest and steppe regions along the Russian and Mongolia border (20 km on either side) by sharing firefighting means, preventing fires, and reducing fire losses.
Bulgaria / Greece	Protocol for cooperation between the National Service of Fire Protection of the Republic of Bulgaria and the National Service of Fire Protection of the Republic of Greece, 1993.	Both parties will render mutual assistance for the liquidation of the originated fires and accidents and for the minimization of their dangerous consequences.
France / Italy	Agreement regarding the intervention by water bombers in case of mutual assistance for forestfires.	This agreement delimitates when mutual assistance is needed, the procedure to ask for assistance and the period of time for which it is applicable.
Italy / Switzerland	Agreement between the Italian Republic and the Swiss Confederation on the cooperation in the field of fire risk prevention and on mutual assistance in case of natural catastrophes or human activities, 1995.	This agreement defines the conditions in which one party will lend, in the limits of their possibilities, assistance in case of the occurrence of a natural catastrophe or due to human activities which will threaten life, goods or the environment.
Greece / Malta	Agreement between the Government of Hellenic Republic and the Government of Malta in	This Agreement favours the cooperation between these states regarding sharing of scientific and

	the field of Civil Protection, 2001.	technical cooperation in the management of emergencies, regarding cooperation in the enactment of policies in the field of prevention and protection of natural disasters, and regarding collaboration in the fight of emergencies which extend beyond the state borders or that cannot be eliminated by one country's own means.
Greece / South Cyprus Rum Side	Agreement between the Ministry of Public Order of the Hellenic Republic and the Ministry of Justice and Public Order of the Republic of Cyprus on co-operation of the national Fire Departments within their competency.	No translation from Greek was available at the time of the update of this report in August 2003.
Finland / Estonia	Operational Agreement between the Rescue Board of the Republic of Estonia and the Ministry of the Interior of the Republic of Finland, 1995.	Agreement providing a framework for the exchange of information, request for assistance and giving mutual assistance.
Spain / Portugal	Additional Protocol on Mutual Assistance in case of Forest Fires in Border Zones, adopted within the terms of the Protocol between the Queen of Spain and the Republic of Portugal on Technical Cooperation and Mutual Assistance in Civil Protection Matters, made	This Protocol facilitates the intervention of both parties in case of forest fires occurring within a strip of 5 kilometres from the common border. It aims to reduce the period of time between the occurrence of the fire and the response from the fire-fighting bodies.

	in Evora on March 9th 1992, Figueira da Foz, 2003.	

Source: Legal Frameworks for Forest Fire Management: International Agreements and National Legislation

Appendix 2: Distribution of Turkey's Forest Fire Causes to Burned Areas in 1999-2009

YEARS		CAUSES															TOTAL
		NEGLIGENCE/CARELESSNESS							INTENTION			ACCIDENT			UNKNOWN	LIGHTENING	
		Stubble	Dump	Hunting	Prairie Fire	Cigarette	Picnic	Other	Terror	Arson	Clearance	Transmission Line	Traffic	Other			
1999		550	7	36	247	185	300	965	359	1496	71	429	12	77	944	126	**5804**
2000		2595	23	124	2006	4520	160	4345	-	4282	135	5205	6	33	2752	167	**26353**
2001		590	315	97	603	444	254	1477	90	469	92	395	19	53	1761	735	**7394**
2002		513	3	6	3866	144	15	618	1	475	33	2100	4	18	457	261	**8514**
2003		727	118	5	404	735	152	1210	0	530	135	972	6	191	765	694	**6644**
2004		518.7	19.4	10.7	334.5	563.6	160.6	1379.7	177.0	540.6	30.8	73.7	0.1	31.8	802.3	232.5	**4876**
2005		186.2	2.4	14.0	57.6	555.1	106.4	856.3	0.0	369.8	31.9	85.0	3.0	218.1	287.8	47.5	**2821**
2006		195.8	60.7	10.4	90.7	1075.4	70.5	1494.0	0.0	200.9	5.3	2850.3	0.1	25.2	1139.4	543.0	**7762**
2007		697.4	182.7	35.7	175.4	933.3	79.6	3850.9	0.0	1673.1	32.0	1968.0	8.0	63.0	1722.1	243.2	**11664**
2008		925	421	155	194	1615	162	7899	0	652	145	14899	13	0	1970	699.0	**29749**
2009		232.9	46.4	21.2	55.2	1404.9	56.6	1264.5	1.6	133.92	0.2	182.2	2.1	70.5	699.8	105.5	**4679**
AVER	**Area**	7255	1155	392	7839	11199	1159	23191	270	9158	872	27797	54	1384	12926	5275	**110456**
	%	6.57	1.0458	0.36	7.10	10.14	1.05	21.00	0.24	8.29	0.79	25.17	0.05	1.25	11.70	4.78	**100**

Source: www.ogm.gov.tr/statistics

Appendix 3: Distribution of Turkey's Forest Fire Causes to Number of Fires in 1999-2009

YEARS		CAUSES															TOTAL
		NEGLIGENCE/CARELESSNESS							INTENTION			ACCIDENT			UNKNOWN	LIGHTENING	
		Stubble	Dump	Hunting	Prairie Fire	Cigarette	Picnic	Other	Terror	Arson	Clearance	Transmission Line	Traffic	Other			
1999		221	10	14	182	212	56	373	18	192	69	50	8	25	442	203	**2075**
2000		186	18	26	207	184	47	569	-	382	28	118	10	19	427	132	**2352**
2001		276	15	24	261	262	77	605	4	186	61	65	9	35	563	188	**2631**
2002		142	3	10	125	133	30	304	1	181	36	48	5	9	263	181	**1471**
2003		167	31	11	161	251	80	510	0	216	42	83	3	20	482	120	**2177**
2004		87	13	10	143	171	52	443	2	228	4	64	1	14	398	132	**1762**
2005		108	5	10	110	166	46	363	0	193	79	46	2	11	251	140	**1530**
2006		85	17	13	116	200	67	623	0	230	10	73	1	46	416	330	**2227**
2007		152	24	17	169	284	89	737	0	266	26	114	3	53	488	407	**2829**
2008		75	11	12	30	16	20	760	2	249	126	60	4	30	410	330	**2135**
2009		81	23	6	69	150	35	520	4	54	5	74	4	11	345	333	**1793**
AVER	**Number**	1327	160	137	1393	1812	545	5491	11	1762	439	748	40	250	4022	2342	**20908**
	%	6.35	0.77	0.66	6.66	8.67	2.61	26.26	0.05	8.43	2.10	3.58	0.19	1.20	19.24	11.20	**100**

Source: www.ogm.gov.tr/statistics

Appendix 4: Monthly Distribution of Number of Fires and Burned Areas in Turkey

2009 Forest Fires

CITIES	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		TOTAL	
	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA	#	AREA
ADANA	4	0.22					2	0.80	1	0.70	9	33.10	7	6.00	27	96.43	13	19.63	17	25.00	2	1.00	1	0.30	83	183
ADAPAZARI					1	0.20			1	0.20	12	7.34	13	60.40	28	237.10	9	9.28	9	42.62	1	0.30	1	1.75	75	359
AMASYA									2	1.60	5	0.91	8	3.05	20	25.15	11	11.32	26	40.76			2	1.40	74	84
ANKARA											5	0.73	31	20.62	24	21.03	8	4.02	16	18.67					84	65
ANTALYA	1	0.10			1	0.01	3	0.75	4	2.50	24	35.46	29	52.28	42	344.35	22	6.69	16	24.01	1	0.60	1	2.00	144	469
ARTVİN																									0	0
BALIKESİR									1	0.50	16	3.96	20	89.18	20	154.93	3	1.93	3	2.00					63	253
BOLU											6	0.30	3	5.08	3	3.05	2	1.80	3	1.04			1	1.00	18	12
BURSA									3	3.56	29	29.94	18	25.92	36	366.10	7	1.56	11	24.69	1	0.20			105	452
ÇANAKKALE									2	0.04	4	1.32	11	64.58	6	5.51	3	4.20			1	0.03			27	76
DENİZLİ		0.00	1	0.50	1	0.50			1	0.20	17	9.01	18	13.14	22	55.90	9	2.50	10	5.85					79	88
ELAZIĞ											6	35.70	10	74.60	15	20.30	9	53.00	4	21.00			1	5.50	45	210
ERZURUM									2	0.15															2	0
ESKİŞEHİR											10	4.37	9	7.87	24	54.79	4	2.65	4	0.81					51	70
GİRESUN	1	1.00					1	1.00			1	0.85			1	1.00							5	7.00	9	11
ISPARTA									1	0.03	17	7.55	17	10.05	15	4.12	13	7.41	13	9.14					76	38
İSTANBUL							11	19.07	1	0.04	16	6.58	38	39.10	40	9.77	8	15.29	1	0.10					115	90
İZMİR							2	0.58	7	6.37	41	160.19	43	265.46	49	1141.17	17	13.29	20	14.97	4	1.10			183	1603
K.MARAŞ	1	0.50			1	0.10			2	1.10	11	4.20	23	21.21	23	32.30	6	7.90	12	10.30					79	78
KASTAMONU					1	0.01	1	0.08	1	0.04	12	0.34	1	0.05	8	1.11	1	0.03	4	3.00					29	5
KONYA									1	0.50	4	2.99	3	0.27	13	54.29	6	16.00	9	13.50					36	88
KÜTAHYA											8	0.28	8	2.75	21	8.01	7	1.65	10	12.47	1	0.30			55	25
MERSİN									2	0.20	8	20.89	15	26.65	10	13.16	4	1.66	17	14.80	1	0.50	3	2.10	60	80
MUĞLA	4	3.60			3	0.60	6	0.70	13	1.40	35	73.80	52	72.90	46	33.80	48	26.00	41	45.90	4	1.00			252	260
SİNOP							1	1.00			3	0.08	3	20.08	2	0.06	1	0.02							10	21
TRABZON	2	4.00	4	35.02			1	4.00	2	2.70															9	46
ZONGULDAK					1	0.90	6	1.76	2	0.01	12	8.90	7	1.63	2	0.31									30	14
GEN. TOTAL	13	9.42	5	35.52	9	2.32	34	29.74	49	21.84	311	448.78	387	882.86	497	2683.73	211	207.83	246	330.62	16	5.03	15	21.05	1793	4679
%	*Number:*		*8.0*								*Number:*		*91.0*								*Number:*		*1.0*			
	Area:		*3.0*								*Area:*		*96.0*								*Area:*		*1.0*			

Source: www.ogm.gov.tr/statistics

Appendix 5: Forest Fire Statistics between 2000-2009 in Turkey

REGION	ENTERPRISE NAME	CHIEFTAINSHIP	NUMBER OF FIRES										BURNED AREAS									
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ADANA	ADANA	Adana	2	3	2	4	2	1	0	3	2	2	1.70	0.26	1.70	3.20	0.40	0.30	0.00	0.30	0.60	0.30
		Ceyhan	5	11	7	13	2	15	2	1	0	0	6.72	13.60	5.63	27.70	0.70	8.60	5.50	3.50	0.00	16.60
		Sarıçam	11	15	9	8	12	0	5	3	7	11	14.10	34.51	8.80	6.10	5.05	0.00	186.00	285.70	5.20	0.00
		Arboretum	0	0	0	1	0	0	1	1	1	0	0.00	0.00	0.00	0.20	0.00	0.00	0.30	15.00	0.50	0.00
	FEKE	Feke	2	4	3	5	2	2	0	3	0	3	1.10	0.50	2.50	2.25	5.50	0.14	0.00	1.50	0.00	2.15
		Çataloluk	1	0	0	1	0	1	1	3	3	2	0.50	0.00	0.00	2.00	0.00	1.00	0.10	1.20	9.43	0.75
		Gedikli	3	1	1	0	3	2	2	0	0	1	3.03	0.20	1.00	0.00	2.80	1.55	1.30	0.00	0.00	0.50
		Mansurlu	1	1	3	1	0	0	1	0	6	5	0.50	1.00	5.27	0.30	0.00	0.00	0.20	0.00	2.32	5.10
		Sarıpınar	0	0	2	0	1	1	0	1	0	0	0.00	0.00	0.60	0.00	0.50	1.50	0.00	0.50	0.00	0.00
		Bahçecik	2	1	0	1	3	2	3	3	2	4	0.70	0.40	0.00	100.00	6.50	37.80	3.50	9.30	1.60	0.43
	KOZAN	Kozan	6	1	3	1	1	1	1	2	2	0	2.40	0.30	0.60	1.00	5.00	0.50	1.50	0.02	15.04	0.00
		Akdam	8	1	3	0	0	3	1	6	9	4	9.00	0.20	2.40	0.00	0.00	0.80	0.50	8.00	2.45	2.01
		Horzum	3	1	3	0	2	3	8	8	5	5	2.80	2.00	10.30	0.00	5.50	4.50	22.61	1.56	1.10	6.01
		Alıçalı	4	3	4	4	4	1	4	5	3	4	14.50	1.40	3.60	3.10	311.50	0.30	7.70	8.02	2.82	31.27
		Meydan	3	1	0	0	0	0	8	1	3	1	20.10	0.30	0.00	0.00	0.00	0.00	10.00	4.00	2.12	0.20
		İmamoğlu	7	7	5	1	2	5	7	8	5	1	157.60	20.00	10.50	0.30	2.80	2.10	91.10	100.70	337.00	2.50
	OSMANİYE	Osmaniye	5	1	1	2	4	0	4	2	9	4	1.33	0.20	0.10	0.80	1.20	0.00	3.80	1.00	6.90	5.20
		Düziçi	4	7	5	2	4	2	6	3	8	0	28.00	6.20	28.85	12.80	7.10	1.50	7.00	1.20	7.40	0.00
		Hasanbeyli	0	5	1	0	1	1	3	2	5	2	0.00	22.30	0.80	0.00	0.60	0.30	4.00	188.00	2.80	2.50
		Bahçecik	1	2	4	1	1	1	1	3	2	6	0.50	0.40	0.90	0.30	5.00	0.30	0.01	0.66	0.70	5.40
		Yarpuz	1	1	2	0	2	0	1	3	1	0	1.00	1.50	1.03	0.00	2.50	0.00	0.20	3.10	0.50	0.00
	POS	Karsantı	2	1	0	0	0	0	1	1	0	3	6.50	0.50	0.00	0.00	0.00	0.00	0.10	0.50	0.00	1.40
		Akören	2	3	2	4	1	0	1	2	1	0	10.50	3.30	1.80	1.05	0.20	0.00	16.00	0.06	1.50	0.00
		Eğni	0	0	0	1	3	0	1	2	1	0	0.00	0.00	0.00	0.05	2.35	0.00	0.80	2.50	0.30	0.00
		Soğukoluk	1	0	1	0	0	0	0	3	2	0	0.50	0.00	1.00	0.00	0.00	0.00	0.00	0.61	1.02	0.00
		Söğüt	2	0	1	1	0	0	1	0	1	1	1.05	0.00	0.50	16.00	0.00	0.00	0.01	0.00	0.50	0.30
		Şamadan	0	0	0	1	1	0	2	0	0	0	0.00	0.00	0.00	0.10	0.10	0.00	2.00	0.00	0.00	0.00
		Yapraklı	0	0	0	0	0	1	2	1	0	0	0.00	0.00	0.00	0.00	0.00	1.00	1.30	0.50	0.00	0.00
	POZANTI	Pozantı	3	0	1	1	1	2	4	2	3	2	12.50	0.00	1.50	1.00	0.10	1.05	1.11	0.30	0.25	1.65
		Karakuz	0	0	0	0	0	0	2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	16.00	0.00	0.00	0.00
		Hamidiye	0	1	1	1	0	0	0	2	0	3	0.00	3.00	0.50	1.00	0.00	0.00	0.00	4.50	0.00	8.40
		Bürücek	2	0	0	0	4	0	0	5	1	0	7.00	0.00	0.00	0.00	7.50	0.00	0.00	3.21	0.10	0.00
		Niğde	0	1	0	0	2	0	0	0	0	0	0.00	4.50	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00
		Ulukışla	1	3	4	1	3	0	0	1	1	1	0.10	8.20	4.70	0.50	0.50	0.00	0.00	2.90	2.90	1.00
		Nevşehir	0	1	1	0	0	0	0	1	0	1	0.00	4.00	2.00	0.00	0.00	0.00	0.00	4.00	0.00	0.50
	SAİMBEYLİ	Saimbeyli	2	3	2	0	6	4	3	1	0	1	1.60	3.20	2.70	0.00	2.30	2.30	2.00	0.10	0.00	0.50
		Ayvacık	3	6	2	2	1	2	4	3	2	0	2.80	1.40	0.40	0.70	0.50	1.00	0.85	2.10	0.60	0.00
		Karaçamlık	1	0	0	1	0	0	2	0	1	1	3.00	0.00	0.00	3.00	0.00	0.00	2.00	0.00	0.30	0.90
		Kızılağaç	0	1	1	0	1	1	0	2	0	0	0.00	1.00	0.50	0.00	0.10	0.30	0.00	2.50	0.00	0.00
		Avcıpınarı	0	0	0	0	1	0	1	1	3	1	0.00	0.00	0.00	0.00	0.50	0.00	3.00	1.00	0.30	1.00
		Tufanbeyli	0	3	0	0	0	0	0	2	0	0	0.00	14.00	0.00	0.00	0.00	0.00	0.00	3.30	0.00	0.00
	YAHYALI	Yahyalı	0	1	0	0	0	0	0	0	0	0	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Burhaniye	0	1	0	0	0	1	0	0	0	1	0.00	30.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.30
		Kayseri	0	0	0	1	0	0	3	0	0	1	0.00	0.00	0.00	1.00	0.00	0.00	7.50	0.00	0.00	4.20
		Develi	0	0	0	1	0	0	2	0	0	2	0.00	0.00	0.00	5.00	0.00	0.00	1.00	0.00	0.00	72.00
		Pınarbaşı	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Ulupınar	0	0	0	0	1	0	0	0	0	0	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00
	KADİRLİ	Kadirli	1	4	1	3	3	4	4	3	6	2	1.10	1.10	0.30	2.15	1.60	1.80	5.30	0.70	3.50	0.50
		Savrun	2	1	1	0	1	0	2	0	0	0	0.12	2.00	1.00	0.00	0.50	0.00	26.50	0.00	0.00	0.00
		Taşköprü	1	1	0	2	4	0	4	2	0	0	2.00	2.00	0.00	13.57	1.80	0.00	1.70	1.00	0.00	0.00
		Milli Park	0	0	0	0	0	0	1	1	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.20	12.00	0.00	0.00
	KARAİSALI	Karaisalı	3	4	4	4	6	5	2	7	5	1	3.50	2.30	3.00	1.77	2.37	23.62	2.50	6.30	1.40	0.01
		Çatalan	1	0	0	0	0	0	1	1	1	1	5.00	0.00	0.00	0.00	0.00	0.00	4.40	2.00	0.10	0.10
		Hacılı	2	2	5	1	2	1	1	10	2	3	8.50	7.50	3.90	1.00	0.50	0.50	2.50	8.58	2.60	8.80
		Akarca	3	1	2	0	1	2	1	5	4	3	3,147.00	0.01	0.90	0.00	0.20	2.00	1.00	12.20	0.90	1.10
		Kızıldağ	1	4	0	1	1	0	1	4	1	1	0.30	16.16	0.00	7.00	5.60	0.00	0.10	0.30	0.10	0.10

REGION	ENTERPRISE NAME	CHIEFTAINSHIP																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ADAPAZARI	İZMİT	Akçaova	1	1	0	1	0	0	1	0	0	2	80	6	0	1	2	0	45	0	0	1.1
		Gebze	4	4	1	3	2	1	3	5	8	14	29	171	3	4.2	1.7	1	2.2	7.2	18.7	10.5
		Dilovası	2	2	0	2	0	0	0	6	7	7	4	1.5	0	1.5	2	0	0	9.93	21.56	6.4
		Kandra	0	1	0	1	1	0	0	0	4	0	0	1	0	0.5	0	0	0	0	1.6	0
		Kefken	2	1	1	1	0	0	0	0	0	1	1.5	1	1	0.5	0	0	0	0	0	4
		Körfez	2	2	0	3	0	3	9	6	13	10	3	11	0	30	0	2.7	14.1	5	46.4	27.7
		İzmit	6	3	2	4	0	2	0	5	1	1	57.6	4.3	2	5.1	0	2	0	23	1	0.2
		Taşköprü	0	1	0	0	1	3	0	3	2	7	0	5	0	0	0	2.7	0	2	0.43	203.67
	GEYVE	Akdoğan	4	7		1	2	1	3	10	7	2	14	29.1		0.5	1	0.3	3.7	11.83	0.2	0.2
		Doğançay	4	4	1	4	2	4	8	5	1	3	20.1	5.5	1	3.6	13	6.5	5.1	29.3	0.2	0.37
		Geyve	3	6	4	7	3	1	4	6	2	5	2.5	5.13	3.1	18	0.6	1	5.2	43.9	39.4	37.58
		Gümüşdere	2	0	0	1	1	2	0	1	2	3	1.8	0	0	0.5	0.5	0.08	0	0.02	0.2	3.23
		Pamukova	1	1	0	0	1	2	1	1	3	2	0.2	38	0	0	0.3	0.3	1.03	0.5	1.26	42.4
		Taraklı	0	2	0	4	2	0	4	5	3	3	0	2.5	0	47.5	23	0	103.92	3.9	0.59	0.4
	GÖLCÜK	Gölcük	1	3	1	3		2	1	4	1		7	7		8		0.5	2	11.3	1	0
		Karamürsel		2	1	2		1	2	2	2	2		2	1	6		2	3.8	145	5	2.53
		Suadiye	3	2	1	2	1					1	3	4	1	4	1					0.4
		Yuvacık	1			2			1				2			4			0.5			
		Kadırga																				
	ADAPAZARI	adapazarı	3	4		1	7	1	1	3	6	4	15	8		0.5	13.5	0.5	0.1	3.2	16.7	5
		Kaynarca	1				1	1		3	2		3				6	1		6.7	1	
		Sapanca	2	4		1			3			1	0.6	5.5		0.3			6.6			0.1
		Söğütlü	2	3		3	2			2	2	1	2.2	14.5		2.4	3.5			5.1	5.6	2.5
		Yeniköy																				
	KARASU	Karasu	3	5	15	3	4	2	3	1	6	3	78.5	10.7	17.3	6.8	3.9	3.75	6.3	3.5	6.72	3.77
		Kocaali	1	2	3	1	1		1	2	3	1	1	1.5	6	0.5	1		0.28	0.55	0.18	0.28
		Kurudere	0	1	2	1	0	0	0	0	3	0	0	1.2	0.9	2	0	0	0	0	1.8	0
	AKYAZI	Akyazı	1	1	2		1	1	0	3	2	0	4	1	3	0	0.5	0.5	0	2.2	1.5	0.1
		Dokurcun	3	1	0	2	0		2	1	0	0	7.3	5	0	0.9	0		1.1	0.08	0	
		G.Dokurcun	3	2	0	2	1		2	0	3	0	7	3	0	3.5	0.5		0.54	0	4.52	
		Taşburun	0	1	0	0	0		0	0	0	0	0	0.5	0	0	0		0	0	0	
		Göktepe	2	1	1	2	0		2	1	2	1	0.7	1	1	5	0		0.7	1	3.5	0.1
		Karapürçek	0	1	1	0	2		2	1	1	0	0	2	1	0	1.5		1.3	0.3	0.1	
	HENDEK	Aksu	1		1								7	0	1.5							
		Hendek	3	3	2	3	1		2	1	8		3.4	8.8	7.5	14.3	1		9	2	8.1	0
		Süleymaniye		1	2	3				2	3	1		2.5	3	0.8				2	2.11	0.1
		Karadere	4	1		2			1		1		3.6	0.7		2.69			1		0.3	
		Kurtköy		1		1			1	1		1		0.5		1			1.5	1		0.7
ARTVİN	ARHAVİ	Arhavi			1	1			1		1				58	2			0.7		4	
		Hopa	3	1	1	2	3	1	1	1	5		11	4	3	1	4.1	2	0.8	0.5	5	
		Kayadibi						1		1	1							0.2		2	22	
		K.paşa	1		1	3					1		1		1	3.5					3	
	BORÇKA	Balcı							2										2.5			
		Başköy				1										0.2						
		Borçka				3			1	2		1				0.55			2	1.3		
		Camili						1										0.01				
		Çifteköprü				1										1.5						
		Göktaş				3				2						0.05				2.5		
		Kabaca																				
		Karşıköy							1										4			
	ŞAVŞAT	Akdamla							1										0.100			
		Meydancık																				
		Şavşat																				
		Veliköy		1			1							1.000			0.150					
		Tepebaşı																				
	YUSUFELİ	Yusufeli	1										0.02									
		Kılıçkaya																				
		Öğdem																				
		Altıparmak																				
	ARTVİN	Artvin						1										5.14				
		Atila																				
		Madenler		1										0.5								
		Şaçinka																				
		Örtaköy						1										2				
		Taşlıca																				
		Tütüncüler	1										0.2									
		Zeytinlik																				
	ARDANUÇ	Ardanuç								1										0.01		
		K.meşe																				
		Ovacık								1										0.05		
		Tepedüzü																				

REGION	ENTERPRISE NAME	CHIEFTAINSHIP																			
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
A M A S Y A	VEZİRKÖPRÜ	AKÇAY	1	4	2			2	4	1	3	1	0.1	6.2	1.5			4	7.3	0.2	1	1
		ÇIGDEMLI				3				1	1					1.3				0.03	1	
		ÇAKIRALAN																				
		GÖLKÖY		2	2	1	1							1	0.2	0.0	0.3					
		HAVZA		1	1	2	1	1	2	2				4	8.0	3.5	0.5	0.8	0.6	4		
		KARAÇAM	1	2	1	1				4			1	3.8	15.0	5.0				273.88		
		KARAPINAR	3					1	1	1			2.21					1.5	0.25	1		
		KÜNDÜZ	1	3	2	3	1			1		1	1	2.5	0.1	2.1	9.5			1.85		0.6
		LADIK					1										1					
		NARLISARAY	2	3		2	1			1	1		0.9	1.12		0.3	1.5			0.05	0.1	
		SARIÇIÇEK	1			1				3			0.01			0.2				1.17		
		VEZIRKÖPRÜ		1					1	1				0.3					0.77	0.01		
	SAMSUN	SAMSUN	2	1		2	4	2		3			3.7	0.3		0.9	1.69	0.6		4		
		ADA		2		1	1	2		1		1		4.02		2.5	0.5	4		0.5		0.1
		TERME																				
		ASARCIK					1			2							0.5			0.5		
		ÇARŞAMBA		1	1	1			1	1		1		0.6	0.3	0.1			0.05	1.5		1.3
		KAVAK	1	1	2	2	1		1	3			0.8	0.15	3.0	0.5	0.5		0.4	3.8		
		TEKKEKÖY				3		1		4	1	1				1.5		0.6		3.8	0.2	0.5
		GOLARDI		2										11.5								
		SALIPAZARI				1										0.3						
		HEMŞINLER	1	1	1					1	1	1	10	5	10.0					0.5	3	0.9
		BOĞAZICI																				
		AYVACIK		2		1		1	1	2				1.6		5.6		1.5	0.04	1.5		
	TOKAT	TOKAT		8	1	5			9	2	4	3		30.21	0.3	1.8			3.5	1.17	3.12	0.35
		TURHAL				1			3	2						15.0			3.8	0.14		
		YAYLACIK				1	3		2	5	2					6.0	3.63		1.45	8.03	1.1	
		GÖKDERE	1	2		3							5	0.06		2.4						
		ARTOVA		3					1	1	1			3.5					0.3	15	0.13	
		PAZAR		2			2		3	1				2			0.55		1.5	0.3		
		ZILE		1	1		3	1	1	1	1	2		7	1.0		39	0.5	2	0.38	0.4	5
	AMASYA	AMASYA	1	10	4	7	5	3	6	5	6	8	0.1	8.69	13.0	6.0	4.8	3.4	9.15	4.43	11.185	6.9
		AYDINCA	3	2	2	2	5	1	5	1		4	0.56	0.11	0.2	10.3	2.36	0.2	20.36	0.02		2.3
		DESTEK		7		1			2	4				7.67		0.3			2.3	0.7		
		GÖYNÜCEK	2	3		3		1	7	2	1	3	0.6	16		1.4		0.3	11.75	1.52	0.03	2.3
		GÜMÜŞHACIKÖY	1	6	2	1		1	3	2	2	2	3	7.33	0.6	0.3		0.2	1.4	0.11	0.45	2.82
		MERZIFON		5	1	1	1	1	1	3	1	3		6.6	5.0	0.2	2	0.5	0.07	1.1	0.005	4.13
		TAŞOVA	2			2	4	1	1			1	1.1			1.6	4.3	0.1	0.1			0.3
	ÇORUM	ÇORUM	3	1		3	4		8	9	3	8	9	2		2.6	4.01		4.921	6.68	0.52	7.43
		ÜRLÜ	2	2		1	1	2	2	2		1	0.7	1.5		0.1	0.1	0.25	2.05	1.07		0.5
		LAÇIN	1	7			2	3	1		4		0.15	3.9			0.6	0.8	0.05		0.92	
		OSMANCIK								2										1.5		
		KOYUNBABA		1		4	2		2	4	1			1		2.3	0.2		1	0.67	0.3	
		MECITÖZÜ	1	3			2		1	4			0.2	5			3		1	2.7		
		SUNGURLU		2			2				2	1		1.1			3.06				0.1	21
	AKD.MADENİ	AKDAGMADENI		4		1	2		3		1	3		9.55		4	11		19.7		0.1	10.5
		AKÇAKIŞLA		3			1		2		1			7.1			0.5		1.5		0.5	
		BAŞÇATAK	1	2			1			1			0.5	15			0.2			0.05		
		BOZHÜYÜK		2					1	1		2		0.05					0.2	0.1		0.65
		UÇKARAAGAÇ					1	1		1	1	2					0.1	0.8		0.2	0.5	1.2
		ÇULHALI		1		2		1		1	1			0.1		0.3		0.02		1.5	0.1	
		KADIPINARI		4		1				1		1		0.806		0.1				0.1		1.2
		YOZGAT		5			1		2			3		5.52			0.2		5			3.55
		SORGUN	1							2		3	13							2.5		4
		ÇEKEREK	1						3	2	2	6	0.3						2	0.55	4	10.25
		AYDINCIK																				
	İSKİLİP	AKKAYA	2	4	1	2	1	2	1	2	4		3.6	1.65	0.4	0.2	0.22	0.13	0.2	1	0.75	
		BAYAT	1		1		1	1		4			0.4		0.3		0.2	2		2.8		
		ISKILIP	1	2		1		2	1	1			0.1	0.26		3.0		0.5	0.5	0.02		
		KARMIS	4	1	1					2	4		1.63	3.5	0.1					1.77	4.3	
		SARAYÇIK	1	1	1					1	2		0.2	0.5	0.3					0.15	0.3	
	NİKSAR	NIKSAR	2	12	2	5	4	5	5	12	1	2	1.04	5.73	0.1	22.1	2.2	0.4	0.565	5.18	3	0.81
		ÇAMIÇI	1	8	6	3			1	3	1		0.03	5.83	13.6	0.2			0.2	1.75	0.1	
		RESADIYE	2	6		3	2		6	5	1		0.7	15.97		17.0	0.5		2.1	2.9	2.5	
	ERBAA	ERBAA		2	1	3			1	3				1.5	1.5	28.0			20	3.89		
		ÇATALAN	1	2	1	2		1			1	1	2	2	2.0	2.2		1			2	2
		ÇATAKDERE	1		1			1					3		1.0			1				
	ALMUS	ALMUS	2	3		1			2	1			3.81	13.4		0.5			0.3	0.2		
		BARAJ		1					1	3				0.1					0.2	2.22		
		ÇILHANE	2	1		1			1	2	2		11	4		0.1			23	3.1	0.6	
		DUMANLI	1	1					2	2	1	1	2.5	1					0.4	4.6	0.03	7

REGION	ENTERPRISE NAME	CHIEFTAINSHIP																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AMASYA	ÇAYIRALAN	ÇAYIRALAN	1	2		1		1	3	1			0.02	3		4		0.8	13.5	10		
		YAHYA SARAY		2								1		3.5								1
		SIZIR		2	1	3						1		7.5	5	3.01						2.5
	KARGI	AKKAYA	3	1		2	1	1	1	1	1		0.2	0.5		0.18	0.1	0.1	0.1	0.01	0.01	
		KARGI	3	2	3	2	1			8	1		0.52	0.96	3.51	0.55	0.05			0.382	0.0015	
		ERENLERKOS	2	2	2	6		3	2	1			0.33	0.12	0.7	0.775		0.95	0.1	5.7		
		KIRAZBAŞI			2	1		1	1	3					3.5	0.05		0.05	0.5	0.22		
		KIZILIRMAK	3	1		1		1		2			1.53	0.93		0.1		3		0.31		
		HACIVELI		2						1				0.09						0.4		
	SİVAS	SİVAS		2			1	1	1	2		2		2.5			5	0.2	0.5	5		1.2
		DIVRIGI								1										0.5		
		HAFIK		5		1	1			2		1		6		2	3.5			2.5		0.5
		YAVU		3				1		1	2	1		3.5				0.1		0.5	2.5	1
		ZARA				1		1	1	1	1					1		0.2	0.8	3	1.5	
	KOYULHİSAR	IGDIRDAG		1					2	1				0.8					1.1	0.7		
		SISORTA		1		2				1				0.5		0.5				0.1		
		KARAÇAM	1	3			1			1			12	2.6			0.7			0.3		
		TATAR								1										0.3		
		SUŞEHRI	1	1			1		1				0.4	1			0.3		6			
	BAFRA	YAKAKENT	1	1				1					0.25	0.8				0.5				
		ALAÇAM	2		1	2							5		0.50	0.315						
		KIZLAN																				
		KURUÇAY	3	1		2				2			4.04	1		1.3				0.5		
		ONDOKUZMAYIS	2	1		1		1					2.3	1		1.5		0.2				
		ÇAYAGZI	2		1	2		1					26.8		0.40	3		0.1				
		BOGAZKAYA	3	2						1			1.285	9.2						0.1		
		INOZU	3	1	2	2		1	2	2			4.02	5	5.70	4.5		0.5	1.03	4.5		
		BAFRA	1	2		2			1				0.55	7		1			0.2			
ANKARA	ANKARA	Ankara	47	43	24	52	27	19	30	44	12	42	79.88	24.6	11.85	61.2	66.5	21.85	45.61	41.02	4.31	26.11
		Çubuk	6	7	6	1	2	2	2	1		8	48.1	2.9	6.44	0.1	0.2	4.2	4	2		6.8
		Sulakyurt		2										45.5								
		Kırıkkale	1	6		7	3	1	4	6	3	11	2	31.01		18.6	10	0.5	5	9	0.85	2.15
		Delice		2									1.1									
		Çiçekdağı	2										4									
		Kırşehir	2	1	1		5	3	7	5	2	1	4	6	0.35		15.07	1.8	16.5	6.5	4	2
		Akçakent		1	1	1								3.1		0.2	0.5					
		Bala					1										0.03					
	BEYPAZARI	Beypazarı	1		1	3	1	3	1	2			0.5	1	1.44	0.05	1.3	0.2	0.5			
		Eğriova				1			1		1					1			0.13		1	
		Kapaklı																				
		Güdül			1	2	3			1	1	3			2	2.4	53.1			3	0.5	4
	ÇANKIRI	Şabanözü	1					1		1		1	0.2					4		1	1	0.2
		Yapraklı	1					1			2		0.5					0.1			1.18	
		Sarıkaya	2			1		2		2	2	3	4.2			0.5		0.1		0.25	4.2	0.84
		Çankırı	3			2	1			2	1	2				5	0.2			0.11	0.62	0.18
	ÇAMLIDERE	Çamlıdere	2		1	1	1	2		1	1	1	4		0.2	0.3	0.5	0.41		0.01	0.4	0.2
		Beniliyayla	3			1	1			2		3	5.11			1	1			1.2		0.5
		Çamkoru	2		1	2	1		1	2			1.05		0.01	10	0.05		1.2	0.3		
		Kuşçular																				
		Peçenek			1	1	1			1	2				0.5	0.3	0.3			1		33
	ILGAZ	Ilgaz	4			3		2	1	2	1		4.3			6.01		2.2	3	13	0.2	
		Yenice	1		2		1	1			1		10.1		0.2		0.5	1			2	
		Kurşunlu	3				1			1	1		9.3				0.1			0.2	184.00	
		Hisardere	2										0.5									
		Devrez					1	1	1	2		2					0.3	0.1	8	3		0.3
	K.CAHAMAM	K.Hamam		4	1	1	1		7	4	1	2		15	1	0.4	3		6.4	1.7	2	0.4
		Yıldırım	1	1		3	1	2	1	4	2	2	2	8		23	0.5	0.2	2	10	4.5	5.02
		Güvem					3		1	1							1.1		0.2	0.05		
		Bozalan	1					1	2	2	2	1	2					3	0.8	3.02	36	0.1
	NALLIHAN	Erenler		5			1			1	1			3.3			1.6			0.5	2	
		Ulufan				1				2		2				2				1.3		2.1
		Andız		3	5		1		2	1		1		1.2	3.41		0.1		3.1	0.5		1.5
		Nallıhan	2	2		1				3		1	1.2	21		0.2				3.6		0.2
	ESKİPAZAR	Eskipazar	2	3	1	1				4		2	7	6.95	1	0.5				1.72		4.02
		Elaman		3	1				3					19.5	0.01				1.91			
		Oren	2						1	1	4		0.1						0.5	0.02	10.9	
	ÇERKEŞ	Çerkeş	7	6			1					1	35.7	11.3			0.01					0.1
		Çatak	3			1	2		2	1			1.7			0.2	10		6.1	1.8		
		İsmetpaşa	1	3	1	1		2	1		1	2	0.1	1.72	0.01	8		1.3	4		0.1	8.2
		Kurtçimeni	1						4	2			5						4	1.58		

REGION	ENTERPRISE NAME	CHIEFTAINSHIP																			
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ANTALYA	ANTALYA	ASAR	14	9	9	4	4	3	4	2	3	4	17.65	23.62	3.2	11.4	0.33	1.9	0.54	0.4	0.2	0.38
		KEMER	4	2	7	4	3	4	5	9	4	3	4.3	0.2	0.9	0.4	0.12	0.05	0.34	10.18	15.57	0.71
		ANTALYA	21	7	11	6	20	57	14	13	12	6	23.85	4.43	0.8	10.8	4.01	5.9	4.8	26.08	51.84	1.81
		DOYRAN	1	2	3	1		2	2	3	2	2	0.4	0.7	0.1	0.01		0.22	0.11	1.6	1.55	0.02
		ULUPINAR	1	2		3	2	4	6	9	1	2	0.2	0.03		2.9	0.03	0.53	3.4	18.27	0.02	0.11
		KURŞUNLU								1	1									0.1	2	
		DÜZLERÇAMI	5	2	2	1				2	2	2	11.8	0.11	1.2	1				2.1	1.2	40.6
		MILLIPARK	4	3	7	4	5	9	6	2	10	7	2.04	1.11	1.4	0.2	1.63	13.03	2.65	0.02	57.16	0.87
		DOŞEMEALTI				8	2	5	3	5	7	4				60	1.01	1.53	55	8.86	5.56	1.33
		ÇAKIRLAR		1	2	1	2	3	2	9	3	3		1.5	62.5	0.2	0.15	0.65	0.03	2.72	3.5	0.6
	KAŞ	KAŞ			1	1			1	1	1				0.5	5			1	0.01	2.5	
		LENGÜME	2	3	2	2		6	4	6	3	3	1.5	0.67	1.1	2.5		6.54	5.1	17.8	1.2	1.55
		LENGÜME m.p								1		2								140		0.51
		DEMİRE	1	3	1	2		2		2	4	3	16	1.62	0.5	0.4		0.3		0.04	1.85	7.23
		KALKAN	6	4	2	3	5	9	10	3	8	5	28.01	7.4	5.2	3.8	336.9	8.86	1.76	0.41	235.09	14.82
		GURSU	3	9	5	7	5	5	2	6		5	2.59	5.93	5.4	0.6	1.37	0.42	0.55	1.72		1
		GÖMBE		1										0.1								
		KASABA	1	1	1	1	2	1	4	5	7	3	0.03	0.1	0.5	0.5	0.11	1	395.08	325.71	4	48.1
	MANAVGAT	MANAVGAT	2	1	3	4	5	4	6	6	3	4	5.5	0.5	0.7	11.6	2.11	1.6	4.54	1.61	4.02	1.83
		YAYLAALAN	7	3	3	1	7	5	4	3	2	4	12.7	0.55	11.4	0.2	2.28	1.34	0.41	0.51	0.13	17.2
		YALCIDIBI	2	1	2	3	3	4	2	3	2	2	6	0.2	0.6	9	2	0.6	0.51	1.85	2.03	0.25
		ŞELALE	21	6	2	8	17	16	16	20	17	2	39.83	1.02	0.6	6.3	11	6.62	22.37	348.92	48.32	3.6
	TAŞAĞIL	TAŞAĞIL	17	7	10	9	7	6	2	3	7	1	22.53	16.5	22	1.5	11.75	4.2	0.72	0.6	40.46	0.01
		B.YAYLA		1	2	3	4	1	1	1	3			1.5	1.6	0.7	4.8	0.02	1	513.5	1.71	
		KAPAN	3	3		2	1	4	2	1	1		6	4.6		1.1	1.5	3.8	7.1	0.1	0.3	
		KARABUK	6	1	3	2	1	2	4	5	1	2	2104.3	0.3	2	0.4	0.1	1.3	1.59	1.12	10300	0.6
		SAGIRIN	5	2	1		3	8	8	4	3	8	4.5	1.8	0.1		2.3	14.12	3.25	2.55	3	2.09
		IKIZPINAR	3	1	1	2			2	2			465.5	1	1	1			2.3	1.01		
		K.K.M.P	7	3	2	3	3	6	2	3	7	2	16.7	2.5	1.8	5	2.1	2.76	0.03	0.71	2.05	0.3
	GÜNDOĞMUŞ	GUNDOGMUŞ	2	2	1	2	2	2	9	4	3		2.1	3.03	0.5	1.5	0.15	1.01	0.12	0.34	0.7	
		ESKIBAG	2	1	1	4	6	1	1	1			0.15	0.2	0.1	122.6	13.8	0.01	2.7	2		
		OGUZ	2	2	2	1	3	1	1				8.1	0.3	0.9	0.1	3.5	0.02	0.02			
		GUZELBAG	5		1	3							58.5		0.2	0.5						
	KUMLUCA	KUMLUCA	8	4	5	4	9	2	1	9	3	4	583.8	0.24	0.3	9.7	4.24	0.31	0.5	41.62	0.31	259.9
		AKDAG	2	1					1	2	1	1	0.8	65					0.05	185.2	208	0.3
		Y.ALAKIR			1					5	3	1			0.1					5.03	2.02	0.01
		A.ALAKIR	3				2	1	3	2			5.45				0.02	0.01	0.51	0.02		
		ADRASAN	4	1	3	5	2	5	3	1	3	1	62.5	0.05	3.4	257.1	0.11	4.23	0.16	1	305.11	0.2
	SERİK	SERİK	19	11	8	16	20	16	14	10	5	3	46.3	2	67.1	3.1	4.8	5.9	3.7	7	0.6	1.2
		AKBAŞ	4	6	4	14	17	6	8	7	7	4	117	3.6	0.9	222.5	50.3	229.5	2	2.6	5506.8	5.6
		GEBİZ	7	2	3	3	3	8	5	4	3	1	3.1	0.4	13.5	2.8	0.1	62.2	1.2	2.3	0.4	0.1
		KIRBAŞ	2	2	7	2	0	2	7	3	4	2	3.6	0.3	3.8	0.6	0	1.2	2.2	0.1	1.3	44.4
		PINARGÖZÜ	4	1	2	1	3	1	1	1	0	2	8.4	0.7	0.7	2.5	5.1	0.5	2.8	0.2	0	0.5
	GAZİPAŞA	GAZİPAŞA	4	2	1	4	4	2	2	3	5	6	2.6	0.31	0.5	6.52	8.5	2.1	2.5	0.35	12.82	6
		KARATEPE	5	7	4		1	7	5	7	2	2	5.7	0.95	2.01		0.7	15.1	0.91	71.81	0.4	5.8
		DOGANCA	2	3		2	2		2	4	4	1	2.8	2.15		0.9	2.5		4.2	2.2	5.9	2
		SIVASTI	3	1	1	1	2	2	1	4	3	1	1.5	0.05	1.5	0.2	0.5	6	0.2	6.71	0.7	0.2
	ALANYA	ALANYA	3	2	2	9	8	5	1	3	2	5	4.3	0.21	0.1	4.1	9.78	1.72	0.1	0.12	1.01	0.77
		ALARA	1		8	7		3	1	3		1	0.5		203.3	35		1	0.01	1.93		0.15
		KARGI	2	8	3	10	8	5	11	11	7	4	1.55	5.15	0.6	7.9	2.77	1.525	6.73	17.89	1.78	2.5
		GUZELBAG					5	4	4		2						2.15	1.22	10.11		1.2	
		SOGUT						2	2	1								0.02	0.5	2		
		DIM	7	2	2	1	7	8	12	7	4	2	16.05	3.01	1.8	0.01	2.48	1.38	3.5	33.91	1.19	1.53
		DEMIRTAŞ	7	4	6	4	9	9	3	13	7	2	4.85	1.31	12	0.7	4.5	0.99	2.08	225.7	119.52	0.25
	AKSEKİ	AKSEKI	3	2	3	10	2		3	1	6	3	2.6	6.5	1.05	1	0.25		0.92	16.5	3	0.03
		BADEMLI				2			1							1.5			0.01			
		CEVIZLI					2	2		1		2					0.1	0.6		0.01		1.1
		GERİŞ	4	3	1	2	5	1	6	7	5	2	45.6	1.3	0.05	2.41	0.92	0.3	0.77	0.55	0.97	0.3
		IBRADI	1	1		1	1	2	3	4		2	50	0.2		0.3	0.1	0.31	0.61	3.53		2.01
		KUYUCAK							4	2	1	1							0.62	0.07	2	1
		MURTİÇI	8	2	5	3	3	4	2	6	2	1	11.9	1.1	1.41	2.6	2.13	3.11	0.52	19.05	0.3	0.4

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ANTALYA	FİNİKE	FİNİKE	5	3	3		4	7	4	2	7	4	4.531	2.02	7.23		0.32	0.81	0.7	0.03	0.49	0.68
		AYKIRIÇAY	1		1		1	1	1		1		0.4		0.2		0.1	0.3	0.02		49	
		PINARCIK	1	3	3		1	2	4	1			1	0.21	0.2		1	0.03	1.38	0.01		
		YEŞİLBAĞ										1										0.7
	ELMALI	ELMALI		2							2	2		0.14							3	6.03
		TEKKE									1										0.1	
		ÇIĞLIKARA									1										0.02	
	KORKUTELİ	KORKUTELİ	1		1				1	1	1	1	1.5		0.1				2	0.1	2.5	0.01
		ARDIÇDAĞI								1	1									0.5	0.1	
		DEREKÖY				1	3		1			1				0.1	0.5		0.1			1
		HACIBEKAR	1						1			1	1							1		1
		YAZIR	2	2							1		0.15	0.08							7	
BALIKESİR	BALIKESİR	Ilıca	2	2		3	1	1	1	1		1	3	0.8		8.2	3	2	1	196.5		0.03
		Balya	3	4	2	1		1	1	2	1	1	51	4.8	0.5	0.02		4	0.2	100.1	0.1	0.02
		Savaştepe	7	11	3	2	3	2	2	9	1	2	141.2	27.8	0.5	0.4	3.5	1	1.3	11.9	40	1.1
		Çamucu	1	5	1	3			5	1	1	2	0.5	8.8	0.1	5			4.23	0.005	1	5.01
		Çataldağ	4	7		3	1	1				1	3.26	8.1		19.4	0.3	1				5
		Balıkesir	3	4		1	1	3			1	3	25.71	30		1	0.2	2.4			0.3	3.3
		İvrindi	4	2	1	1		1		1	1		15.5	1	5	2		0.5		0.1	1	
		Korucu	8	9	1	5	2	1		2		3	5.76	3.5	0.2	50.4	0.06	1.2		20.01		0.052
		Konakpınar			4	4	4	1	2	4	4	2			2.6	7.3	0.8	0.2	0.21	6.8	7.5	1.3
		Kepsut	2	5	2	4	2	2		2	3	3	3.5	10.3	2982	2.6	8.5	12.5		0.6	13.2	7.5
	EDREMİT	Zeytinli	3	4									0.3	6								
		A.M.Park						1										0.05				
		Edremit	2	3		1			3	1	1	1	0.55	2.1		0.1			1.1	0.15	0.05	2.08
		Gürgendağ		2		1	1			3	1	3		5		0.01	0.05			0.85	1	65.03
		Ayvalık	6	5	2		2	3	3	2	4	5	17.4	24.6	2.5		24.5	1.54	168.36	0.52	9.02	12.004
		Burhaniye	3	3	3		3	1	3	4	1	2	7	0.7	1.8		0.36	0.1	1.26	4.06	2	0.13
		Çınarlıhan	9	4	6	3	4	2	5	5	2		5.25	3.3	3.9	4.4	3.05	3.5	4.88	0.86	0.62	
		Altınoluk	7	2	4	2	1	2	2	1	2	1	6.16	0.4	0.8	2.5	0.05	1.25	0.55	0.01	0.3	0.05
		Havran	2	3	1			2	1				3.53	40.3	1.1			2.5	0.1			
	DURSUNBEY	Çamlık		2										1								
		Durabeyler		3	2	2	1	1	1			1		1	0.4	2.1	0.05	0.05	0.5			0.03
		Civana		1	1	1			2		1			0.03	0.1	1			0.15		0.01	
		Gökçedağ	5	2	2		2		2	2	1	2	46.2	4.3	7		8		42.5	0.2	4	48.5
		Dursunbey	4	7	4	1	2	6	1	2	2	1	0.65	40.7	0.3	0.2	0.425	13.4	15	0.3	0.04	0.5
		Yayla									1	1									0.1	8
		Candere	1	1	1			1				1	0.01	0.3	0.4			0.05				0.3
	SINDIRGI	Düğüncüler	2	2			1	1	1		1		0.6	1.6			0.01	0.1	2.5		0.25	
		Seydan	6	7	2	2	3	4	3	2	1		33.26	3.6	0.5	2.1	0.82	0.17	0.4	15.02	3.5	
		Bulak	1	1	1				1	1	1		0.1	0.01	0.1				0.1	0.002	0.5	
		Yüreğil		4	2	1	2	1	2	2	1			0.6	1.1	3	177.2	0.3	0.2	0.2	0.3	
		Sındırgı	3	4	2	2	3	2	2	5	3	1	0.4	0.4	0.5	71	1.9	0.2	0.35	8.3	0.5	0.2
		Ulus	2	1	2	1	2	1	1	1	1	1	0.11	0.02	2.2	1.5	1.55	1.5	1	0.1	0.1	0.1
	BANDIRMA	Manyas	5	9			2	3	1	8	2	2	15	27.5			3.3	3	3	4.91	2	0.51
		Erdek	4	1	4	4	6		1	7	4	4	351.05	1.5	20	2	30.25		1	27.81	21.2	5.58
		Bandırma		4	2	2	2	2	1	2	1	4		4	1.3	13.5	2	5.385	0.4	3.1	1	1.66
		Susurluk	5	5		1	2	3	2	5	1	3	89.5	20.5		0.1	1.3	1.4	0.55	5.55	0.2	4.93
		Gönen	4	3		3	1	1	1	2	1	1	92.1	3.2		3.3	0.05	0.1	3	25	1.5	10
		Aladağ	2	5	1	4			3	1			1268	11	0.1	29.2			2.71	5		
	BİGADİÇ	Bigadiç	5	7	1	2				2	1	2	10.6	133.4	2.5	11				1.3	10	48.7
		Adalı		1		3								5		8						
		Dervişler	1	1								2	2	8								0.02
		Beydağ		1	1					1	1	3		0.5	0.1					0.1	0.1	0.52
	ALAÇAM	Alaçam	1	1			1		1		2		0.05	0.02			0.05		0.08		0.13	
		Gölcük	1	2					1			1	0.1	1					0.02			0.05
		Ardıç	1	1	1	1	3						0.01	0.2	0.1	1	0.5					
		D.Eğrek	1			2							0.4			0.7						
		Kireç		2	2	3	3	1	1	1	1	3		50.3	595.2	0.6	3.55	200	0.5	2.8	28	20.25

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BOLU	BOLU	Çele		2		1				1				2.2		1				0.01		
		Çaydurt		1										0.3								
		Sarımustan							1										0.05			
		Bolu		1						1				2.5						0.01		
		Sazakiçi		1						1				0.2						0.01		
		Ayıkaya				1			1							5			2			
		Kökez				1										1						
		Abant																				
	GÖLYAKA	A.Pınarı						1	2									0.05	0.7			
		Gölyaka		1	2	1		1	1	3	2			1	1.5	1.5		0.5	0.5	2.05	0.55	
		Kardüz	1	1						1			3	5						0.14		
		Balıklı																				
	MENGEN	Geyikgölü								1										0.04		
		Çosur	1			1		2	2	1	1		1.5			6		0.06	17.3	0.03	0.02	
		Kayrak	1			1							2			0.2						
		Mengen		1			1		1	2		1		0.5			2		0.5	56.00		0.03
		Yalakkuz	1	2		1			2		1		4	2.1		0.1			1.05		2.00	
		Daren		3			1	1						3			4	6				
		Gökçesu				3	1	1				1				7.2	0.5	1				0.05
	MUDURNU	Sarpuncuk					2		1	1	2						0.32		193	0.05	0.30	
		Almacık								2										0.12		
		Yürse	1	5	1		1		1	1	1		1	6.3	0.5		0.3		4.2	0.08	0.10	
		Güveytepe	1	3	1	8	2		1	2	2		0.5	1.2	0.1	84.7	0.6		0.8	0.15	1.00	
		Vakıfaktaş										1										2.00
		Hacıali						1										0.3				
		Taşkesti	2	1		2		1	1	5	2		1.4	0.1		0.8		0.5	0.5	1.66	0.30	
		Sarot	1	1		1			1	1			2	1		95			2.5	0.50		
		Sırçalı	1	2		4	2	2	4	4	1	4	2.5	0.6		2.2	0.6	4.1	0.065	0.11	0.01	0.295
	DÜZCE	Danyeri		1			1		1					0.4			0.8		0.04			
		Düzce	3	1				1	4		3	1	7.9	1.5				1	4.9		0.67	0.50
		Konuralp		2	3	1			3	1				0.6	4.7	2			4	0.60		
		Aksu					1										1					
		Gümüşova					1										4					
		Samandere					1										2					
		Tatlıdere		1										2.5								
		Ağsar	1						1				1						2.3			
		Melen	2		1	1		1			2		3.8		1	2		3			3.35	
		Cumaova		2		3					2	1		5.4		6.2					1.15	1.30
		Odayeri	1										0.02									
	GÖYNÜK	Gürpınar		3		3			1	4	1	1		3.6		1.1			0.05	4.10	0.10	0.01
		S.Gölü	1	2		3	1	1	1		1	2	2	0.5		7	0.02	0.1	0.03		1.00	0.06
		H.Mahmut	3	1	2	1	1		2		1		3.2	0.2	1.5	0.3	0.2		0.84		0.20	
		Merkez	1	4	1	1			2	1		1	1	5.1	0.1	0.2			23.04	1.50		1.00
		Ilıca	2	2				1	1		3	1	74	0.6				0.1	0.025		5.50	0.02
		Alançayı	1	1	2		1	1	1	2	1		52	1	2.5		0.2	0.1	0.05	0.30	0.10	
	AKÇAKOCA	Deredibi		2	1				2	1				2.5	6				2	0.77		
		Aktaş							1	1									0.3	1.20		
		Altınçay	3		1				1	1			4.7		2				3	0.30		
		Cumayanı	1		2	1							1.5		1.1	0.5						
	YIĞILCA	Karakaş	1	1	3	1		1	1	2	2		0.1	0.2	1.8	0.7		0.3	0.05	0.45	1.00	
		Karadere			1	1	1				1				2.5	0.1	0.06				0.60	
		M.Dere			2	3			3		2				0.8	0.7			3.15		0.20	
		Boğabeli	1	1			1		2		1		3	0.3			1.98		6.07		0.10	
	KIBRISCIK	Yayla			1	2				1					0.2	0.03				0.10		
		Çökeren		1					1	1				0.2					0.6	4.00		
		Kıbrıscık								1	2	2								1.00	2.20	4.00
		Serke		2		1								0.03		0.2						
	SEBEN	Kızık		1						2				3						0.01		
		T.Yayla		1							1			0.3							0.01	
		Seben				2		1	1		1	2				1.1		1	0.03		0.03	3.00
	ALADAĞ	Ardıç				1			1	1						172			0.2	0.10		
		Aladağ								1										0.05		
		Sarıalan								1										1.50		
		Belkaraağaç							1	1	1								1	0.02	0.01	
		Alabarda	1						1	3	1		0.03						0.05	1.10	0.02	
	GEREDE	Aktaş		4						2	2			8.5						0.07	2.03	
		Yeniçağa		1						1				0.5						0.01		
		Dörtdivan							1										5			
		Salur							1		3								0.5		4.51	
		Haşat	2						1				15.1						3			
		Köroğlu		1						2				2						1.01		
		Yongalı				1					2					0.3					2.00	

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BURSA	BURSA	Mudanya	8	3	2	2	3	2	1	1	1	3	170.67	1.6	0.4	14.1	3.2	0.31	0.1	3	0.03	0.75
		Bursa	1	7	1	4	1	2	2	10	3		5	4.25	2.5	8.8	0.3	0.62	1.3	2.06	0.17	
		Kestel	2	8	5	16	6		11	2	8	7	471	4.72	3.9	18.2	1.7		50.1	168.08	6.06	7.5
		Orhangazi										6										4.2
		Osmangazi										3										1.5
		İnegöl					2										1.5					
		Soğukpınarı			1	1	1				2	1			0.2	0.02	10				0.81	0.04
		Çalı	1	7	2	3	3		1	3	2	9	3	6.42	1.6	1.2	1.46		0.1	5.4	1.01	30.31
		Gemlik			1	2				2	3	1			90	0.5				0.02	1.2	0.3
		Umurbey	1	4		2	2	1	2	4	4	4	0.2	72.4		1.5	1.3	0.2	2.3	40.32	1.52	1.4
	İNEGÖL	İclaliye	1										0.5									
		Oylat		2										7								
		T.Köprü		2		1								2		0.03						
		Boğazova										1										0.05
		Y.Şehir		3		1		1		1	1	2		39.1		5		0.1		0.1	0.2	15.48
		İnayet		2			1		2	1				0.6			0.2		0.45	0.2		
		İnegöl	1	2	1			1	1	1	1	1	16.5	7	2			0.1	0.5	0.01	0.3	0.05
		Mezit	1	3			1		1		1		0.1	1.73			0.8		0.7		0.02	
		Yenice	1		1		1		2	3			0.3		0.5		0.01		0.1	3.01		
	KELES	Keles		2	1		1	1	6	4	8	2		2.6	1		1.5	1	1.042	0.35	1.46	0.03
		Bayraklı					3			1	1						1.3			0.001	0.02	
		Sorgun	1			3				1	1	4	0.04			6.6				0.1	0.01	0.54
	YALOVA	Yalova		1		3		1			1	1		0.5		5.5		0.01			0.05	1.5
		Armutlu	2	3		4	3		3	3		6	0.13	14.2		0.2	30.1		0.78	0.47		338.74
		Orhangazi	1	1				1	2	3	1		0.5	2.5				0.5	0.2	2.02	1.2	
		Mahmudiye	1		1	1	1	1	1	1	1		0.2		2	4	1.5	0.4	0.05	0.01	2.5	
		İznik		1	3	2	1	1	2		1			0.5	2	14.3	0.2	0.01	3.05		0.5	
		Çınarcık		4		2	3		1	5	4	1		7.4		19.5	3		0.04	0.18	1.53	1
		Taşköprü				3	1	1	1	4	1	5				9.1	0.01	1	0.2	3.55	0.1	2.1
		Altınova	1										1.5									
	BİLECİK	Gölpazarı	5	9		5	2	1	3	2	7	4	4.2	1.92		8.9	0.55	0.01	2.8	2.02	5.15	20.21
		Bilecik	7	6	1	6	2	1	4	4	3	8	6.45	44.4	0.2	5.1	5	1	26.4	0.82	4.02	0.782
		Dodurga		2	1					2	2			2.5	0.2					0.04	0.8	
		Pazaryeri	1	1		1		2	1	1	1		0.01	1.1		0.6		2.5	0.5	0.1	0.2	
		Söğüt	1	1		3	2		4	1	6	1	0.3	1		7	1.2		6.3	0.5	6.6	0.01
		Muratdere		1							1	3		3							0.02	0.52
		Osmaneli	3	9	4	10	5	1	2	7	8	4	2.2	673.8	2.2	4.4	19.2	0.01	0.11	127.96	4.79	1.15
		Bozöyük		4		2	2	1	1	2				3.2		2.5	1.04	0.2	0.01	0.3		
	M.K.PAŞA	Karacabey	1	2	1	2		1	4	3	1	2	5	2.5	2.5	2.5		0.3	30.6	0.52	0.2	1.03
		Çaltıbükü	1			2			1				5			8			13			
		M.K.Paşa	4	7		2	1	1	3	1	2	1	10.5	1.93		0.6	1.6	1	0.1	0.5	2.3	0.9
		Devecikonak	4	2	2			1		2	1		45	0.02	0.1			0.1		0.4	2	
		Burhandağ		2			1		3	1	1	1		0.2			0.01		0.82	0.03	0.1	0.01
		Turfal	1										5									
		Yeniköy		1	1					1				0.5	0.5					0.1		
		Sarnıç		4										3.5								
		Paşalar	2	2		1				1	2	2	6.1	0.11		2.7				0.05	5.1	1.2
	ORHANELİ	Büyükorhan		1		4	1			4	1			2		1.4	2			1.04	0.1	
		Karıncalı	2			3	3	3	4	3	8	6	1970.05			2.5	12.1	0.38	14.09	1.08	1.53	3.57
		Orhaneli	3	4	1	5	6	4	9	6	4	4	2.01	6.7	0.1	2.1	0.95	0.36	3.05	8.13	1	0.555
		Kınık	1	2	3			2	1	1	1	3	0.05	1.01	3.6		1.08	0.204	0.02	0.02	0.01	15.06
		Harmancık	1	2	1	3	4	3	3	2	3	9	1	41	0.1	4		0.111	0.485	0.07	1.15	1.48
ÇANAKKALE	BAYRAMİÇ	Aladağ	2	1		1			5	3		1	0.5	2		0.5	0.7		5.11	4.4		0.02
		Gökçeiçi	5	3			2	2	1				397.7	3.8				0.25	0.5			
		Karaköy	1	1				1	1	2			0.05	0.6				0.7	0.3	1.01		
		Evciler	1	3	1	1							0.01	7.5	2	0.01						
		Kumludüz	5	1	1	2	2	3			2		47.38	0.04	0.1	0.1	3.82	0.09			1.3	
		Bayramiç	3	2		1	3	2	3	1	1	2	3.63	0.1		1.5	1.4	0.9	0.8	0.1	0.5	0.12
		Konakköy	1										1									
		Kazdağı						1			1							0.02			8	
		Çırpılar		1										0.3								
	AYVACIK	Baharlar	2	2	2	3	1		5		1		0.3	2.3	0.2	1.5	0.05		0.78		161	
		Ayvacık	4	1	2	3	2		1	1	1	2	7	1	1.2	31.1	0.25		0.2	0.5	0.5	1.3
		Küçükkuyu	1			1			1	1			2			0.01			0.2	0.2		
		Ezine	1	8	2	2	2		2	3	1	1	6	8	1.2	1.5	1.5		5.5	1.8	1	2

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ÇANAKKALE	ÇANAKKALE	İntepe	4	1	1		2	3	5	1	3	1	144.5	0.3	0.1		0.02	0.60	1.47	0.25	6.52	0.02
		Gökçeada	4	2		1							8.50	5.00		2.00						
		Çanakkale	4	5	5	3	4	3	1	3	2	3	62.02	7.50	1.1	0.6	160.70	0.34	0.50	2.11	1300	0.05
		Eceabat			2	2	2	1	4	1	3				0.80	8.10	0.70	0.01	12.04	1	9.51	
		Kirazlı	1	1		1	1				1	1	10.00	0.20		0.30	0.20				2.5	0.01
		Umurbey	3	6	1	2	2	1	2	1	1	1	9.32	28.00	2.00	19.50	1.00	1.00	0.35	5	1	0.01
		Lapseki	4	4	2	1	2		2	7	1	2	6.75	5.70	5.00	10.00	0.22		0.51	16.82	0.03	0.02
		G.M.P.								1										0.01		
		Gelibolu	5	1	1	3	3	2	5	1	6	1	9.60	0.50	0.30	307.00	511.00	0.73	0.16	0.5	324.88	3.8
	YENİCE	Soğucak	2	1	1	1	1					1	845.55	0.50	1.00	1.00	0.05					0.03
		Pazarköy		1	2	2	2			2		1		0.10	3.50	2.10	2.50			1.5		1
		Asar	2				1		1			1	0.51				1.00		0.01			0.2
		Yenice		1		1			2					0.10		0.05			0.51			
	KEŞAN	Enez	1	3	1				1	2			4.00	6.00	0.30				2.00	0.7		
		Korudağı	1			1					1		15.00			0.50					0.01	
		Çınarlıdere	4		2	1							1695.20		2.50	19.00				2		
		Şarköy	11	4		1		1	1	2	2	1	27.00	0.40		4.00		2.00	0.30		3	3
		Malkara	4	7			2				1		21.50	17.00			1.15				3	
		Mürefte			2	4									0.90	1.00						
		Uzunköprü	2	7									8.00	11.00								
		Tekirdağ	6	8		4			1				8.50	22.0		1.20			3.50			
		Keşan		1					1	3		2		0.50					2.50	59.4		13
	KALKIM	Kalkım	1	2	1								0.40	1.10	1.00							
		Eybekli	1										0.50									
		Kirsialan	1										6.00									
		Sarıot	1										0.02									
	BİGA	Sava	3	3	1			1				2	53.50	4.20	0.90			0.20				1
		Karabiga	3	4		2	1		2	1		1	407.00	4.60		1.20	0.20		7.00	2.5		48
		Biga		3		3	1		2	1				1.60		29.50	1.00		1.00	1		
	ÇAN	Çan	3	6	5	1	3	1			2	2	32.01	1.60	0.60	1.00	1.20	0.20			0.8	1.1
		Etili	3	2			1						6.20	0.60			0.20					
		Katrandağ	2	1		1	1	2				1	53.10	4.00		0.50	0.03	0.51				1
DENİZLİ	DENİZLİ	Sarayköy	9	6	1	4	1	1	5	5	6	5	21.06	1.20	0.20	1.20	105.00	1.00	1.04	0.63	5.31	1.34
		Pamukkale	2	4	4	8	10	9	15	15	8	5	2.20	8.70	1.10	4.30	3.83	1.54	16.64	5.43	7.85	1.33
		Honaz	2	1	2	1	5	2	2	4	3	1	1.50	0.20	0.80	0.30	1.00	0.34	0.31	0.3	1.13	0.1
		Güney	5	2	1	4	1	2	3	5	4	5	2.80	1.10	0.50	2.60	1.50	0.11	1.03	3.86	1.03	5.1
		Buldan	8	1	3	1	3	2	1	4	1	3	1592.60	0.50	145.50	8.00	0.30	5.00	0.50	4.3	0.03	1.4
		Kocabaş	1	2	1	1		2	1	1	2	1	0.01		0.10	0.20		0.47	0.01	0.02	0.03	0.3
		M.Park	1										0.10									
		Kaklık	1	1		2	2	8	2	6	1	4	1.00	0.05		0.40	0.07	4.30	0.11	67.32	0.1	0.14
		Denizli	5	7	4	10	7	15	4	12	6	6	3.06	5.90	3.10	9.70	7.00	9.39	0.13	42	10.42	21.71
	ESKERE	Yelkencidağ		1	3	2	4	2		3		2		0.20	0.40	0.70	0.35	0.06		1.09		0.04
		Karacaören	1	3			1		8	1	2		0.10	1.80			0.10		0.09	5.5	0.11	
		Eşenler	1	2	1		1	2	1		1	1	0.10	1.60	0.10		1.50	0.04	0.03		0.01	0.03
		Çiçekli			3		1	2	8	5	3	1			0.30		1.50	0.04	0.08	0.06	0.03	0.05
		Eskere	3	2	2				5	3	1	1	1.02	0.60	0.20				0.05	0.04	0.02	0.01
	ÇAL	Çal		2	1	7	8	4	2	4	4	2		2.30	2.00	3.80	17.80	0.06	3.70	4.73	7.7	11.6
		İnceler	1	2	1	1		2	2	3	3	3	0.01	23.00	0.10	0.10		0.51	0.03	3.03	0.22	1.91
		Çivril		1		1	2	1	1	4	2	3		2.00		0.30	0.20	0.01	3.00	2.56	1.08	1.25
		Baklan				2	2	2	2	1	3	2				0.40	1.00	0.11	1.51	0.5	0.22	0.31
		Çardak		1			2	4	1	2	1	1		6.00			0.20	2.65	0.02	1.01	0.01	13
	ACIPAYAM	Alçı	4	1	2	4	6	12	5	4		1	3.02	1.00	0.60	1.10	5.40	1.42	1.21	10.72		0.03
		Bozdağ		1			2		3	3	4			1.00			0.20		1.20	0.26	0.27	
		Kelekçi							1		2								0.10		3.1	
		Yatağan	1			2	1	1					4.00			5.30	0.50	0.10				
		Elmaözü				1	5	2		1	1	1				1.00	1.80	0.51		0.03	0.5	0.5
		Acıpayam					2	1	1	3	2						0.30	0.01	0.30	2.75	0.04	
		Yazır		1		3	1	1	1	1	1	2		0.50		1.10	0.01	0.10	0.01	0.01	0.1	0.45
	ÇAMELİ	Değre	5	1			2	2		1	1		0.35	1.00			5.40	0.02		0.2	0.2	
		Çameli	5	2				4	4	3	1		3.10	0.40				4.45	0.55	3.03	0.4	
		Göldağ	3		1	1	2		5	2	1		0.04		0.50	0.40	1.00		2.21	2.01	2.5	
		Boyalı	4		1		3	1	2			1	0.73		1.00		0.60	0.01	0.51			0.5
	TAVAS	Tavas	2	1		1	3		2	3	4	2	0.60	0.5		0.20	0.09		4.04	1.02	6.07	2.6
		Köprübaşı	3	1	4	1	1	5	1	3	2		0.25	0.1	1.20	0.10	0.50	9.03	0.01	0.05	0.12	
		Konak	1		1	3				2	1		0.50		0.10	0.90				0.02	0.02	
		Yenidere	5	3	7	3	4	3	4	6	3	1	30.10	3.9	9.90	0.80	2.29	0.56	3.26		0.6	5
		Kale	2	4	1	2	5	5	1	1	2	3	5.25	1.1	0.10	6.20	0.56	0.06	0.02	9	0.51	0.03

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DENİZLİ	UŞAK	Çatak	6	5	3	3	3	2	6	11	3		**0.93**	**4.2**	**0.10**	**0.70**	0.15	0.035	6.97	3.59	0.06	
		Çamsu	3	2	3	4	6	2	4	3	3	1	**0.28**	**1.8**	**0.20**	**1.50**	0.5	0.31	0.04	1.03	0.08	0.01
		Ulubey	2	2		1	2	3	3	2	2		**1.10**	**1.0**		**0.50**	4	1	1.33	0.15	8.5	
		Güre	2	3	2	7	5	5	4	5	2	4	**0.30**	**4.6**	**3.20**	**1.20**	5.56	2.52	2.03	0.93	0.23	1.78
		Banaz	5	7	4	6	11	3	10	3	1	7	**0.39**	**1.7**	**0.30**	**0.70**	2.3	0.21	5.13	4.11	1	4.28
		Uşak	4	5	3	2	10	2	6	7	1	2	**9.08**	**3.7**	**0.60**	**0.50**	0.9	0.6	3.35	151.2	0.02	0.4
		Sivaslı	5	8		4	2	1	1	7	2	6	**1.33**	**5.8**		**0.80**	0.3	0.03	0.02	37.9	11.5	7.1
		Eşme	1	6			4		1	1		2	**0.30**	**4.7**			7.8		0.3	0.02		5.3
ELAZIĞ	ELAZIĞ	Elazığ	1	4	4	4	2	2	6	6	6		**1.50**	**17.0**	**7.30**	**4.00**	7	3	8.6	18	9.5	
		Karakoçan		5							2	2		**49.0**							29	2.6
		Keban	1										**1.50**									
		Malatya				1	1			1						**1.00**	0.5			2		
		Pötürge		3	1			2	1	2	1			**24.0**	**0.60**			12.5	7	3.5	0.8	
		Hekimhan	1	2	1		1					1	**10.00**	**3.0**	**2.00**		1					1.8
		Darende																				
		Hasanorhan							1										2			
		Doğanşehir									1	1									4	0.1
		Genç	3	5	3	1			3	5	1	1	**9.10**	**32.9**	**2.70**	**42.00**			18	18	7	1
		Ilıca	1	1						1		1	**0.50**	**1.5**						5		0.6
		Solhan	1	1							1		**6.00**	**15.0**							20	
		Kığı	2	1		1			3	2	5	3	**13.00**	**3.0**		**28.00**			21	45	97	11
		Bingöl	2	5					2	5	5	6	**3.50**	**30.0**					12	19	15	8.6
		Palu									1										25	
	BİTLİS	Mutki		1		1						1		**5.0**		**3.00**						1
		Kızılağaç	2	6					1		1		**15.00**	**33.5**					2		3	
		Muş	1	1									**45.00**	**5.0**								
		Tatvan		2	1					1	1			**16.0**	**5.00**					1	1.5	
		Hizan						1		1								2		2.5		
		Bitlis	1	6		1		1			5		**50.00**	**50.0**		**2.00**		2			153	
	SİİRT	Baykan	1				1	2		1	6	4	**30.00**				4	7.5		1	15	1.3
		Sosan	1										**2.00**									
		Eruh	1	4	2	1							**3.00**	**36.5**	**21.00**	**2.00**						
		Pervari			2							1			**25.00**							1
		Şirnak			2	3		2	1	1	1	2			**65.00**	**65.00**		7.5		4.5	2	3
		Cizre						1	1			2						30	20			30.5
		Siirt				1										**5.00**						
		Batman	1		1				1				**4.00**		**20.00**				2			
	DİYARBAKIR	Çermik		1	1		1			2	2			**25.0**	**6.00**		6			3.5	14	
		Midyat			2					1	3				**5.00**					6	41	
		Mardin										1										1
		Mazıdağı			2					1					**26.00**					4		
		Hazro		2							2	1		**40.5**							23	0.1
		Dicle				1				1	1					**14.00**				5	10	
		Hani		5	1	1			1	7	3	12		**73.0**	**3.00**	**16.00**				51	34	91.8
	HAKKARİ	Hakkari		1	1					4		2		**3.0**	**3.00**					42.5		22.1
		Şemdinli		2	1				2	6	3	1		**7.0**	**10.00**				5	39.5	83	5
	TUNCELİ	Hozat		1	1		5			2	4			**8.0**	**10.00**		190.5			12.5	137	
		Nazımiye					1		1		6						5		3.5		70	
		Ovacık								2	1									53.5	8	
		Tunceli				1	2	4	3	2	11	2				**2.00**	2.5	46.06	3.3	3	46	5.6
		M.park				1		1								**8.50**		2				
		Pülümür	1					1		1	4	1	**10.00**					2		5	11	22
ERZURUM	ERZURUM	Tortum							1										2			
		Erzurum							3	1	2								1.8	10	0.3	
	SARIKAMIŞ	Hamamlı	2				2		1		1		**6.00**				2		0.5		0.5	
		Karakurt	1	1		3	5		7	1	1		**1.00**	**2.0**		**4.00**	8		11.6	1	1.5	
		Merkez	1										**7.00**									
		Çamyazı	1				4		4				**0.03**				2.6		1.8			
		Boyalı	3								1		**7.00**								3	
	ERZİNCAN	Erzincan	3	2	1		2		2	2			**4.10**	**5.0**	**2.00**		13		15.06	1.3		
		Kemah							1										5			
		Refahiye		4	1		2	1	2					**7.5**	**0.05**		12	0.4	8			
		Tercan		1					1					**25.0**					2			
		İliç	1			3							**24.00**			**3.50**						
	ŞENKAYA	Karıncadüzü	9									1	**89.50**									0.05
		Şenkaya	6	1		1	1		1				**21.30**	**1.0**		**1.00**	1.5		11			
		Pınar	4	1									**9.00**	**0.2**								
		Kılıçboğaz	2	1									**17.00**	**0.0**								
	OLTU	Oltu	3	2							1		**4.00**	**2.5**							5	
		Hisar	3	1		2			1				**5.80**	**2.0**		**0.30**			2.5			
	GÖLE	Ardahan	2			1		1			1		**8.00**			**0.04**		2			3	0.1
		Posof																				
		Yanlızçam	1								1		**0.50**								1	
		Köroğlu	1						2				**9.00**						2.5			
		Uğurlu	4										**50.00**									
ESKİŞEHİR	ESKİŞEHİR	İnönü	2	4			1	1	1	1	2	1	**2.02**	**13.0**			0.05	0.05	1	0.01	0.16	4
		Kalabak	1	2		1	1			2	2		**1.00**	**6.0**		**0.20**	0.1			0.03	0.11	
		Türkmenbaba					4	1	3	5	1	3					4.8	0.2	1.07	4.09	0.01	3.02
		B.Yayla	1	1	1		1	1	3	4	1	1	**0.03**	**0.5**	**1.50**		0.1	0.4	0.16	0.15	1	0.2
		Kırka	2	1	1	1	2			1	1	3	**1.01**	**0.0**	**0.10**	**0.01**	0.11			0.01	0.5	2.9
		Eskişehir	3	1			3	1	1	1	3	5	**0.57**	**2.0**			0.13	0.03	0.5	0.02	1.21	3.51
		Seyitgazi		4		4	3	1	2	4	2	4		**575.8**		**5.10**	5	0.01	6	1.52	0.05	4.23
		Çifteler		1	2	1	2	1	1	1	1	2		**5.0**	**0.10**	**0.05**	2	0.01	2	0.01	1	3.2
	ÇATACIK	Sarıcakaya	3	4	3	3	1	1	3		4	1	**3.01**	**0.8**	**0.10**	**35.10**	1	0.07	0.2		1.05	0.05
		Değirmendere										1										0.03
		Gümelidere		1			1			1				**2.5**			0.02			0.1		
		Alpu		1						4	1	2		**0.5**						25.36	0.05	0.15
		S.Yayla		1										0.1								

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ESKİŞEHİR	MİHALIÇÇIK	Mihalıççık	2	6	1	1	1	4		7	4	5	1.04	4.7	0.4	4	0.04	2.13		6.14	3.11	6.2
		Kızıltepe	1	3	1	2			2	1	2	4	0.05	24	0.1	2			0.09	0.01	4.8	1.6
		Beşpınar	1	6			3				3	2	0.3	3.7			0.22				0.9	1.6
		Çatacık		1	2					2		4		0.1	0.1					0.03		2.43
	AFYON	Hocalar	3	8		2	3	1	5	7	3		2.43	11.2		0.1	3	0.5	0.61	5.72	1.4	
		Afyon	5	6	2	4	11	2	13	8	3	2	60.1	7	0.2	1	5.77	7.5	49.21	9.99	0.18	2
		Emirdağ	1	1	1	3	4	1	2		2		0.2	0.7	0.1	0.2	4.43	0.4	0.02		0.6	
		Sinanpaşa	3	4		4	4	1	4	3	4		0.25	5.6		1.5	8.6	0.15	2.75	1.02	5.06	
		Sandıklı	2	5		1	1		1	4	2		0.52	8.9		0.5	1		0.1	26.11	2.55	
		Çay	1	2		1			2		1	1	0.5	0.5		0.5			2.01		0.1	1.5
GİRESUN	ESPİYE	Yağlıdere		*1*	1						1			*1.5*	*3*						14	
		Esenli								1		1								0.5		1
		Karadoğa								1										0.05		
		Tohumluk			1		1								*0.1*		0.25					
		Espiye	1	1	1	1				1	3		2	5	3	1.5				3	3.8	
	Ş.K.HİSAR	Alucra		3		1	2							17		3.5	2.5					
		Üçköprü						1			1	1						3			1	1
		Ş.K.Hisar					1		2								0.05		2			
	TİREBOLU	Tirebolu	1	4	3		1			1	2	1	3	15.8	3.5		2			0.01	4	2
		Harşit			2										3							
		Görele			1	2		1		1	1				2	6.5		2		9	4	
		Akılbaba				1										3						
	ÜNYE	Ünye	3	1		6	2	1		2	3	2	31.5	1		9.2	4.5	3.5		1.2	4.2	3
		Kumru	6		1	3	1		1				36		2.5	2	5		1.5			
		Fatsa	2	1		1				1	3		4	5		6.3				0.2	4.5	
		Korgan	1		1	1						1	2		1.5	0.3						1
	DERELİ	Dereli		1						1	2			1.5						0.01	2.1	
	GİRESUN	Bulancak	1		1	3	1		1		4	1	10		1.5	6.5	4		2		7.1	1
		Bicik		1		1					1	1		4.5		10					1	0.85
		Anbardağı	1					1					1					2				
		Keşap								1										0.25		
		Giresun	1			1	1		1	1	1		1			0.8	0.1		1	0.1	0.2	
		K.Köprü			1	2	1	1							4	1.8	2	0.5				
		Karakaya																				
	AKKUŞ	Göllüce								1										0.5		
		Akkuş	1										5									
		Düzdağı	1	1									8	3								
	MESUDİYE	Mesudiye								2										0.6		
		A.Alan	1					1					0.25					0.1				
	ORDU	Ordu	1		1			1	4				3		0.4			2	2.4			
		Çambaşı	1							1			0.05							0.05		
		Perşembe	1							1	1	1	1							1	2.8	1
		Gölköy							1										0.6			
		Ulubey			1	2	1	1	1	3	4				2	7	0.5	5	0.7	0.11	2.15	
ISPARTA	ISPARTA	Dinar		2	1	3		1	1	2	1	2		2.5	1	2.2		0.1	3	0.9	1	2.04
		Dazkırı	1	1	1	1		1	3	1	2		0.3	0.6	0.5	0.2		0.1	0.14	0.03	2.03	
		Isparta	2	7	2	1	11	2	3	7	7	5	1.6	5.7	0.5	0.1	4.83	0.6	0.11	1.89	1.54	2.01
		Senirkent		1	1				1		1	2		0.3	0.5				0.3		0.5	0.03
		Keçiborlu	1	1		1	6	1			1	1	2	2		0.3	3.17	0.5			0.5	2.8
	SÜTÇÜLER	Söğütdağı	1	3	1			1			2	2	0.6	2.3	4			0.05			1.04	0.21
		Sipahiler										2										0.03
		Tota	4	4	5	1		2	1	1		2	3.7	0.4	4.1	2		0.225	0.5	8		0.011
		Karadağ	4		1		2		2	1	2		2.69		0.5		0.6		0.55	3.2	0.95	
		Çandır	2	3	9	1	3	1			2	2	0.8	6.1	4.1	0.1	8	0.5			0.52	0.21
		Sütçüler		1			1	1		2	1	5		0.1			0.2	0.1		0.035	2	0.06
	EĞİRDİR	Eğirdir	3	4	2	7	2	2	10	10	4	5	4.1	43.7	0.2	10.9	1.8	1.25	11,525	15.98	12.43	10.7
		Y.Gökdere							1										0.25			
		A.Gökdere	1	1	2	1		1	2		1	3	1	0.5	1	0.5		1	10.3		0.5	0.3
		K.Kulağı		1				1		1	1	1		1				0.3		1	1.1	0.5
		Ş.Karaağaç	1	1								2	1	1								2.95
		Yalvaç	2					3	3	7	1	1	7.16					0.27	0.63	13.62	3	2
		Aksu			5	1					1				2.1	0.03					0.3	
		M.Park				3			1			3				2.7			0.05			0.535
		Pazarköy	1								1		0.2								1.5	
	BURDUR	Çamoluk		2						1	3	3		0.5						2.5	0.9	0.52
		Burdur				2		1	1	4	4	6				4.5		2.891	0.5	2.21	0.65	1.3
		Yeşilova	1	1			1		1	1	8	2	0.2	29			0.6		0.01	1	7.15	1.01
		Kemer			1			1							0.2			0.25				
		Ağlasun	1		1		2		2	2		2	8.5		8		23.1		5.6	1.01		0.11

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ISPARTA	GÖLHİSAR	Gölhisar	2	1	2	2	6	2	2	1	3	2	0.08	0.20	0.70	0.20	0.88	0.80	0.04	0.30	0.85	0.20
		Gölova		2	1	3	2		1	2	4			0.70	0.10	2.90	1.20		0.40	0.50	6.22	
		Dirmil		1		1				2	2	2		0.10		0.10				1.80	0.08	0.21
		İbecik					2	3	2		1	4					0.35	0.45	0.06		0.80	3.63
		Altınyayla		1										0.10								
		Tefenni	1	2		3	2	1	2	1	1		0.02	1.10		1.10	1.00	0.05	0.90	2.50	0.05	
	BUCAK	Uğurlu	1	2	1	1	1			1	1	3	2.00	4.20	3.00	0.20	0.05			0.15	0.01	0.26
		Bucak	6		1	2		1	3		6	3	9.35		1.00	0.10		0.20	0.81		0.49	0.56
		Melli	2	3	3	2	3	1	3		3	2	1.60	0.40	0.80	0.30	0.36	0.50	13.00		3.12	0.95
		Kestel	1	2		4	1		1		4	2	0.20	0.50		0.90	1.00		0.03		11.51	0.21
		Çamlık			1	1	1	1		1		4			0.10	0.10	0.20	0.20		1.50		1.64
		Pamucak	4	1	3	1	2		1	2	1	2	3.30	0.10	0.50	0.20	0.30		0.10	0.02	0.01	0.31
İSTANBUL	KANLICA	Alemdağ	11	14	13	23	2	3	8	24	7	13	11.49	0.30	0.50	1.40	0.07	0.21	1.94	7.89	7.39	0.93
		Sultanbeyli	5	15	6	40	16	9	40	42	29	37	0.19	2.90	0.10	8.70	1.89	0.25	8.97	24.03	4.42	34.217
		Milli park										1										0.100
		Beykoz	8	5	6	13	8	7	5	6	8	3	0.63	3.40	0.90	20.10	11.23	2.64	4.18	4.07	3.44	0.12
		Ömerli	1	2	2	1	1	2			4		0.20	2.00	1.60	0.30	0.05	1.70			1.25	
		Kartal	6	25	16	13	4	3	13	15	12	8	32.15	14.70	0.70	8.30	0.56	2.50	6.12	8.11	8.00	7.05
		Adalar	7	1		5		2		2		2	3.46	0.10		40.10		0.40		0.04		0.06
		Kanlıca	11	14	10	14	5	7	25	24	20	11	4.44	2.20	1.30	1.80	0.53	2.60	6.68	37.45	1.62	1.39
	ŞİLE	Şile	1	2	1	2		1	3	3			15.00	0.70	0.10	2.00		0.50	2.70	1.55		
		Yeşilvadi	2	1	1	2		1	1	4	2		2.15	0.20	0.10	1.20		2.00	0.20	0.92	0.17	
		Ağva	3		4	2		1		1		1	975.00		2.20	1.50		1.00		0.01		0.20
		Sahilköy	4		1	1	2	1	4	3		2	1.43		0.10	0.10	85.00	0.10	1.92	0.04		0.13
	ÇATALCA	Durusu	2	4	2	3	2	2		2	1	1	19.50	4.40	0.50	1.50	1.00	1.00		0.40	0.20	0.50
		Karacaköy	1	1	1				1	1		2	0.15	8.00	3.00					0.01		1.00
		Silivri	3	8	1	4		1	2	1		1	14.00	1.80	1.50	16.30		1.00	0.90	2.00		12.00
		Yalıköy					1							18.00			23.00					
		Binkılıç	2						1	1	1		2.04						0.20	2.00	1.00	
		Çatalca	1	4	2	6	3		2		1	1	2.00	7.50	6.50	1.50	2.20		1.30		0.50	0.02
	İSTANBUL	İstanbul	3	6	7	9	4	8	8	8	3	5	1.52	0.80	0.50	6.40	1.58	0.81	2.33	1.87	1.25	4.10
		Kemerburgaz		4	1	2	2	1	3	1		1		3.60	1.00	0.10	1.19	0.01	0.24	4.00		0.05
		Fenertepe	2	13	7	15	7	3	7	10	12	4	1.55	2.60	0.40	2.60	1.40	0.15	5.63	1.73	6.04	1.51
		G.O.Paşa	4	2	4	10	3	1	7	10	6	4	2.57	0.10	0.10	1.30	3.00	1.20	2.09	2.14	0.78	0.39
	BAHÇEKÖY	Kurtkemeri				1				1						1.50				0.10		
		Arboretum		1	1									0.40	0.10							
		Sarıyer	4	3	2	8	1	1	4	4	4	2	0.25	2.10	0.20	0.90	0.02	0.05	0.21	0.37	2.52	0.53
		Bentler					1		5	2	2	1					0.10		0.21	0.02	0.06	0.10
	VİZE	Kömürköy	1	1		3					3		3.00	3.00		4.70					4.05	
		Yumurtatepe	2			2	1	1	2	1		1	7.00			4.00	0.70	3.00	1.03	0.01		3.10
		Çerkezköy	3	4	1	1			3	6	3	2	20.00	2.80	10.00	3.00			15.00	116.00	5.20	3.30
		Kıyıköy										1										3.00
		Bahçeköy	2	1					1	2	2	1	125.00	2.00					0.03	2.50	2.00	0.10
		Saray	7	1	1						2		38.00	0.20	0.50						1.20	
		Midye	2	1		2		1	1		2		152.00	0.50		3.10		1.50	0.01		0.60	
		Sergen				1				1						4.00				0.20		
		Vize	8	7		3				1		1	131.50	51.60		3.10				0.70		4.05
	KIRKLARELİ	Üsküp	1	1				1				1	0.30	1.00				5.00				3.50
		Lüleburgaz	2	2	1					1		1	10.00	10.00	0.10					1.00		2.50
		Demirköy					1										11.00					
		Kofcaz								1		2							0.10	2.00		1.50
		Lalapaşa																	0.50			
		Pınarhisar	3	2	1						1	2	6.70	43.10	0.10						0.52	1.00
		Kırazpınar			1	1			1	2	1	1			2.00	0.10			2.00	0.55	1.00	0.50
		Edirne	1	1						3			0.60	10.00						16.50		
		Kırklareli			1	1					1	1			0.10	8.00					40.00	2.00
	DEMİRKÖY	İğneada	2	3									2.50	9.10								
		İs.Tepe	1	2		1	1				1		3.00	2.00		0.20	0.60				3.00	
		Şarapnel							2	1									1.50	0.01		
		Kurudere		1										0.10								
		S.Kulube	1						1				2.00						0.50			
		Bulanıkdere								2	1	1								1.01	0.10	1.00
		Kadıkule								1										0.01		
		Çakmaktepe																				

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																			
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
İZMİR	İZMİR	Gaziemir	3	3	2	7	10	3	8	2	3	3	0.75	12.60	0.30	14.60	228.30	0.41	1.23	1.03	638.20	1.40
		Urla	15	3	3	4	8	1	6	6	4	5	126.37	46.00	15.30	55.50	14.10	0.40	10.51	15.40	7.50	17.48
		İzmir	34	16	7	15	15	12	6	13	10	4	204.83	53.00	135.80	4.10	8.84	2.02	8.73	20.85	9.15	2.50
		Bornova	3	8	5	3	6	3	8	7	6	12	0.35	75.00	2.60	10.60	9.00	1.60	6.12	316.40	2.32	193.31
		Kemalpaşa	1	3		1	6	7	7	3	1	5	2.00	23.00		0.50	68.17	9.83	4.11	2.57	0.15	3.18
		Seferihisar	6	3	2	5	4	2	4	2		5	151.40	5.50	4.10	7.80	351.20	4.00	3.20	6.00		1105.50
		Menemen	5	10	6	7	5	5	10	13	5	3	263.00	299.70	16.40	117.80	53.40	1.01	36.21	31.94	248.10	105.50
		Karaburun	5	2	2	3	1	1	1	1		1	10.00	0.10	5.50	4.60	4.50	2.00	0.20	1.50		0.30
		Gümüldür	3	6	5	10	4	5	2	6	4	2	1.10	17.50	0.70	44.50	13.80	20.34	0.70	56.07	607.90	2.00
		Armutlu	3	5		1			1	2		5	70.50	8.60		4.50			0.07	2.50		1.08
		Karabel	2	1		1				1		3	70.05	2.00		0.50				0.03		2.70
	MANİSA	Manisa	7	17	5	8	15	5	6	31	5	12	0.93	8.10	2.50	57.90	2.10	1.46	5.31	226.89	2.00	19.78
		Yuntdağı	3	5	5	1	2		5	2	7	3	0.33	3.90	3.40	0.10	1.60		0.80	31.50	2.85	2.00
		Turgutlu	7	7	4	4	2	2	3	2	4	7	587.00	111.00	2.30	4.50	1.30	2.00	1.55	0.60	2.40	18.36
		Salihli	8	8	4	6	5	2	5	8	4	4	5.36	9.90	35.50	31.80	3.43	1.00	2.82	10.40	3.40	6.00
		Sarıgöl		6	1	5	2	5	3	4	3	6		4.50	1.00	5.40	19.50	0.81	1.30	1.15	1.70	4.63
		Alaşehir	1	7		3	2	1	2		2	5	0.02	8.00		10.60	3.10	0.05	0.01		1.00	9.05
		Saruhanlı	1	1	1	5		5	3	6	2	1	4.00	0.10	0.20	9.40		0.57	1.70	2.41	2.55	0.70
		Milli Park	2	3	1	4		1					0.24	0.20	0.10	3.10		0.05				
	AKHİSAR	Kırkağaç	11	12	12	7	7	3	9	8	5	7	237.84	5.90	5.30	2.70	10.10	3.50	2.00	1.29	2.23	6.26
		Göktepe	11	5	8	3	5	4	3	11	6	4	610.16	3.70	2.60	1.30	2.37	3.25	15.40	10.69	66.12	2.30
		Soma	24	8	3	16	13	4	11	13	16	8	157.98	28.80	4.10	10.00	4.20	0.69	3.85	5.13	10.96	8.20
		Akhisar	6	4	2		2	4	3	5	5	4	3.62	4.70	0.60		2.20	0.33	0.60	2.52	0.50	3.535
		Gölmarmara	2	5	3	2	1				3		0.35	84.10	1.70	1.00	2.00				2.91	
		Başlamış	4	4	2	3	7	3	3	9	2	2	1.50	2.30	0.30	0.70	1.62	0.42	0.85	4.32	2.51	0.30
		Zeytinliova	9	13	10	2	6	7	2	6	4	3	61.66	9.50	3.70	0.60	3.28	2.70	0.35	7.91	5.21	1.20
		Kavakalan	4	2		5	3	1		3	1		2.12	0.20		2.10	70.00	0.20		0.24	4.00	
	BERGAMA	Bergama	5	5		9	4	3	5	1	2	3	203.56	1.20		3.70	26.70	10.25	4.10	46.00	0.32	0.40
		Madra	5	2	1	1	2	1	1	4	7	3	16.00	0.60	6.00	0.20	6.20	0.50	0.30	5.40	16.25	0.516
		Y.Şakran	4	5	3	4	5	1	5	2		7	4.25	12.50	1.20	4.20	2.97	0.20	20.39	24.00		7.43
		Dikili	1		2	3	5	5	2	3	2	1	1.00		9.00	123.10	12.80	1.65	1.20	40.15	0.51	0.50
		Kozak						3			1							1.17			0.50	
		Göçbeyli	1	2			1	3	2	4	2	1	1.00	2.10			2.50	16.02	0.52	6.80	1.00	1.00
		Poyrackk									3										1.70	
		İncecikler										3										0.60
		Kınık		3	5	1	7	5	4	3	6	3		0.20	3.20	0.50	6.15	6.34	3.31	8.40	2.86	1.20
	DEMİRCİ	Başalan	9	5	3	3	2	2	2	3	3	3	2.29	52.80	0.20	4.20	4.50	2.60	0.70	2.10	3.90	0.80
		Borlu	9	5	2	6	1	3	1	5	1	5	5.33	7.60	1.20	8.40	0.10	0.50	0.10	1.50	25.00	8.80
		Demirci		3		4	2	1	3	10	1	5		0.40		2.30	0.60	0.30	5.12	3.51	0.40	11.00
		Kula	7	2	2	3		1	3	3	1		24.75	1.30	4.00	6.10		0.50	10.20	3.75	1.00	
		Selendi	5	6	2	5	1		3	9	2	4	1.97	3.20	0.20	2.50	7.00		1.52	3.80	0.70	2.20
	BAYINDIR	Ödemiş	2	1	1	5					2	3	15.20	0.30	0.10	13.00					6.00	6.30
		Kiraz	3	5	3	3			2	5	2	3	0.65	4.00	1.80	3.50			0.80	3.65	4.50	1.30
		Selçuk	1	1	1	5	1	1	3	1	2	2	10.00	1.50	0.50	16.20	0.50	0.50	353.01	1.00	45.00	7.10
		Torbalı	4	5	3	8		2	7	5		10	19.80	5.50	5.20	14.60		0.50	49.75	0.46		4.27
		Gölcük	2		2					1		3	15.10		3.70					0.01		5.32
		Bayındır		1	3	3	3	3	3		4			0.50	1.80	0.20	3.15	325.15	4.22		3.50	

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
İZMİR	BAYINDIR	Tire	2	3	2		1	2	3	3	1	3	45.00	4.70	19.00		0.20	2.50	1.40	17.10	0.10	2.50
		Ovacık	2	4	1	1	3	3		4	2	3	0.31	66.70	0.20	0.01	0.40	3.50		1.00	0.17	0.113
		Beydağ	2			5	3	4	6	8	2	3	7.07			8.30	6.20	4.10	9.73	3.51	4.00	21.50
	GÖRDES	Gördes	2	5	1	4	7	8	7	8	3	1	3.50	1.40	0.20	1.70	2.46	3.14	3.26	1.82	48.03	3.00
		Şahinkaya	2	1	1	4	5	2	4	6	1		2.10	0.10	0.10	1.10	14.90	0.22	2.09	9.93	2.00	
		Gökseki		1	1	3	1		1	5				0.20	0.10	0.30	0.03		0.05	1.19		
		Güneşli	1		1	1			1				0.50		0.10	0.01			0.03			
KAHRAMANMARAŞ	K.MARAŞ	Suçatı						1	1	1	1	2						0.10	3.00	2.10	3.00	1.90
		Kapıkaya		1		2	1		5		1	1		0.20		0.60	0.10		10.70		1.90	0.40
		Başkonuş	1	2	1	1	1		2	8	1	4	0.10	1.00	0.10	0.10	0.10		0.20	65.85	0.10	1.80
		Pazarcık	1	1	3			1		3			1.50	0.20	0.60			0.10		3.10		
		Hartlap	1	1	2	1	1	1		2	1	1	2.50	1.00	3.00	1.00	0.20	0.10		60.00	70.00	2.50
		Çağlayancerit		1										0.50								
		K.Maraş	3	2	2	1	3	2	5	7	1	4	11.10	1.20	0.30	0.10	1.40	2.60	0.50	8.63	0.05	6.10
		Elmalar		3	1	3		1		2	2	5		1.10	0.50	0.90		0.10		5.10	1.10	3.60
		Balkaya	1	1	1		1	2	1		2	3	0.10	4.00	1.00		0.20	0.20	0.20		1.80	3.60
		Türkoğlu		2	2	2		3	1	2	4	1		20.50	1.20	0.40		0.40	1.13	2.40	4.30	0.20
	ANDIRIN	Yeşilova	3		1	1	1		1				12.10		0.10	0.10	40.00		0.10			
		Andırın		2		2			2			1		1.00		0.20	0.20		1.10			1.00
		Akifiye	2			1	1		1	1			1.01			0.10			0.10	1.50		
		Kaleboynu		1										0.50								
	ANTAKYA	Antakya	10	6	12	8	8	4	6	6	2	9	10.20	4.30	10.90	9.30	9.90	3.60	1.50	12.60	0.30	5.30
		Yayladağı	6	2	4	2	6	4	2	10	2	1	6.20	2.30	16.00	4.50	9.20	9.50	0.10	490.60	1.20	0.10
		Uluçınar	1	2	3	2	2	2	3	6	1	5	0.01	263.00	26.00	2.20	16.00	0.20	0.80	12.90	0.20	4.50
		İskenderun	4	3	3	5	5	3	5	6	3	4	27.80	0.30	2.60	1.00	0.80	0.30	2.10	2.00	0.30	9.50
		Samandağ	7	6	2	5	5	4	5	11	8	3	2.50	12.50	1.10	10.90	14.60	33.60	8.00	232.30	581.20	1.50
		Belen	2	2	3		1	4	1	2	5	3	2.20	0.40	46.50		9.00	0.80	1.50	2.00	2.50	2.00
		Hassa		3		1	1	2	3	2	3			5.40		0.10	0.10	0.30	0.30	3.10	0.40	
		Kırıkhan	2	2	2	4	2	3		2	3	1	0.15	0.20	1.70	11.40	0.20	2.70		0.20	10.30	1.00
	GÖKSUN	Afşin	1	3		2							0.10	0.40		0.60						
		Göksun	2	6	2	1		2		1	2	1	4.60	2.00	4.50	0.10		0.20		0.50	5.00	1.00
		B.Çamurlu	1	1			4	3		2	1	1	0.50	0.50			0.40	1.60		0.20	0.20	0.30
		Çardak	1							1		2	5.00							0.50		1.00
		Yağbasan		1		1	1	4	1					0.10		0.20	0.10	2.20	0.50			
		Elbistan		2					3					4.60					0.50			
	ADIYAMAN	Kahta		1	2	1		1	4	3		2		1.50	1.50	1.00		0.10	1.30	1.00		1.50
		Gölbaşı		2	2	2	3	1	4	6	4	3		0.80	0.70	2.00	0.50	0.10	1.30	16.90	0.70	2.10
		Çelikhan		1			1	1			1	1		0.30			0.10	0.10			0.10	0.10
		Adıyaman	1	4		3	2	3	2	5	1	1	1.00	2.40		0.90	0.12	0.30	0.60	0.50	0.20	0.10
		Şanlıurfa	4	7	8	4	5	3	4	5	4	5	5.40	11.00	20.50	2.70	7.90	14.20	1.72	2.60	5.70	7.21
		Siverek				1										5.00						
	KİLİS	Kilis	5	3	1			3	2		1	2	1.70	2.00	5.00			6.10	1.10		0.50	3.50
		G.Antep		1	1	4	1	2		2	2			8.00	2.00	4.70	0.10	3.10		1.50	0.70	
		Islahiye	3	12	7	9	3	3	6	2	6	11	7.50	29.50	16.20	11.20	6.00	3.10	5.00	2.30	16.40	12.80

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS																				
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
K.MARAŞ	DÖRTYOL	Erzin		1	3	2	3	3		1		1		7.00	1.40	1.10	1.80	4.20		0.50		2.00
		Dörtyol	2		2	1	1	2		1	2	1	23.00		0.60	1.50	0.10	3.50		0.50	2.20	1.00
		Ufacık																				
KASTAMONU	SAMATLAR	Iğdır	1	1		2						2	0.05	0.10		0.10						0.04
		Dorukyayla	4	3				1	1	1			1.13	0.4				0.01	0.01	0.03		
		Kartalsuyu			3	1	2		4	1	2				5.00		6.00		23.00	2.00	1.10	
		Aksudere	2	4	1	3		1	4	1	2	3	2.05	3.10	0.80	2.00		3.00	4.53	0.01	1.06	0.22
	KARADERE	Akkaya	4	6	2	5	1	2	2	5	1		4.62	14.50	9.50	9.00	0.10	4.05	6.00	90.21	0.20	
		Karadere	3		1	3	1	1	1	6			2.03		0.10	2.00	0.80	0.30	1.00	3.54		
		Kaşçılar	4	2		2	1		1	1	1		4.33	0.50		2.10	1.50		0.02	0.05	0.20	
		Handüzü	1		1	1			1	2			0.70		0.50	1.60			2.00	5.80		
		Kadıdağı	1	2		1	2			5		1	0.07	0.80		1.00	0.03			2.71		0.05
		Çaltepe	4	5	2	4	1	4	3	5		3	21.02	2.30	9.00	0.50	0.10	2.60	1.80	4.60		1.03
	ARAÇ	Araç		1		2		3	6	1	1	2		0.50		2.00		3.08	1.50	0.01	1.30	0.03
		Karkalmaz	2	1	1								2.03	8.00	0.10							
		Boyalı	1			1	1		1				4.00			0.30	0.30		0.20			
		Gölcük		1	1									0.10	0.10							
		Dereyayla		1	1			1		1	1			1.00	0.10			0.15		0.10	0.50	
		Sırağömü	1	1		1	1			2			0.30	1.50		0.01	0.30			2.00		
	KASTAMONU	Kastamonu	2	3		7	3	1	4	4	1		11.00	8.60		3.00	1.24	0.06	23.21	3.20	0.05	
		Değirmenciler	4			3			1	3	1	2	3.17			5.50			0.03	6.34	0.01	0.025
		Gölköy	1	3	2		2		1	2	1		0.05	11.00	0.70		0.25		0.18	0.16	0.08	
		Kuzyaka	2	2		1							5.05	1.70		0.10						
	TAŞKÖPRÜ	Bayam	2	2		3			5	3		2	1.50	0.60		143.50			5.90	1.03		0.01
		Gökırmak							1										1.00			
		Karatepe	1	3	2	1		1	2	3	4	1	1.00	0.10	1.40	0.50		0.04	1.72	0.19	0.46	0.02
		Kırkçam	1	1	1	3		1	3	4	1		0.05	0.10	0.10	4.40		0.03	8.70	1.66	0.20	
		Taşköprü	2	1						2			0.11	2.00						0.11		
		Kuzaluç							1			1							0.02			0.08
		Hanönü		1										2.00								
		Gökırmak		2					1		2			1.00					1.00		2.00	
		Çatalçam		1	3							1		2.00	1.30							0.01
		Günlüburun	2	1	1	1				2			1.50	0.20	0.30	0.10				0.80		
		Koçanlı	1	3	2					1			0.01	2.20	0.50					0.05		
		Saraycık	1	1	1				1				0.10	0.50	0.70				0.30			
		Sarıkaya	4	4	1	1		1		1			1.14	2.00	0.50	0.20		0.04		0.01		
		Düzdağ	2		2	1	1			4	1		3.30		1.40	0.10	1.00			0.45	0.02	
		Tekçam		1						3				4.00						2.35		
		Dikmen	2			3			1	1	1		1.55			3.60			4.00	1.00	0.08	
		Çiftlik	5	1					1				4.03	1.00					0.02			
	DADAY	Çamlıbel	1	3			1	2		1		1	1.00	0.20			0.10	1.20		0.01		0.30
		Daday	1	1			2			4		2	0.20	0.50			0.50			13.06		0.09
		Savaş	1		1					1	1		0.50		8.00					0.07	1.00	
		Sarıçam	1		2				2				1.00		2.10				0.07			
		Çöme					1										1.00					
		Yayla	1			2				1		1	0.20			0.60				0.30		0.005
		Ballıdağ		1						1				0.10						0.50		
	İNEBOLU	Gemiciler		1	2	1				1				0.10	2.00	0.30				0.02		
		Altınkum		1		1		2		4				0.10		5.00		0.40		1.00		
		Doğanyurt		1	1		1	2		4		1		1.00	0.50		1.00	0.51		31.70		0.006
		İnebolu	3	1		2	1		2	9	8		7.00	1.50		0.90	0.10		1.25	12.17	8.91	
		Şenlik																				
		Özcüler	1	1	1	1	1			2			0.50	2.00	8.00	1.50	0.30			1.10		
	Ç.ZEYTİN	Akçay	2			1			1				3.10			1.00			1.00			
		Ç.Zeytin			2	1	1			1	1				5.50	4.00	2.00			1.00	1.00	
		Karacakaya	1	1						1			0.30	1.00						0.30		

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1999	2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
KASTAMONU	PINARBAŞI	Sorkun		1		2							3	0.33		4.00		4.30						
		Sarnıç		1					1				2	0.22		1.50					10.00			
		Çöme								2	1											1.10	0.05	
		Kurtgirmez	1		1	1	1		1	2	1		8	0.89	1.00		0.50	0.10	0.50		1.50	0.40	2.00	
	KÜRE	Küre		2	1	1				2	1		4	0.44		2.50	2.00	2.00				0.53	0.10	
		Ağlı		1									1	0.11		1.00								
		Kösreli								2												1.02		
		Şenlik		3						1	1		3	0.33		1.50						0.10	0.30	
		Devrekani	2	1		1				2			4	0.44	1.80	1.00		1.00				0.20		
	TOSYA	Yeşilgöl	1	3	2		1			1			7	0.78	0.40	9.60	0.30		6.00			0.10		
		D.Dağı	2	4	1	3	1			3			11	1.22	0.05	2.10	2.50	12.10	5.00			4.20		
		Akseki	2	2						1			4	0.44	0.64	1.60						0.10		
		A.Dağı	1	2			2	1	1	1	1		9	1	0.02	0.30			1.10	0.00	1.50	10.00	0.04	
		Bademdağ		1									1	0.11		0.10								
		Kösdağı		2			1		1		2		4	0.44		3.00			0.10		1.00		0.60	
		Tosya	4	3		1				3			8	0.89	0.54	4.60		0.20				3.30		
		Çaldağı	2	7	1	2	1		1				14	1.56	0.06	0.30	0.10	1.50	3.00		2.50			
	İHSANGAZİ	İhsangazi		1				1		1	1		2	0.22		0.10				0.20		0.30	0.01	
		Eceler	3	2		1				1			6	0.67	0.35	0.20		0.10				0.50		
		Kirazlıtepe										1												1.50
		Mergüze	1	1		1		1		2	1		4	0.44	0.03	0.50		1.00		1.00		0.15	0.01	
	BOZKURT	Abana							1		1										0.50		0.05	
		Bozkurt						1			1	1	1	0.11						1.00			0.20	0.20
	AZDAVAY	Kirazdağı	3	1		2			2	1	1	1	8	0.89	2.06	0.10		0.20			3.50	0.05	0.01	0.01
		Azdavay		1			1		1				3	0.33		3.00			0.03		2.00			
		Kırkbudak							1	1	1	1									0.50	0.05	0.15	0.012
		Çamlıbük							1												10.00			
		K.Pınar	2	1							2	1	3	0.33	2.00	5.00							3.02	0.015
	CİDE	Cide	1	1					1	1	5		3	0.33	4.00	0.10					1.50	0.05	2.07	
		Güren		1					2				3	0.33		1.00					2.60			
		Dağlı							1												1.00			
		Kızılcasu										1												1.00
		Şehdağ			1								1	0.11			3.00							
		Aydos	1	1		1			6	8	3		9	1	3.00	1.00		1.00			7.44	18.20	2.52	
KONYA	BEYŞEHİR	Beyşehir	1	1		2	3	2	3			6	18	2	0.50	2.00		2.50	11.20	0.02	6.00			15.90
		Kızıldağ						1	3	1	1		4	0.44						0.06	10.06	2.00	0.05	
		Kurucuova			1				3	1		1	4	0.44			0.20				6.04	1.00		3.00
		Yeşildağ	3	5	1	2	2			1		4	13	1.44	15.60	31.60	0.10	0.50	0.40			0.01		12.36
		Seydişehir	3	10	2	3	4	2		2	1	5	24	2.67	36.70	45.60	10.50	4.50	10.00	1.03		5.00	0.01	38.00
	ERMENEK	Çamlıca		4	1		1	1	2	1	1	1	12	1.33		1.50	0.10		0.15	0.42	11.72	0.53	0.21	0.50
		Ermenek	2	9	7	5	3	7	3	3	4		43	4.78	2.00	5.80	4.20	6.10	0.16	1.51	36.90	1.05	2.41	
		Kazancı	1	3	3	2	2	3	3	4	5	1	27	3	1.00	2.80	0.80	0.10	0.10	0.44	0.43	1.70	2.21	0.10
		Göktepe	2	4	1	4		1	2		2	1	17	1.89	0.82	6.50	1.00	1.90		0.03	1.30		0.70	0.23
	KONYA	Hadim		2		1		2		1			5	0.56		4.10		1.00		1.20		0.30		
		Konya	1	4		2	5	1	5	4	1	1	24	2.67	2.20	0.90		2.00	0.97	3.00	18.05	0.45	0.50	2.50
		Bozkır	1	1			4			1			6	0.67	1.00	16.00			9.00			0.30		
		Bademli	1	2	1	1	1	1	1		1		9	1	0.05	4.20	0.10	0.01	1.00	0.30	0.70		0.03	
		Aksaray		1	1	2	2		7	1		1	15	1.67		2.00	0.80	1.20	1.00		24.70	0.50		2.00
		K.Hanı	1							1	2	1	1	0.11	0.50							5.00	1.00	0.05
		K. Karabekir							1												8.00			
		Güneysınır							1	3											0.10	14.00		
		A.Çiğil		3			1	2	1			1	8	0.89		13.00			0.01	1.53	0.05			0.05
		Doğanhisar	1	3	1	1	2		2		1	1	12	1.33	0.30	2.00	0.10	0.20	4.00		2.06		3.38	1.80
		Ilgın		4		1	1		1	3	2	3	15	1.67		7.50		0.50	1.00		0.10	1.52	0.80	2.51
		Akşehir		2		1	3	1	3	1	2	4	17	1.89		0.50		0.50	0.07	3.00	0.25	0.01	1.50	4.66
		Karaman		5	1					3	4	2	6	0.67		33.20	3.00					3.20	2.75	1.00
		B.Kışla		3	2	1	1			3	3		7	0.78		10.00	0.80	0.30	0.30			2.90	1.55	
		Ereğli	1					1	1	3		3	3	0.33	5.00					0.20	6.00	2.70		2.89
KÜTAHYA	EMET	Tetik	1						2		5	2	3	0.33	0.05						0.81		0.12	0.02
		Değirmisaz	2	3	6		5		4	4	3		27	3	0.50	10.10	107.00		1.00		301.10	1.12	0.09	
		Hisarcık	1	2	1	2			3	3	1	2	15	1.67	0.04	0.30	0.10	0.10			0.32	110.02	0.10	0.10
		Örencik		3	1	3	2			1	1	2	9	1		0.30	1.00	0.10	110.00			0.01	4.50	0.02
		Ç.Hisar	1	1					2	1	1		4	0.44	0.05	0.50					0.60	0.03	0.03	
		Eğrigözdağı	2	4	1		1	1	2	2		1	14	1.56	0.57	0.30	0.10		0.01	3.30	0.02	0.12		0.50
		Emet	1	3	1	1	1			4	1	2	7	0.78	0.50	0.30	0.10	0.80	0.50			0.21	0.05	0.06
	DOMANİÇ	Domaniç	2		1	1	2						6	0.67	1.02		1.10	0.10	80.00					
		Gürgenyayla	1	2		1	2	1	1	2			10	1.11	4.00	1.00		0.10	0.07	0.01	0.02	0.03		
		Alagöz		2		2	3	4		2	1	3	11	1.22		0.70		0.10	0.30	0.05		0.07	0.01	0.33
		D.Çarşamba							2				2	0.22							0.06			
	TAVŞANLI	Alabarda	1	6	2	1	2	3	5	4	5	4	33	3.67	0.10	14.40	21.00	0.10	2.00	1.04	1.84	32.50	1.51	0.09
		Tunçbilek	4	6	1	3	2	3	4	2		1	26	2.89	0.34	1.00	0.50	0.20	1.00	2.13	9.23	0.52		0.01
		Tavşanlı	5			2			4	2	2	11	11	1.22	0.29			1.30			231.60	0.10	0.06	6.19
		Balıköy	2	3		3	2		3			1	14	1.56	1.70	1.60		3.80	0.08		1.50			0.08
		Yaylacık	8	2	1	3	2	1		4	2	3	17	1.89	5.12	1.50	0.10	1.60	0.12	0.30		36.40	0.25	0.62

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1999	2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
KÜTAHYA	GEDİZ	Çukurören	2	2	1			1		2	1	1	6	0.67	0.51	0.1	0.1			0.02		0.07	0.01	0.04
		Şaphane	4	8	2	4	2	3	1	5	1	4	34	3.78	0.53	21.70	0.10	0.60	0.43	0.30	0.01	6.14	0.02	1.58
		Gediz	1	4	3	1			1	2		1	13	1.44	1.00	0.10	35.10	0.01			1.00	8.01		0.50
		Muratdağı	4	3		2			2		2	1	11	1.22	1.08	0.10		0.10			0.12		0.12	0.05
		Karadonа	5	7	2	3	6	1	4	2		1	31	3.44	2.13	0.50	0.10	6.00	0.30	0.01	0.65	0.17		0.05
		Çayçinge	3	6	1	1	3	3		7	3		17	1.89	0.28	1.80	0.10	0.10	1.55	0.04		0.60	0.55	
	KÜTAHYA	Aslanapa		2		2	1		2	1	1	2	11	1.22		1.00		0.10	0.01		1.02	0.20	0.10	0.14
		Sabuncupınar	2	4		1	1				2	3	8	0.89	0.50	4.10		0.10	0.05				2.01	7.02
		Altıntaş		6		4	2		1	1	2	1	17	1.89		1.10		0.10	0.50		0.50	1.50	1.50	1.00
		Dumlupınar	1	2	3	3	1						10	1.11	0.10	0.10	0.10	0.50	0.01					
		Çöğürler	2	8		1	3		1	3	1	2	21	2.33	0.02	1.40		0.30	4.30		0.01	1.32	0.01	1.01
		Kütahya	1	11	1	3	1	1		1	3	4	18	2	0.01	1.70	0.10	6.80	1.00	0.02		2.00	1.65	5.15
		Ören	2	5	1	3	1	2			2		14	1.56	0.42	4.20	0.20	0.70	0.02	0.53			0.60	
	SİMAV	Simav	6	9	3	3	4	1	1	5	4		36	4	0.72	5.30	0.90	1.30	1.70	0.20	5.00	0.52	1.10	
		Kiçir	4		1				1		1	1	6	0.67	24.17		0.10				19.00		0.40	0.10
		Aksaz	3	6	1		3			1	1	1	13	1.44	0.18	2.20	0.10		0.07			1.00	0.30	0.80
		Kınık	3			1					1		4	0.44	1.15			0.10					0.04	
		Naşa	1	1		1				1			3	0.33	0.01	0.10		0.50				0.01		
		Alasöğüt	1	2									3	0.33	0.01	0.50								
		Korucuk		3		1	1						5	0.56		4.90		0.20	0.90					
		Söğüt		3	3	3	1	1		1	1	1	11	1.22		1.70	0.40	0.70	0.20	0.01		380.00	0.10	0.02
MERSİN	SİLİFKE	Silifke	2	3	5	10	3	8	6	9	3	4	53	5.89	1.50	2.20	0.30	2.10	0.50	1.80	7.40	4.58	0.82	0.84
		Uzuncaburç	2	2	3		2	1	1	7	4	1	23	2.56	2.50	0.20	8.00		0.31	0.05	5.00	2.76	0.74	0.50
		Gökbelen	1	1				2	2	3	1	3	6	0.67	0.60	6.00				0.80	0.90	0.97	1.20	1.50
		YeşilOvacık	2	2	2	4	2			1	1	1	12	1.33	1.10	0.10	9.10	2.80	3.10			3.00	0.01	0.80
		D.Dere	3	1	3	2	6	1	1	5		2	24	2.67	5.40	1.00	1.50	1.40	0.85	0.03	0.20	2.65		0.40
	ANAMUR	Anamur	2		2	4	4	1	2	3	4	6	28	3.11	1.05		300.50	0.60	0.24	0.10	0.55	0.03	0.93	11.60
		Sarıyayla	1		1					1	1	1	2	0.22	0.80		0.50					3.50	0.30	1.50
		Abanoz								1			0	0								0.01		
		Gökçesu	4	1	1		2	3		1	2	1	11	1.22	0.12	0.10	12.00		0.53	0.83		0.01	0.51	0.30
		Güngören				2				3	5		2	0.22				1.00				41.70	0.27	
		Çaltıbükü		1	1			1		3		1	3	0.33		0.50	0.10		0.25	0.03		1.51		0.10
	TARSUS	Çamalan	1	5	5	4	2	5	5	4	3	4	38	4.22	2.00	1.30	1.00	1.90		0.90	1.01	7.45	0.50	37.55
		Buladan		2					2		2		4	0.44		5.00					1.00		1.32	
		Tarsus	4	2	1			1	1	5	5	2	21	2.33	2.80	3.70	2.00			0.10	1.00	2.05	3.01	0.315
		Gülek	5		1	1			1	2	2	1	8	0.89	1.20		0.10	0.90			0.01	0.25	0.11	0.002
		Ç.Yayla		1		1	1	1	3		2	1	10	1.11		0.20		0.20	0.10	0.20	1.80		0.02	0.10
		Cehenemdere					1		1			1	2	0.22					1.00		0.20			1.00
		Karabucak	1						1	3	1	1	2	0.22	1.00						0.50	0.60	0.30	0.30

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
MERSİN	GÜLNAR	Aydıncık	4	2	3	3	4	3	1	4	7	2	37.20	45.20	0.20	0.50	6.50	0.31	0.01	2.55	0.52	11.55
		Zeyne	2	5	2	1	2				1		0.80	9.70	0.10	0.10	0.30				4.00	
		Kuskan	2	3		3	1	1		1	2	1	0.40	3.80		1.10	0.01	0.10		0.20	10.40	5.00
		Büyükeceli	3	1	1	3	8		1	6	2		0.19	0.20	0.10	1.10	0.98		0.02	5.85	5037.05	
		Gülnar	3	6	5	4	2	1	1	7	3	1	0.61	0.80	4.00	1.70	0.55	0.02	0.15	1.16	0.17	0.01
		Pembecik	1	3	2	2	3	1		5	1		0.50	0.20	80.80	91.50	1.12	0.01		914.30	0.02	
	MERSİN	Mersin	1	1	2		1	1	1	7	3	5	0.05	0.10	0.10		0.04	2.50	0.70	0.53	0.26	0.73
		Davultepe	1	1	1	1				4	5	3	1.00	0.10	1.00	0.30				2.95	0.72	1.12
		F.Pınarı		1					1	3	4	1		0.10					0.10	4.02	0.09	0.50
		Aslanköy									1	2									0.01	1.00
		Gözne	2	1					2	3	1	3	1.05	0.10					1.05	0.56	0.01	0.12
	MUT	Karacaoğlan			1					2	2				0.10					0.60	0.30	
		Alahan	2	3	1	1	1			1	1	2	15.30	0.80	0.10	2.50	1.20			0.03	0.50	0.20
		Kıravga	4	2		1			2				5.40	1.20		1.50			0.02			
		Dağpazarı		1		1				1	2			2.50		0.10				0.10	0.20	
		Mut	1		1					2		1	4.00		0.20					0.21		0.028
		Çamlıca	1	1	1				1	1	3	1	0.20	0.30	5.50				0.10	1.00	0.30	0.10
	ERDEMLİ	Tömük	1	3	4		5	3	1		3		0.03	1.30	0.70		1.35	0.90	0.20		0.02	
		Toros							1										0.05			
		Alata	6	4	1	1	3	4	1	5		3	1.14	1.10	0.30	0.10	0.70	0.66	0.03	1.53		1.40
		Erdemli	6	2		1	1				4	1	1.93	1.60		0.20	0.10				1.20	0.02
		Güzeloluk	1					1	1	1	1		0.20					0.10	0.20	1.00	0.50	
	BOZYAZI	Tekmen	1	1	2		1	1	3	6	3	1	0.10		2.60		0.20	0.40	0.90	1.46	12.31	0.20
		Toldağ	2		2		1		2	2	2		2.50	0.10	3.10		0.20		6.02	0.02	0.03	
		Kozağacı		1				2	4	4	1			0.10				0.60	0.20	1.82	0.05	
		Bozyazı	5	4	5	4	2	6	1	13	5	3	4.10	1.00	5.50	0.30	3.60	2.94	0.02	41.74	0.99	1.15
MUĞLA	AYDIN	Söke	6	8	3	4	8	2	2		1	1	83.00	17.60	2.50	63.10	4.80	1.20	1.60		0.10	4.00
		Akçaova	4	3	4	2		2	3	1	6	3	1.30	60.20	1.70	1.70	0.30	0.60	0.40	0.10	0.60	49.20
		Kuşadası	5	3	5	6	2	7	5		2	2	7.20	1.40	2.30	13.80	2.30	27.40	514.60		0.20	6.10
		K.M.park							2										0.20			
		Çine	1	5	5	9	3	5	4	10	6	3	0.50	0.30	3.80	1.60	1.40	2.40	1.30	4.35	0.60	2.20
		Koçarlı	1	7	4	3	5		2	4	1	1	0.10	1.80	3.30	2.50	3.20		0.60	4.60	1.00	1.00
		Karpuzlu		4	3	2	1	4		3	3	1		1.10	3.10	7.00	1.00	7.40		0.50	2.40	0.50
		Aydın	7	3	2	6	4	1	4	10	6	5	4.40	0.60	0.40	20.10	0.50	0.10	4.40	92.41	5.00	6.40
		Germencik	1	2	4	2	2	2	1	1	1		0.20	0.30	1.70	40.50	2.80	1.60	30.00	2.00	1.00	
	KEMER	Kemer	8	4	6	12	6	6	8	24	11	10	4.60	3.00	2.50	10.20	2.30	0.90	4.00	446.23	177.90	10.70
		Seki			1	1		2	2	3	4	2			0.20	2.00		0.50	0.90	1.90	0.50	0.20
		Akçay	9	4		5	2	5	8	7	6	12	10.00	5.40		7.20	0.20	3.90	1.90	1.48	2.60	31.50
		Y.Tepe	4	2	1	2	1	4	7	4	10	4	45.00	0.30	0.50	0.40	5.00	0.80	2.60	0.60	1.10	0.40
	MUĞLA	Yerkesik	4	4	1	3	3	9	6	8	10	3	1.50	17.70	5.00	0.40	2.20	1.62	1.00	22.90	5.20	1.30
		Muğla	2	1		3		4	5	13	2	5	1.20	0.50		9.20		1.40	0.70	5.12	11.10	0.50
		Yaraş	1	2	1	3		1		1	2		0.10	0.20	0.10	2.60		0.10		0.10	0.20	
		Gökova	4	3	2	2	2	3	6	2	4	5	15.60	14.30	0.80	2.10	0.20	1.60	1.20	0.20	0.70	0.70
		Denizova	1		3	3							1.00		6.20	0.90						
		Yeşilyurt	2	6	3		2	1	1	4	1	2	0.40	2.00	1.10		19.10	0.30	0.10	0.60	0.10	0.20
		Üla	2		1	1	1		3	2	2	2	2.10		1.00	0.20	0.10		0.70	0.60	0.20	0.70
		Karabörtlen	2		1		8			2	2	2	0.40		0.50		2.50			0.40	0.20	0.60

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1999	2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
MUĞLA	NAZİLLİ	Nazilli	8	5	2	4	3	5	4	6	8	2	47	5.222222222	1.10	43.50	0.80	9.50	2.20	0.90	91.20	13.20	15.90	1.20
		Karacasu	8	5	3	10	6	5	4	6	3	5	55	6.111111111	3.10	1.40	2.90	49.70	2.10	0.90	1.00	25.78	0.40	34.40
		Yenipazar				2	4	2	3	1	4	3	19	2.111111111				2.70	2.60	3.00	2.50	2.00	2.00	1.70
		Sarıcaova	2	1	1	2	3		3	3	2	2	19	2.111111111	4.10	0.30	2.00	0.40	3.60		0.80	0.40	0.20	2.20
		Bozdoğan	7	10	3	11	9	6	9	9	11	5	80	8.888888889	10.50	3.00	0.30	49.60	16.00	9.40	1.30	77.80	6.80	6.30
		Kemerbaraji		7	3	3	7	2	5	8	3	5	43	4.777777778		1.40	0.50	0.90	0.90	0.50	3.30	10.70	3.60	4.50
		Kuyucak	13	5		4	2	5	6	6	1	2	44	4.888888889	47.20	4.40		0.70	0.30	2.80	10.40	1.00	0.10	1.30
		K.Dağ	1	1		3			2	2	2		7	0.777777778	1.50	2.00		10.40			0.20	2.10	0.20	
		Yenice	5	3	1	1	2	1	1	1	1	6	22	2.444444444	2.60	0.30	0.30	2.00	0.30	0.10	0.10	0.10	0.10	6.80
	FETHİYE	Fethiye	2	4	3	9	5	9	6	4	6	7	55	6.111111111	0.20	0.80	3.70	6.80	1.10	2.10	1.60	6.60	2.90	1.40
		Güneydağ	5	2	2	7		3	3	11	8	3	44	4.888888889	1.30	1.10	0.30	2.40		0.40	0.30	8.61	2.60	0.30
		Üzümlü	4	3	1	5	4	5	4	6	6		38	4.222222222	2.20	0.60	1.00	1.40	29.80	80.70	2.50	0.73	0.80	
		Akçay		1									1	0.111111111		1.00								
		Eşen	7	9	8	9	3	7	10	9	7	4	73	8.111111111	1.40	2.60	2.20	2.90	1.20	2.70	9.30	3.20	1.30	1.10
		Göcek	7		1	2	1	6	7	8	7	7	46	5.111111111	1.10		6.00	4.10	0.10	15.70	2.60	3.60	1.00	0.70
	KÖYCEĞİZ	Sultaniye	3		3		2		3	1	4	1	11	1.222222222	1.90		1.70		0.20		0.30	0.10	1.30	0.10
		Köyceğiz	1	2	2	1	3		10	7	3	1	30	3.333333333	0.10	0.30	0.20	1.00	1.30		1.80	2.80	0.50	0.20
		Beyobası	6	2	2	8	1	3	13	9	3	6	53	5.888888889	4.30	0.40	0.30	61.00	0.50	1.40	2.70	2.90	0.30	1.40
		Karaçam	27	9	6	17	10	34	18	11	4	7	143	15.88888889	76.10	3.00	1.20	13.00	5.10	8.90	3.40	2.50	1.40	17.00
		Ağla		1			2		2	7	1	6	5	0.555555556		0.10			0.20		0.30	1.90	0.10	0.80
		Akköprü	2	3	6	1	2	1	7	2	3	1	28	3.111111111	94.00	5.10	1.70	6.00	16.10	0.20	0.70	0.20	0.40	0.80
	MARMARİS	Marmaris	4	1	1	4	6	8	5	10	11	4	54	6	2.30	0.10	0.50	5.20	9.40	2.80	0.60	2.80	6.60	0.40
		Datça	2	2	2		3	6	5	3	5	5	33	3.666666667	5.00	1.60	1.10		27.10	26.50	50.50	1.20	8.30	2.80
		Çetibeli	1	2	2	2		2	3	4	5	2	23	2.555555556	0.50	0.20	1776.5	1.10		1.10	0.40	1.30	45.40	0.20
		Hisarönü	8	3	3	2	2	3	3	9	3	1	37	4.111111111	4.00	157.0	12.20	329.0	0.30	1.60	0.30	73.51	0.30	0.10
		Bayır	1	2	2	1	1	2	3	5	5	3	25	2.777777778	25.00	0.60	0.20	1.00	0.10	0.20	0.30	0.42	0.50	0.40
	DALAMAN	Bahtiyar	5		1	1	3		5	5	4	3	27	3	1.40		0.50	0.30	2.70		1.40	35.60	0.60	0.30
		Dalaman	7	1	4	1	1		4	4	3	9	34	3.777777778	1.50	0.10	2.90	3.00	0.10		0.50	3.40	1.60	5.10
		Ortaca	3		2	1	1	3	7	5	7	7	36	4	19.30		0.40	0.30	0.50	0.50	6.20	0.50	0.80	1.60
		Çaldere	2	4	8	1	1	2	1	5	4	6	34	3.777777778	2.90	2.50	2.20	95.00	0.10	1.10	0.10	0.60	0.40	0.70
	YILANLI	Şenyayla	1	1	2		1	3		2	2	2	8	0.888888889	0.20	51.00	0.20		0.20	0.60		0.20	0.30	0.20
		Yılanlı	6	2				1	1	7	2	3	10	1.111111111	2.20	1.20				450.00	0.10	0.70	276.00	0.30
		Çakmak	1		1	2	1	2	1		4	2	14	1.555555556	0.50		0.10	2.00	0.20	2.00	0.20		0.40	0.60
		Namnam	2	1	1		3	1	3	3	4	3	21	2.333333333	2.10	1.00	0.30		1.40	2.50	0.30	1.40	2.80	0.70
		Göktepe	2	1	2	1		2	1	4	3		16	1.777777778	0.60	0.10	0.20	0.50		3.20	0.10	6.40	0.80	
		Muratlar	4	2		2	2			1	1	2	10	1.111111111	1.40	1.60		2.00	3.00			0.10	0.10	0.20
		Boyalı	2	5		1		3	1	6	1	1	20	2.222222222	0.20	3.00		0.20		0.70	1.50	3.10	0.50	0.10
	YATAĞAN	Yatağan	4	5	5	9	9	5	4	11	9	5	66	7.333333333	45.60	1.00	0.80	22.80	8.30	0.70	0.70	2.50	1.00	3.80
		Turgut	15	7	3	2	2	5	10	13	8	7	72	8	5.60	46.40	0.70	9.10	1.10	2.00	1.20	3.80	0.80	10.70
		Bağyaka	6	10	3	7	8	1	9	17	7	3	71	7.888888889	4.00	2.20	1.40	1.20	3.00	0.10	4.80	10.72	2.40	0.80
		Menteşeçayı	2		3	2	1	2		7	8	5	30	3.333333333	1.10		0.50	0.50	0.30	0.30	0.70	5.93	1.20	1.00

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	adet	ort	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
MUĞLA	KAVAKLIDERE	Kavaklıdere	1	5			5	2	3	9	2	5	32	3.56	0.10	1.80			25.50	0.80	2.20	2.00	0.80	3.30
		Bellibol	3				1	2	1	2	1	2	7	0.78	7.20				0.10	0.30	0.10	0.20	0.10	0.20
		Menteşe	2	2			1	4	1	2	2		14	1.56	10.10	0.40			0.10	1.30	1.00	0.20	0.20	
		Gökçay	4	1			5	1	3	5	5	3	27	3	1.10	0.10			0.70	0.30	3.00	3.80	4.90	1.90
	MİLAS	Karacahisar	13	6	10	2	5	3	8	7	3	3	60	6.67	81.00	1.90	22.10	3.00	5.20	2.70	2604.00	0.91	2.40	1.60
		Mumcular	12	9	10	8	3	10	2	9	25	5	93	10.3	13.80	23.60	32.80	61.00	4.60	17.20	0.30	3.22	27.90	1.40
		Sarıçay	13	7	6	5	4	9	6	11	8	7	76	8.44	21.00	6.30	3.10	18.50	0.60	1.90	2.00	18.13	2.00	1.30
		Milas	7	7	7	3	7	3	5	8	11	4	62	6.89	34.00	13.90	2.60	10.10	3.20	0.80	4.50	224.97	2.40	1.80
		Ören	6	2	4	3	9	5	10	8	10	3	60	6.67	182.0	1.20	126.90	0.60	5.70	2.00	1.40	8.51	11.50	2.20
		Bodrum	2	2	3	5	3	2	3	3	5	3	31	3.44	305.5	1.50	4.50	201.50	18.10	1.60	6.50	308.60	3.90	16.60
		Kayadere	3	2	6	4	10	4	11	6	6		52	5.78	0.90	2.30	9.60	1.40	2.90	2.70	13.50	1.00	1.70	
		Selimiye	13	3	8	8	5	7	11	13	7	8	83	9.22	237.0	0.50	8.50	8.00	2.40	235.50	5.00	5.21	3.80	1.00
SİNOP	BOYABAT	Elekçamı		2	1			1	1	1			6	0.67		3.10	1.00			0.01	1.50	0.70		
		Kabaçam	1	3	1		1	4	2	1		1	14	1.56	0.01	7.00	1.00		0.50	1.61		0.50		0.01
		Karageriş	2	1	1	1		2		3	2		7	0.78	27.00	30.00	2.00	0.50	0.20	1.01	2.50	3.02	49.00	
		Bürnük	1	3	1	1	1		1		1		9	1	0.10	3.00	1.00	3.00	0.07		0.10		1.00	
		Karaçam								1												1.00		
		Boyabat	2	2	1	2	1	4	1	1	3	2	19	2.11	25.50	5.60	0.50	1.30	1.20	3.55	1.50	0.05	0.15	1.05
		Saraydüzü	2	1			2					2	5	0.56	11.00	0.50			0.20					18.06
		Aksu	1	2		1	1						5	0.56	0.50	10.00		0.50						
	DURAĞAN	Adadağı	1	4	1	4		2	2	3			17	1.89	8.00	2.70	0.20	3.60		0.20	2.10	0.52		
		Altınkaya							2	2											5.00	1.12		
		Durağan		1	1			2	3	4	1	3	15	1.67		0.30	0.10			1.10	3.50	43.71	0.15	0.036
		Aydoğan	1	2		2		1		1	1		6	0.67	2.00	0.60		1.60		1.00		1.00	0.50	
	AYANCIK	Kumluk		1					1				2	0.22		5.00					1.50			
		Kepez											0	0										
		Akgöl											0	0										
		Kömürgölü				3		1		4			4	0.44				1.60		1.00		4.50		
		Yenice						1					1	0.11						4.00				
		Ayancık	1	1	1								3	0.33	0.60	1.50	1.00							
	SİNOP	Gerze	4	1		1		2		3			8	0.89	15.60	11.00		0.50		3.00		3.00		
		Dikmen	2	2	2	1	1	4		1		1	12	1.33	44.00	2.00	5.00	5.00	2.50	15.50		0.30		2.00
		Erfelek	1	7		1		1	4	1	1		16	1.78	0.50	72.00		2.00		1.00	3.80	0.30	0.50	
		Sinop	5	1		2	2			4	2		10	1.11	7.16	0.30		0.60	0.53			2.50	2.50	
		Suludüz	3	1				1	1	4			6	0.67	3.00	1.00				2.00	0.50	3.70		
		B.Ağa	1	1	2	2	5		2	1			14	1.56	0.50	1.00	1.20	0.20	5.40		0.80	0.50		
		A.Yeri	4	2	1				1	1		1	8	0.89	10.31	3.00	2.00				2.00	1.50		0.08
	TÜRKELİ	Türkeli				2			1	2			3	0.33				3.00			0.20	5.00		
		Çatak		1									1	0.11		10.00								
		Kazköy								1												1.00		
		Gökçealan			1	1			1	1			3	0.33			45.00	2.00			4.00	0.70		
TRABZON	TRABZON	Vakfıkebir					1						1	0.11					5.00					
	PAZAR	Fındıklı	2	2	2	2	3	2		1	6	1	13	1.44	39.50	1.70	8.30	5.50	7.86	3.28		0.88	126.65	0.70
		Ardeşen	1			1	2	2			5	2	6	0.67	4.00			20.00	11.00	7.59			23.00	8.00
		Ç.Hemşin	1					1	1		1	1	3	0.33	3.50					0.20	0.10		2.00	2.00
		Hemşin		1									1	0.11		3.00								
		Pazar	1								1		1	0.11	10.00									
	SÜRMENE	Sürmene	3	3	6	3	1	1	1	3	4	3	28	3.11	69.50	43.00	24.00	26.00	29.00	15.00	8.00	7.00	27.00	31.01
		Of	1	2	1	7	1				2		12	1.33	23.00	6.50	3.00	27.80	7.50				62.00	
		Araklı		2	4	1		2					9	1		16.50	8.70	10.00		28.50				
		Sarıçam			4								4	0.44			10.80							
		Arsin	3	1	1	2		1			4		8	0.89	16.00	17.00	1.00	5.50		2.00			61.50	
	MAÇKA	Yeşiltepe	1								1		1	0.11	15.00								2.00	

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	adet	ort	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
TRABZON	RİZE	Güneysu											0	0										
		Rize	1			1						2	2	0.222	25.00			3.00						4.01
		Çayeli				1					1		1	0.111				1.00					2.00	
		İkizdere						1			1		1	0.111						1.00			2.50	
		Dereköy	1			1							2	0.222	0.20			10.0						
	TORUL	Gümüşhane	2	1		1							4	0.444	1.30	4.00		5.00						
		Kelkit											0	0										
		Şiran	1										1	0.111	0.90									
		Bayburt							1	1			1	0.111							2.00	7.00		
		Kürtün	1										1	0.111	4.00									
		Zigana	1										1	0.111	1.00									
		Torul											0	0										
ZONGULDAK	KARABÜK	Soğanlıçay	3	3	1	6	3	2	6	3	2		29	3.222	0.11	0.60	0.10	591.0	6.70	0.05	11.10	92.90	0.80	
		Karatepe	6	2	6	5		2	9	7	6	2	45	5	2.66	38.50	0.80	12.30		5.01	6.16	8.61	2.20	1.03
		Sipahidağı	6	9		13	8	3	9	7	2	3	60	6.667	2.98	7.30		103.1	4.14	0.38	6.06	125.27	0.05	0.022
		Dikmen	3	3		3	3	6	8	6	3	2	37	4.111	2.10	1.60		0.30	0.13	3.28	0.48	0.31	2.11	0.03
		Karabük	5	8	1	4	1	2	7	4	4		36	4	0.31	3.40	0.30	21.00	4.00	0.03	2.76	0.09	0.14	
		Başköy											0	0										
		Kışlapazarı							1												0.30			
		Eğriova		2		1			1	1	1		4	0.444		0.10		0.10			0.01	0.01	0.01	
		İndere		2		4		1	1	2	1		11	1.222		1.20		3.60		0.50	0.10	0.55	0.50	
		Kışla		6	1			3		3	1	1	10	1.111		4.60	0.10			8.21		6.01	0.10	0.015
		Ovacık	5	3	1	4	5	4	4	4	6	2	38	4.222	1.26	1.70	2.00	3.60	5.50	4.02	0.71	6.90	1.35	1.01
		Safranbolu	1	3	1			2	2	3			12	1.333	0.01	1.80	0.20			3.00	4.00	2.02		
		Eflani	5	8	2	6			2	1	1		25	2.778	2.16	1.70	1.40	10.90			0.40	0.40	0.50	
		Keltepe	4	5	1	5	6	2	6	1	2		32	3.556	0.11	0.50	0.60	1.50	1.15	0.04	0.72	0.02	1.20	
	DİRGİNE	Kozdere		1		2						1	3	0.333		0.50		1.20						0.03
		Aksu		1				1		1	1		2	0.222		1.80				0.70		1.00	0.10	
		Kurdeşe							2	2	2										2.60	1.52	2.20	
		Gölcük		1		2							3	0.333		1.00		0.20						
		Dirgine	1		1	1					2		3	0.333	0.10		0.10	0.50					2.01	
		Çaldere				1	1						2	0.222				0.50	0.20					
		Karadere				2							2	0.222				0.20						

REGION	ENTERPRISE NAME	CHIEFTAINSHIPS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	adet	ort	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
ZONGULDAK	BARTIN	Amasra		4		2	2	2		2	1	2	10	1.1111		3.30		2.60	0.11	4.40		5.20	0.03	0.938
		Bartın	1	1		6	2	2	3	1	2	1	19	2.1111	1.50	4.90		0.60	0.34	2.26	0.61	0.20	1.03	0.04
		Dumanlı		1		1	1						3	0.3333		2.00		0.03	0.50					
		Günye		1	5	3	1	1	2	1	2		16	1.7778		1.00	9.20	4.10	0.30	0.20	1.20	0.40	2.60	
		Kozcağız		3		2					1		5	0.5556		3.00		0.90					0.50	
		Sökü						1			1		1	0.1111						0.20			2.00	
		Arıt	1	1	3	3	2		5		1		16	1.7778	0.20	0.30	2.90	0.30	0.62		6.83		0.60	
		Kurucaşile		1	1	2		2	1		1	2	10	1.1111		0.30	0.40	0.80		2.14	0.60		0.03	0.89
		Hasankadı				1		1					2	0.2222				0.30		4.00				
		Kumluca						2		1	1		2	0.2222						3.03		1.50	0.17	
		Yenihan							4	6		1	4	0.4444							0.70	1.50		0.05
	ULUS	Abdipaşa		1		7	1		3	4	4	1	21	2.3333		1.00		5.70	0.10		2.15	0.81	0.87	0.10
		Durabaş		1									1	0.1111		2.00								
		Karakışla		1		2	1		2		1		7	0.7778		0.10		6.00	0.72		7.00		0.30	
		Ulusçayı		4	3	2	1	2	5		1	1	19	2.1111		0.30	1.60	0.30	0.01	2.00	1.38		0.20	0.01
		Ovacuma	1			3			1				5	0.5556	0.03			0.10			2.50			
		Drahna				1	1		1		1		3	0.3333				2.00	0.02		0.05		0.30	
		Uluyayla	1	1		3	1					1	6	0.6667	1.00	1.00		11.00	2.00					0.20
	ZONGULDAK	Zonguldak	3	7	4	7	5	4	5	6	6	3	50	5.5556	2.11	2.90	7.10	2.00	4.70	1.05	2.36	1.41	2.14	2.70
		Yayla	1	3	5	10		5	6	8	4	1	43	4.7778	38.00	2.30	15.60	12.70		2.77	8.51	3.98	0.30	0.80
		Kozlu				1						1	1	0.1111				0.20						4.70
		Çaycuma		1	4	1	1	3	4		6		20	2.2222		1.70	5.40	0.10	0.30	10.51	6.05		5.79	
	DEVREK	Ören		1	1								2	0.2222		0.20	0.50							
		Akçasu	2	2	1	1			1				7	0.7778	2.20	3.00	2.80	8.00	0.10		6.00			
		Babadağ	1	2		3			2	1	3		8	0.8889	0.10	1.20		1.50			0.90	0.01	0.40	
		Beklibi	1										1	0.1111	1.50									
		Durukan		1									1	0.1111		1.00								
		Sargıöl			1	1				1			2	0.2222			0.50	0.50				3.10		
		Tefen	1	1		1	1	1		1			5	0.5556	0.40	2.50		0.30	0.70	0.30		0.30		
		B.Dere	1								1		1	0.1111	0.50								0.03	
	YENİCE	Balıksık		1	1	1	1	2	3	2	1		12	1.3333		3.00	0.30	1.00	0.10	1.00	3.70	0.65	0.03	
		İncedere		1									1	0.1111		2.00								
		Şimşirdere		1							1		1	0.1111		3.00							0.02	
		Yaylacık							1	1											0.50	0.01		
		Çamlıyanı							2												0.11			
		Karayaka							3	1	3	1									2.50	66.20	0.08	0.30
		Göktepe	2						2	2	2		4	0.4444	20.10						0.02	0.06	0.10	
		Bakraz	1							1			1	0.1111	5.00							0.01		
		Çitdere						1		1	1		1	0.1111						1.00		0.01	0.20	
		Kızılkaya						1					1	0.1111						0.20				
		Yenice			1	2				2	1		3	0.3333				3.00	0.10			1.83	0.05	
		Sarıot								1	1											0.05	0.05	
		Kavaklı									1												0.01	
		Kayadibi	1	1	2	1			2		1		8	0.8889	7.00	1.00	1.50	0.10			2.20		0.60	
	KRZ EREĞLİ	Ereğli	4	9	9	7	3		4	6	2	3	47	5.2222	2.94	6.40	8.00	9.00	0.90		0.52	2.14	5.30	0.63
		Cuma	1	3	1	3	1	2	7	7	9	1	35	3.8889	1.00	5.20	1.00	3.40	0.50	0.37	5.60	1.66	3.12	0.01
		Çaylıoğlu							1	3	2										0.20	1.45	1.71	
		Alaplı				4	4	2	6	3	13		32	3.5556				5.10	1.30	0.65	2.02	0.27	7.18	
		Bendere				1			1		1		2	0.2222				0.50			0.10		0.10	
		Kocaman				1				1			1	0.1111				6.60				2.50		
		Suludere			1	1		1	1		1		5	0.5556			0.40	0.20		1.50	0.50		7.30	

Source: www.ogm.gov.tr/statistics

Appendix 6: Technical Specifications of Aerial Vehicles

	Speed (km/h)	Flight Time (hour)	Landing Distance (meter)	Take of Time (min)	Water Capacity (liter)
Cesna Discovery Plane	200	3	150	7	-
Dromader Water Bomber	250	3-3.5	150	7	1.500
CL-215 Water Bomber	250	3-3.5	200	7	5.000
M17&K32 Kamow Helicopter	250	3-3.5	-	7	2.500

Appendix 7: Excel Macro Model

```
Sub mert()
'
' mert Macro
'
' Keyboard Shortcut: Ctrl+q
'
s = 168 ' number of supply points
d = 168 'number of demand points
For i = 1 To s
   lon1 = Worksheets("sheet1").Cells(i + 1, 2)
   lat1 = Worksheets("sheet1").Cells(i + 1, 3)
   'MsgBox (lon1 * 1000000 + lat1)
   For j = 1 To s
      lon2 = Worksheets("sheet1").Cells(j + 1, 2)
      lat2 = Worksheets("sheet1").Cells(j + 1, 3)
      c = Round(dist(lat1, lon1, lat2, lon2))
      yaz = 1
      If lat1 = 0 Or lat2 = 0 Or lon1 = 0 Or lon2 = 0 Then yaz = 0
      If yaz = 1 Then Worksheets("sheet2").Cells(i + 1, j + 1) = c
      'MsgBox (lon2 * 1000000 + lat2)
   Next
   'End
Next
End Sub
Function dist(dlat1, dlon1, dlat2, dlon2)
   Pi = Application.Pi()
```

```
    earthradius = 3443.89849  'nautical miles

    nm2km = 1.852

    lat1 = dlat1 * Pi / 180

    lat2 = dlat2 * Pi / 180

    lon1 = dlon1 * Pi / 180

    lon2 = dlon2 * Pi / 180

    cosX = Sin(lat1) * Sin(lat2) + Cos(lat1) * Cos(lat2) * Cos(lon1 - lon2)

    If (dlat1 = dlat2 And dlon1 = dlon2) Then dist = 0 Else dist = earthradius *
Application.Acos(cosX) * nm2km

End Function
```

Appendix 8: dmatrix