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**SURVEY FOR THE STRATEGIC AND OPERATIONAL PREPAREDNESS  
AND TACTICS OF FIRE AGENCIES IN A SMALL GREEK ISLAND**

**Abstract:**

Forest fires consist one of the greatest hazards for the viability and sustainable development of forests with implications both on natural and cultural environment, affecting the economy and the quality of life of local population.

The outbreaks of forest fires could stem from either natural (thunders) or anthropogenic causes

(carelessness, accidents, arsons). The latter usually compose the greatest percentage of ignition of forest fires especially at the Mediterranean regions.

Primary aim of the paper is the exploration of strategic and operational preparedness and tactics of fire agencies in a small Greek island. Case study is the island of Thasos, which is located in the north of Greece. The prevention and effective confrontation of natural catastrophes such as forest fires constitutes high priority for the integrated protection as well as the sustainable development of such susceptible ecosystems. The purpose of the study is the overall enhancement and improvement of prevention; timely and powerful suppression and generally the rational confrontation of forest fires, adapted to the indigenous peculiarities of the insular environment, through knowledge and operational gaps that will be resulted from the current survey.

The ongoing research consists of a survey (through questionnaires) by exploring the perspectives and knowledge basis of agencies responsible for preventing and containing forest fires (forest service, civil protection secretary of municipality of Thasos, local Fire Service) on specific issues such as coordination issues; economic data and information; possible ignition causes; necessary precautions and activities for effective prevention and timely suppression and the corresponding difficulties; quantity and quality of fire machinery and human resources involved to the fire confrontation.

All above could be integrated into a unique study so that we may develop a comprehensive Decision Support System for the island. Finally, it should be highlighted that neither the prevention nor the suppression agency staff have been aware about the existence and significance - contribution of Decision Support Systems to the natural catastrophes (like forest fires) management and containment. Hence, there is fertile ground and a unique opportunity is presented in practicing contemporary Decision Support Systems into Thasos island, assisting and educating actively the fire personnel to the usage of such state-of-the-art systems. Thus, the added value of this project is considered of vital importance for educational, preventative and operational reasons before and during forest fires.

**Keywords:**

Survey, operational preparedness and tactics, fire agencies, island, Thasos

## Introduction

Forest fires consist one of the greatest hazards for the viability and sustainable development of forests with implications both on natural and cultural environment, affecting the economy and the quality of life of local population.

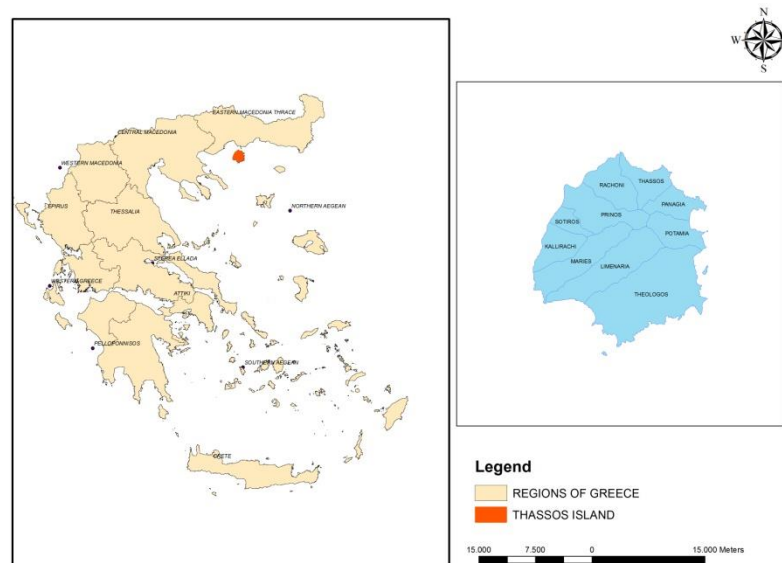
The outbreaks of forest fires could stem from either natural (thunders) or anthropogenic causes (carelessness, accidents, arsons). The latter usually compose the greatest percentage of ignition of forest fires especially at the Mediterranean regions (Ager et al. 2014, Carmel et al. 2009, Christopoulou 2011, Demir et al. 2009, Dimitrakopoulos 2011, Moreno 2014).

Primary aim of the paper is the exploration of strategic and operational preparedness and tactics of fire agencies in a small Greek island. Case study is the island of Thasos, which is located in the north of Greece. The prevention and effective confrontation of natural catastrophes such as forest fires constitutes high priority for the integrated protection as well as the sustainable development of such susceptible ecosystems. The purpose of the study is the overall enhancement and improvement of prevention; timely and powerful suppression and generally the rational confrontation of forest fires, adapted to the indigenous peculiarities of the insular environment, through knowledge and operational gaps that will be resulted from the current survey.

## Study Area

The island of Thasos is situated in the northeastern part of Greece and administratively belongs to the region of Eastern Macedonia and Thrace. The length of the shoreline amounts to 115 km, while the area of the island is 380 km<sup>2</sup>. Thasos constitutes an island of Northern Aegean. The geomorphology of the study area is abnormal, as it seems from the huge mountainous areas. Despite the mountainous nature of the island, accessibility is considered quite satisfying due to the high density of forest roads. Map 1 depicts the geographical position of the Thasos island in the context of the country as well as the administrative division of the island.

Finally, Thasos island is characterized by rich vegetation, as it is reflected from the great variety of trees, such as olives, plane, fir, linden, cedar etc (<http://el.wikipedia.org>, 2015).

**Map 1: Geographical position and administrative division of the island of Thasos**

Source: Own processing

**Material and Methods**

The ongoing research consists of a survey (through questionnaires) by exploring the perspectives and knowledge basis of agencies responsible for preventing and containing forest fires (forest service, civil protection secretary of municipality of Thasos, local Fire Service) on specific issues such as coordination issues; economic data and information; possible ignition causes; necessary precautions and activities for effective prevention and timely suppression and the corresponding difficulties; quantity and quality of fire machinery and human resources involved to the fire confrontation. We have distributed more than 100 questionnaires at the fire agencies staff and the rate of successfully completed questionnaires was 41%.

In this stage of the research, some interesting points will be highlighted based on the replies of the staff that are responsible for the effective forest fire management at the island of Thasos. Hence, some preliminary results will be presented with the aid of descriptive statistics, while a more sophisticated statistical technique will take place when the research has been completed. It should be emphasized that most of the questions use a scale bar from zero which indicates the least influence or strong disagreement to 11 which shows great influence or strong agreement and effectiveness. Thus, each question has its own total percentage depending on the degree of influence etc. and not in cumulative basis of different elements.

**Preliminary results – Discussion**

This section presents the preliminary results of a broader survey regarding the forest fires management at the island of Thasos. In the section of general questions, we observe that the most frequent size of burned area is 1-5 ha (36.5%) and follow incidents with burned area  $1 < \text{ha}$  and 30 – 40 ha (19.5%). So, most of the incidents related to

small fires which are contained immediately, while there is a significant percentage of intense huge fires (1 to 5 fire incidents). Concerning the possible cause of fire ignition, the fire agencies staff estimates that the human factor has great (53%) and moderate (46%) responsibility in fire ignition. On the other hand, natural factors tend to have moderate (53%) and low responsibility (43%) for a fire ignition. Among the most frequent causes, the staff considers that the greatest share of responsibility belongs to arsons (43%); to fire spread from the adjacent agricultural areas (34%); to carelessness (21); and finally to accidents (2%).

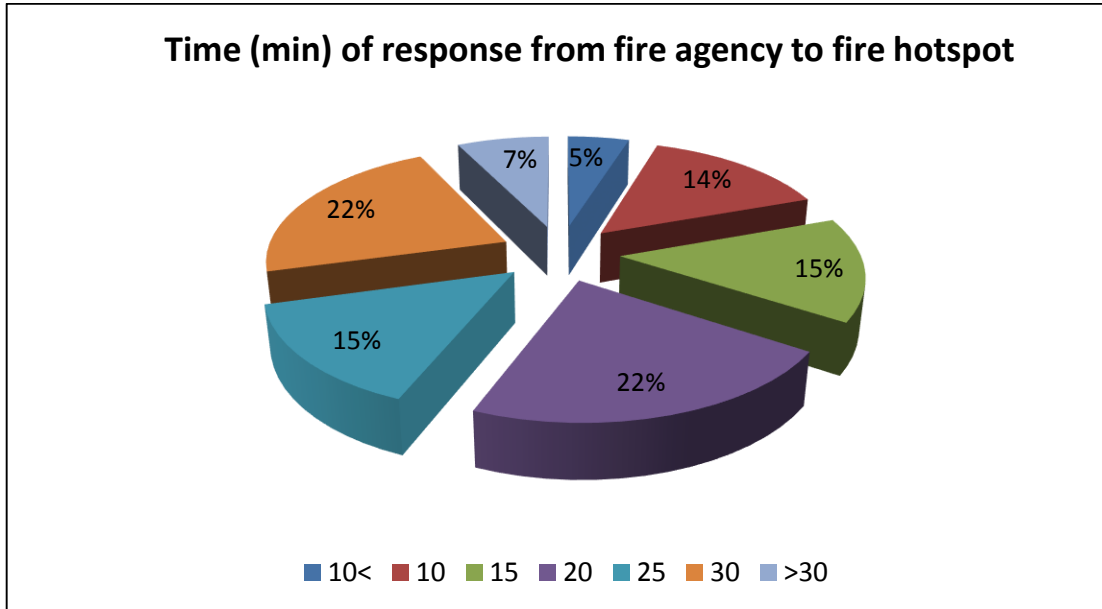
The first group of questions explores the evaluation of significance of some critical factors to the prevention of forest fires. It is impressive the fact that even though the staff considers the effective cooperation between all the involved fire agencies of crucial significance (80%), they rank the current level of collaboration –in terms of effectiveness– as very low (17%). Other critical factors which are considered vital for the forest fires prevention are the investigation of the causes (75%); the contribution of the scientific personnel (70%); the current level of public awareness (58%). It is obvious that there is a cooperation gap between the agencies, which can lead to the waste of the critical time of response, a fact that should be seriously taken into account by the upper fire agency administrative level. The second group examines the major problems which affect the overall fire prevention. The most crucial problems mentioned concern the financial restrictions (85%); the shortage of technical and technological projects (fire machinery, fire simulation software etc.) (76%); gaps in the evolution of scientific knowledge (43%). Thus, we should highlight the fact that the overall prevention strategy and tactics should be revised with the enrichment of hard (fire breaks planning etc.) and soft reforms (upgrading the current cooperation level between the scientific staff; adoption of the newest technological improvements etc.).

Another group of questions explores the effectiveness of some techniques and strategies which are related with the fire prevention. Most appropriate tactics are considered the rational planning of road and water tanks network (85%); the establishment of well-planned firebreaks (82%); the adoption of traffic restrictions especially when extreme meteorological conditions are predicted (80%); constant patrols and immediate monitoring for fire incidents (either by human force or drones etc.) (73%) and follow other measures like the development of meteorological prediction systems (68%) and the determination of fire risk analysis (68%). Less important actions are considered the grazing control (34%). According to the above analysis, we may conclude that the fire agency staff focuses on the road network functionality and possible imposed restrictions as well as the estimation of fire risk based on specific input data, such as the meteorological data.

The last group of questions explores the opinion of fire agencies staff regarding the Decision Support Systems as well as information about the suppression procedures that normally take place. The graph 1 depicts the usual time of response from fire agency to fire hotspot, based on historical experience. It should be emphasized the fact that the incidents that needed up to 15 minutes are about 25% of the total, while about

60% of the incidents were reached in a time frame from 20 to 30 minutes. Only 7% of the fire hotspots are approached after 30 minutes due to late warning or because some incidents took place in steep and not very accessible areas.

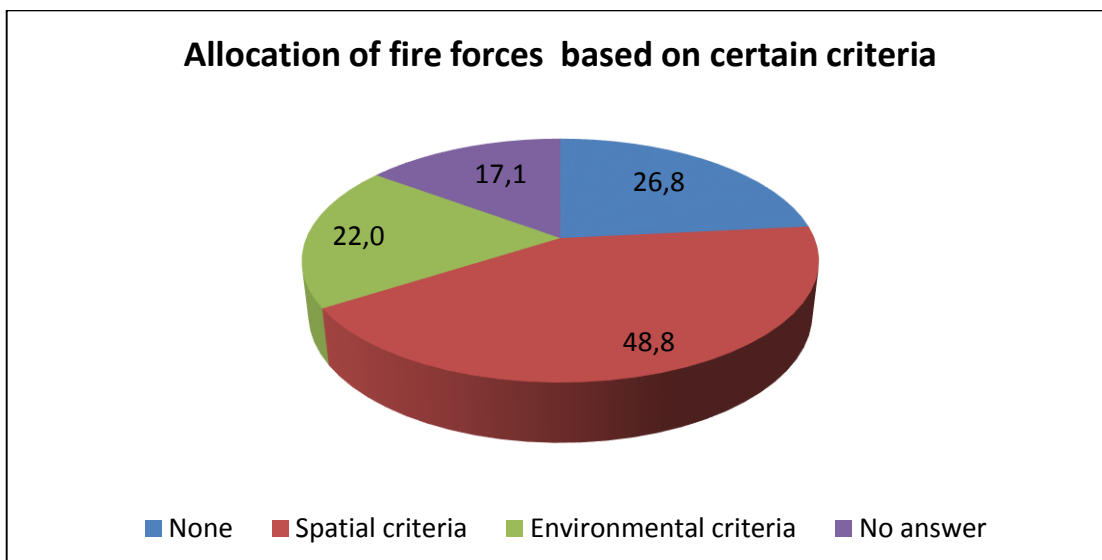
**Graph 1: Time of response from fire agency to fire hotspot**



Source: Own processing

The next group of questions examines the criteria with which the distribution of fire forces is realized through the island.

**Graph 2: Distribution of fire forces based on certain criteria**

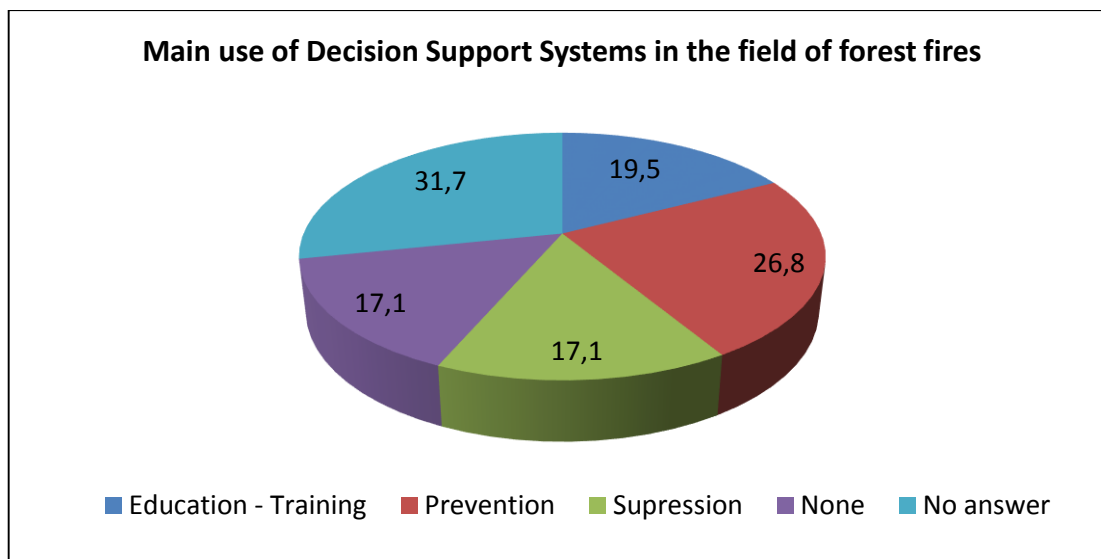


Source: Own processing

As we observe at the graph 2, there is much uncertainty and ignorance concerning the adopted criteria for the effective distribution of fire forces in the island. A significant percentage (43.9%) of answers indicate that  $\frac{1}{4}$  of the staff do not know anything about the strategy for optimal fire prevention. On the other hand, 48.8% of the personnel claim that for an optimal allocation of fire forces, criteria of spatial nature are taken into account, while, for the same purpose, 22% of the fire personnel claim that environmental criteria are taken into consideration. Therefore, we conclude that there is no a coherent strategy about this critical issue and some decisions may vary according to special circumstances or other administrative priorities (protection of vital environmental ecosystems etc.).

Finally, as we can see from the graph 3, about 48% of the responses indicate that half of the staff either is completely unaware about the existence and the added value of Decision Support Systems (DSS) or they consider that there is no any functional DSS in use. On the other side,  $\frac{1}{5}$  of the participants emphasized the fact that the DSS are mainly used for educational reasons or training; 27% of the participants consider that the DDS are primarily used for preventative reasons; while only 17% of the sample responded that they mainly use DSS for suppression purposes. Despite the fact that many of the people actively involved in the field of fire management responded that they normally use some kind of DSS, none of them was aware about a specific type of DSS (such as specific software or a fire simulation etc.). Hence, there are certain reasons to believe that very few people are aware about these systems and most possibly, they are more familiar with some subsystems that help them to decide more effectively, rather than with a state-of-the-art integrated DSS.

**Graph 3: Main use of Decision Support Systems in the field of forest fires**



Source: Own processing

## Conclusions

This paper presented some preliminary results of a survey focusing on the staff that is actively involved in the field of fire management in the island of Thasos. The

questionnaire was structured with a way which will explore many aspects of the fire management, so that we may collect, edit, and analyze all the valuable information and develop a concrete DSS adjusted to the local characteristics. That's why, we examined the typical fire size in the island; the most frequent fire causes; the adopted fire prevention measures and their effectiveness as well as the perspectives of using contemporary DSS that will contribute to the rational and more effective fire management.

The above analysis could be integrated into a unique study so that we may develop a comprehensive Decision Support System for the island. Finally, it should be highlighted that neither the prevention nor the suppression agency staff have been aware about the existence and significance - contribution of Decision Support Systems to the natural catastrophes (like forest fires) management and containment (except some elements of DSS as highlighted in the discussion unit). Hence, there is fertile ground and a unique opportunity is presented in practicing contemporary Decision Support Systems into Thasos island, assisting and educating actively the fire personnel to the usage of such state-of-the-art systems. Thus, the added value of this project is considered of vital importance for educational, preventative and operational reasons before and during forest fires.

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