



Joint UNEP / OCHA Environment Unit



Ecological Damage Assessment of the Wildfires in the Former Yugoslav Republic of Macedonia in 2007



Joint Mission by the UNEP-OCHA Joint Environment Unit, UNEP, UNDP and GFMC

Executive Summary

Between July and August 2007 the Former Yugoslav Republic of Macedonia (FYR Macedonia) experienced extended wildfires, which severely affected forests and other vegetation on an area exceeding 50,000 hectares (ha). By end of July 2007 the damages in fire-affected forests as well as the costs for suppression already amounted 21 million Euros. At the time of compiling this assessment there were no damage figures available for the month of August 2007. Although nearly 200 people were forced to evacuate from Bitola direct impact on residential areas has been thankfully minimal. Damage to infrastructure has been relatively slight. However, there were quite a few occasions where damage to these areas (communities and public infrastructure) was only averted at the very last moment.

In response to the request of the Government of FYR Macedonia, UNDP, in a cooperative effort with the Joint UNEP / OCHA Environment Unit, UNEP and the Global Fire Monitoring Center (GFMC), a mission was deployed to FYR Macedonia to assess the damages of the wildfires in FYR Macedonia in 2007 and to recommend action for future fire disaster risk reduction. The GFMC was deployed through the Joint UNEP/OCHA Environment Unit. The mission was implemented between 27 August and 7 September; the field assessment team was deployed between 29 and 31 August 2007. The field assessment was conducted in the most fire-affected regions. These regions were also representative for the fire occurrence and fire effects throughout the whole country. Agencies and individuals involved in wildfire prevention and suppression were consulted in all regions visited.

All wildfires were consequences of human activities, e.g., agricultural burnings, careless use of fire, and in some cases suspected arson. Extremely dry, hot and often windy weather conditions prevailing during the whole fire season created extreme fire situations and often made firefighting impossible. This situation is aggravated by the consequences of the rural exodus. The widespread abandonment of land cultivation is resulting in increasing loads of unused combustible materials in forests and former agricultural and pasture fallow lands. With a reduced presence of the young generation of rural population and average over-aging of the rural communities, the human resources available for fire prevention and fire suppression activities are dramatically dwindling.

	<p>Report prepared by the Global Fire Monitoring Center (GFMC) by Johann G. Goldammer (GFMC) and Nikola Nikolov, Faculty of Forestry (Skopje, FYR Macedonia) / UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network Edited for IFFN – 30 September 2007</p>	
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The prime responsibility in fire prevention and initial fire suppression in the state-owned forests is with the Public Enterprise "Macedonian Forests". This basic responsibility is very appropriate. However, there are expectations by non-state landowners that P.E. Macedonian Forests would also be responsible for fire prevention and control on non-state forest and other lands. Legally this expectation cannot be met due to a lacking mandate, although the P.E. Macedonian Forests is usually and informally responding to all wildfires regardless of land ownership. However, human and technical resources for fire management of P.E. Macedonian Forests are inadequate to professionally and successfully suppress forest fires.

Besides a lack of trained personnel, most of the firefighting equipment is outdated, obsolete and overall insufficient. This severe underfunding and under equipping extends beyond fire management itself into areas of communications, basic office equipment, even office space.

Secondly and very much related to the scale of damage witnessed the general crisis-management system is requiring a severe overhaul. There is a great need for unity and a systematic approach to crisis management. The fires of 2007 have highlighted a picture of competing mandates, duplication of efforts, coordination and leadership clashes both at local and central level. Key preparatory activities are performed in isolation to others, the evident expertise the country has in various areas related to the crisis management system is either under-utilized or left outside the system altogether.

It is therefore recommended that a number of measures to be taken to overcome the institutional weaknesses and to improve capacities in fire management. The proposed measures include:

- Launch of a fire management capacity building programme for FYR Macedonia and initiation of a capacity building training programme at regional level; assistance to be sought e.g. through the Environment and Security Initiative (ENVSEC), the Joint UNEP / OCHA Environment Unit, UNDP, Council of Europe (CoE) through its Euro-Mediterranean Major Hazards Agreement (EUR-OPA) and GFMC
- Strengthening the fire management capabilities of P.E. "Macedonian Forests"
- Establishment of adequately trained and equipped voluntary rural fire brigades
- Call for a National Round Table on Fire Management to be supported by UNDP, GFMC and the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network
- Replacement of obsolete and procurement of sufficient firefighting equipment for the local fire services and P.E. "Macedonian Forests" (provision of model units for wildland fire response, fully equipped with vehicles, tools and personal protective equipment); assistance to be sought through UNDP and national agencies
- Upgrading fire research and training at the Forestry Faculty in Skopje and conduct regional fire management summer schools
- As the FYR Macedonia is aiming at joining the EU, request of a "Twinning" (or Twinning Light) project between FYR Macedonia and an EU member state, to adapt Macedonian legislation and practical procedures in forest and fire management.
- Development of a regional strategy on cooperation in wildland fire management and establishment of a Balkans Regional Fire Monitoring Center; assistance to be sought through UNDP, GFMC and the UNISDR Regional SE Europe / Caucasus Wildland Fire Network, flanked by ENVESC and CoE / EUR-OPA
- Convene a "Regional Balkan Wildland Fire Crisis Conference" (or "Summit"), in which highest-level possible government commitment should be sought, under the joint auspices, among other, of UN specialized agencies and programmes (UNDP, UNEP, the Joint UNEP / OCHA Environment Unit, FAO), the European Commission, Council of Europe / EUR-OPA, ENVESC, OSCE and NATO, and facilitated by the UNISDR Global Wildland Fire Network and its regional network, the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network, with the main objective to:
 - Address the underlying causes of increasing threats of wildfires to the environment and society, notably the consequences of land-use change and climate variability
 - Outline the need for the development of national policies and strategies addressing land-use, forestry and forest protection, nature conservation and fire management
 - Elaborate agreement for strengthening fire management capabilities in the region through standardized and joint regional training and introduction of improved technologies for wildfire suppression
 - Development of border-crossing mechanisms and agreements on mutual assistance in fire emergency situations

1. Introduction

In July-August 2007 the FYR Macedonia was severely affected by extended forest fires and fires occurring in other vegetation. The extreme size and impacts of fires were determined by the extremely dry weather conditions on the one side, and the lack of human and technological resources for fire management on the other side.

In response to the request of the Government of FYR Macedonia UNDP, in a cooperative effort with the Joint UNEP / OCHA Environment Unit, UNEP and the Global Fire Monitoring Center (GFMC) deployed a mission to FYR Macedonia to assess the damages of the wildfires in FYR Macedonia in 2007 and to recommend action. This report focuses on one of the three parts of that mission: the ecological damage. Other aspects (socio-economic and crisis management) of the mission are examined separately. As this report on ecological damage is designed to also be prepared as stand-alone version there may be a little duplication in the areas of damage.

The mission was implemented between 27 August and 7 September; the field assessment team was deployed between 29 and 31 August 2007. The field assessment was conducted in the most fire-affected regions. These regions were also representative for the fire occurrence and fire effects throughout the whole country. Agencies and individuals involved in wildfire prevention and suppression were consulted in all regions visited.

This report provides a summary of the on-site assessment and investigations in the FYR Macedonia and recommendations for action for future prevention, response and mitigation of wildfires.

2. Mission Narrative

After a preparatory meeting on 27 August 2007 the field mission started on 28 August 2007 and ended with a debriefing at the Center for Crisis Management (CMC) on 1 September 2007. The complete mission report including a detail mission narrative is available in the original report.¹

3. Results of the On-Site Investigations and the Field Assessment

3.1 The 2007 fire season: Climatic conditions

In summer 2007 the jet stream was flowing further south as compared to average years, allowing low pressure systems to sweep over Western / Atlantic Europe. Warmer air was pulled from Africa, which was affecting South-eastern Europe for weeks. Appendix 1 provides an example of a pressure chart, which is illustrating the reasons for the flow of hot air masses from Africa to the Balkans.

The extreme heat and dryness is reflected by the weekly averages of fire danger level, which were determined by the Joint Research Center (JRC) using the Fire Weather Index (FWI). An example for the month of July for Europe, including the Balkans, is provided in Appendix 1.

An exact comparison of climatological information for FYR Macedonia (long-term average weather data vs. weather data of 2007) is not yet possible due to the lack of evaluated weather data of the current year. However, the high temperatures recorded in summer of 2007 exceeded by far the long-term average temperatures for the summer months. Appendix 1 provides the long-term climatic conditions for a post-mission evaluation.

3.2 Preliminary summary of area burned by vegetation types

Detailed data on area burned and number of fires in August 2007 are not yet available. The fires recorded until the end of July 2007, however, indicate that the area burned by wildfires in 2007 most likely will be higher than in the most recent extreme fire year 2000.

Unfortunately the statistical data collected by various agencies or units – both long-term as well as in 2007 – are inconsistent and probably not comparable. Different sources of fire statistical data come up

¹ <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/FYROM-2007.pdf>

with different numbers – see datasets provided by the Ministry for Internal Affairs (MIA) for the period 1989-2005 (Tables 2 and 3) vs. the data compiled by P.E. “Macedonian Forests” for 1999-2006.

The mission had the impression that the data compiled by the Public Enterprise “Macedonian Forests” are the most reliable. With a burned area of more than 32,000 ha recorded by end of July 2007, the total area devastated by fire in 2007 most likely will exceed the area burned in the extreme fire year 2000, during which ca. 46,000 ha of forests and other lands had been burned. It is assumed that the total area burned may exceed 50,000 ha.²

3.3 Fire causes

In many cases the causes of the fires are unknown. However, local briefings revealed that agricultural burnings, especially straw residual burning caused many fires, as it usually happens in late summer. Other fires may have been caused accidentally. Arsonists have set some fires. However, there is limited proof, except for two fires in Berovo and Katlanovo, which were set intentionally and which are currently investigated.

The long-term average data show that about 65% of wildfires in Macedonia were caused due to negligence, 7.5% were ignited intentionally and lightning caused only 2%. For 25.5% of fires, the causes were unknown due to difficulties in determine the cause. It is strongly assumed, however, that the majority, if not all, of the fires with unknown origin were started by people.

The farmers, who were using fire, most likely have not been aware of the extreme weather conditions, especially the influence of wind, which caused the spread of land-use fires and created high-intensity wildfires that were difficult to control.

3.4 Fire impacts on vegetation, environment and secondary disasters

An overview of the specific fire impacts is given in the following:

Forests

The degree of ecological and economic damages varied by forest types. High-value forests, such as natural or planted pine forests (*Pinus nigra*, to a lesser extent *P. sylvestris*), have been severely damaged (destroyed) by fire in many places. The “severity” of fires (i.e. the deep fire impact on the forest floor and soil cover; the consumption of all burnable material on the forest floor as well as damage of destruction of tree crowns) was often a result of extreme drought, strong winds and topography (on steep terrain high-intensity, up-slope moving fires are developing very fiercely). Most of the fire-affected pine forests will not regenerate sufficiently by natural regeneration, and need to be re-forested. The value of the partially burned timber (the tree stems are charred by fire) is reduced. The costs of salvage logging and preparation of the land for restoration / sanitation amount to ca. 1000 €/ ha. It means that the costs for rehabilitation of 1000-ha burns (such fire sizes have been reported in many forest districts) will amount to 1 million Euro. This magnitude of costs must be kept in mind when judging the investments necessary for appropriate fire prevention and control measures.

As pine reforestations are very sensitive to fire, it should be considered to use different species for reforestation, e.g. oak species (*Quercus* spp.). Oaks are also affected by fire but have a good potential of regenerating naturally (from sprouting). Thus, fire affected oak stands may not require high investments for rehabilitation.

High-altitude forests with different tree species, e.g. spruce and fir species have not been visited during the assessment mission. However, there are reports of fires burning in national parks in which such forests may have affected by fire. In general, these mountain forests are very sensitive to fires, and fires represent of threat to biodiversity and mountain ecosystem stability.

² According to a quick satellite survey by the JRC a total of 36,492 ha of lands were affected by fire by end of August 2007, of which 30,645 ha were forest lands (84%):
http://effis.jrc.it/documents/2007/EFFIS_Newsletter_2_2007.pdf

The forest fire damage assessment by the Public Enterprise "Macedonian Forests" estimates a damage of forest products and the costs for fire suppression in the magnitude of 21 Million Euro (as of end of July 2007).

For private forest owners the situation can be rather difficult. The majority of the ca. 60,000 private forest owners have very small forests; the average size is 0.5 ha. One farmer interviewed by the mission team lost the whole forest on his property of 3.5 ha. For such a case a fire can be economically very disastrous.

Other lands

Degraded forests affected by fire in some cases have a history of earlier fires and land-use. The economic value of degraded forests and brushland is less than the high-value forests.

Only a limited amount of agricultural lands or other cultivated lands have been affected by wildfires. The team noticed some viticulture and fruit tree plantations damaged by wildfires. The authorities in general did not report major damages in agricultural crops.

Infrastructures

In some places damages of infrastructures were reported and observed, e.g. some burned power and telephone masts. In general there was limited damage, although it was observed that many electric power lines were near or even over burned vegetation. The potential of damages, however, was very high, but was successfully prevented by fire suppression efforts. The TV tower at Katlanovo (near Skopje) was threatened by fire in July 2007, but successfully protected.

Near Gevgelija a short section of railway sleepers burned, but could be repaired at short notice. At the fires near Katlanovo the highway and tunnel had to be closed for several hours in order to avoid traffic safety problems due to fire and smoke.

Most endangered was the coal-fired electric power plant Oslomej near Kicevo. The fires burned nearby this power plant and created some spotting fires, which were falling on the main per plant facility. The fire personnel prevented the ignition of the facility. Burning of this power plant could have caused enormous direct and indirect damages (e.g. loss of electricity with subsequent economic losses in the region or even countrywide).

Social / humanitarian (public health, safety and security)

In a number of regions the loss of some buildings was reported, e.g. some weekend houses. In the outskirts of Bitola a small informal settlement of the local Roma population was partially burned down, several barracks were destroyed or damaged. The authorities evacuated 178 persons from the fire scene. There were no casualties. While some of the evacuees were allowed to return after the fire, a total of 32 persons are currently still hosted in a holiday resort and are waiting for decisions and actions by the city of Bitola to provide new housing ground and to assist building of barracks. Details on the fire impact on the Roma community in Bitola are provided in the tandem report.

Other regions reported about losses of private houses and equipment, e.g. in Berevo the loss of one house, one weekend house and one tractor was reported. In Strumica the authorities reported the loss of several barns and cattle stable.

The Red Cross units were actively participating in the fire and rescue operation in several places where peri-urban or village sites were endangered by fire, e.g. in Bitola and Kicevo. The Red Cross gave advice to people to protect themselves from heat stress. Although severe smoke pollution was reported in the call for international assistance (Appendix 3), the regional representatives of the Red Cross and other authorities did not consider smoke pollution and health risk as a major problem during the fire crisis.

The fire and forestry units reported about several critical situations in which firefighters were threatened by the wildfires, e.g. during fires burning near Prilep where firefighters were trapped by fire. However, no casualties were reported. For comparison: in Croatia six firefighters were killed and seven severely injured in a fire in the last week of August 2007. (Note: By 6 September the number of fatalities in Croatia has increased to 11 firefighters.)

In conclusion it can be stated that unlike the situation in Greece, where more than 64 people had been killed by fires and more than 3000 houses burned during the fire episode of August 2007, the humanitarian consequences of wildfires in FYR Macedonia were less severe.

However, the potential for higher losses was there, including the long-term effects of smoke pollution (damage through inhalation of smoke particles, with the risk of short-term effects on elderly and young people and those suffering cardio-vascular diseases, asthma, etc., or long-term effects such as cancer).

Other damages: Secondary damages and disasters

It is very likely that considerable damage will be caused by secondary events. Bark beetles most likely will infest pine forests, which were partially damaged by fires. The expected mass infestation will result in additional damages affecting surrounding unburned forest stands.

In most areas fires burned on steep terrain (slopes). The high severity of fires has burned the protecting humus layer and removed the grass-herb vegetation. In some places the fires penetrated the ground through burning of old tree stumps and roots. The effects of these hot-burning fires make these slopes very prone to soil erosion, with the consequence of loss of soil and nutrients. This will be a major impediment for regeneration and reforestation.

Once heavy rainfalls in autumn-winter will hit these burned sites, it is expected that massive surface runoff will lead to floods, landslides, mudslides and rock falls. The downstream effects of heavily burned sites may become more disastrous than the direct fire damage in terms of timber losses and reforestation costs.

Specific issues: UXO threat to human security

Many forest sites and non-forest lands in the Balkan region are contaminated by land mines and unexploded ordnance (UXO) from recent conflicts. In FYR Macedonia the threat of UXOs to be triggered and exploded by forest fire is stemming from World War I. Most contaminated is the former line of contact of 1917 between Strumica and Bitola (LoC between the Austro-Hungarian, German, Bulgarian and Turkish forces in the North and the Antanta Union in the South), where large numbers of grenades and mines are threatening firefighters and civilians. During the fires in July 2007 more than 70 explosions of ammunition were recorded in the immediate vicinity of Bitola, but no casualties occurred.

3.5 Fire management

The following summary is concentrating on the technical fire management capabilities. An analysis of the general Crisis Management System in light of the forest fires can be seen in the separate report (including some aspects of multi-stakeholder involvement at a local/national level).

Wildfire prevention and preparedness

The prevention of forest fires is the task of the forest owner (Law on Forests, 1997). The Public Enterprise "Macedonian Forests" plays an important role in this regard. However, the enterprise is allocating very limited resources for technical fire prevention measures, e.g. for creating firebreaks, pruning of trees alongside roads, planting of greenbelts, or construction and operation of fire watch towers.

The economic situation of private forests is rather difficult. The average small size of the forest properties, usually intermixed with forests of other owners, makes fire prevention measures extremely difficult, not to say impossible, unless agreement can be reached by a group of forest owners of a forest complex.

During the field mission it was noted that only very few billboards and other public education / information materials have been posted. Some leaflets addressing forest fire risk were presented by the authorities in Kicevo, including materials in Albanian language.

Wildfire response: Fire suppression

Forest owners have the primary responsibility for fire response. Since private forest owners have limited to none capabilities in fire suppression, the Public Enterprise "Macedonian Forests" is serving *de facto* as the only acting entity to initially respond to fires (initial attack) regardless of forest ownership. P.E. Macedonian Forests is actually acting like a public body ("Forest Service") although it does not have a mandate or budget to do so. P.E. Macedonian Forests is acting because there are no resources in private or community forests to respond to fire.

If a fire cannot be suppressed P.E. „Macedonian Forests“ calls the local Fire Service for support and the Directorate for Protection and Rescue is involved. In a declared "disaster situation" (emergency / crisis dimension of a fire) the Crisis Management Center is responsible for coordinating fire fighting. This task includes the coordination of foreign assistance, e.g. targeting foreign aerial resources to the fire to be suppressed.

The mission received several reports from the regions (e.g., Struga) that private landowners expected that P.E. Macedonian Forests should fight fires also on private lands. These landowners did not participate in fire fighting.

In almost all regions it was reported that there are insufficient to none volunteers for firefighting. Some exceptions, however, indicate the potential for volunteer involvement: In Kicevo-Krusino it was reported that a fire, which broke out on 26 July 2007 in the afternoon, the local population was immediately through the local media. Immediately about 400 to 500 people assisted the foresters, fire services and the armed forces in combating the fires and saving very valuable forest resources. In Tetovo a representative of a volunteer group of Brevenica reported the availability of volunteers, which at moment have no budget and no equipment at all.

Equipment, professional competence and firefighters personnel safety

In all regional meetings visited (Annex: itinerary map of field assessment mission) the representatives of the agencies involved (P.E. Macedonian Forests, Fire Services, DPR, CMC) reported in detail about the available technical / equipment resources to combat fires. The reports reveal that the equipment for fire suppression in forests and other lands outside villages and towns are absolutely insufficient. Compared to international standards the available resources almost nil.

In many regions the total amount of equipment included a small number of fire swatters (fire beaters) and backpack pumps. In some regions one single vehicle for transport of personnel was available. In some regions vehicles were borrowed or made available by private persons.

The units dispatched to fight forest fires do not have any specific training for capacitating the personnel to carry out fire suppression professionally and – most importantly – safely.

In all regions it was reported that units, which did not have any tools for fire suppression, had to attack fires burning with extreme intensities.

Rehabilitation of fire-affected lands

It was noted during the mission that P.E. Macedonian Forests was already working on preparations for post-fire sanitation cutting (salvage logging and removal of fire-damaged trees to reduce bark beetle infestations in burned pine stands) and reforestation.

The rehabilitation of forests damaged by high-severity fires (fires burning deep into organic terrain and depleting the soil from protecting humus and vegetation cover) must receive highest priority in order to reduce the degradation or loss of soils due to erosion and increased surface water runoff. Reforestation must receive priority in watersheds where heavy rainfalls may cause floods and destabilization of mountain slopes.

International cooperation in fire suppression

During the fire crisis in 2007 the government requested international assistance. Appendix 5 provides an overview of the assistance given by countries and donor organizations. Aerial fire fighting resources were received from some countries. The efficiency of foreign aerial firefighting missions

varied. In the case of the fire near Kicevo the deployment and aerial attack of a Croatian Canadair CL-215 was particularly successful.

During the fire crisis in the whole Balkan region numerous fires crossed national borders. This was also the case in FYR Macedonia. Authorities in Struga reported about border-crossing fires from Albania. They reported that there were no official communication channels with Albania, and that all action at the border had to be done in an unofficial way. There is also no communication with the authorities in Kosovo.

During the peak of the fire crisis in Greece, the government of FYR Macedonia offered assistance to Greece by sending a mixed firefighter team with the most experienced personnel. The Greek authorities, however, did not allow the fire crew to cross the border.

4. Conclusions

4.1 General: Implications of changing socio-economic conditions and regional climate on fire regimes and institutional capabilities in fire management

The fire assessment mission team has been confronted the dramatic social, economic and political changes in the rural space of the FYR Macedonia. Most visible during the mission were:

Consequences of the rural exodus

- Reduction in agricultural and pastoral activities
- Reduction in the overall use of biomass
- Together with increasing size of fallow lands with bush and forest encroachment, the reduced utilization of biomass constituting an increasing availability and continuity of fuels available to wildfires
- Villages becoming over-aged and even completely vacated due to the exodus of the young generation to the cities
- Decrease of availability of young, active rural population ready to prevent and suppress fires

Consequences of political and structural changes in the society

- Institutional weakening of the authority and efficiency of the forestry authorities
- Degraded financial capabilities of the fire and rescue services and other stakeholders concerned directly or indirectly with fire prevention and control
- Impoverished private forest and land owners with virtually non-existing capability on fire prevention and control

Consequences of climate extremes such as in 2007

- Unprecedented heat wave
- Extreme desiccation of forests and other vegetation
- Extended dry season without rainfall
- Occurrence of strong dry and hot winds favouring the intensity, spread and uncontrollability of wildfires
- Neighbouring countries are similarly affected, with consequences on reduced availability of foreign fire disaster assistance

Consequences of fires on the country and the environment

- As a consequence of these developments the territory of the country is becoming increasingly vulnerable to fire
- The effects of fire on the natural environment in the country constitute a major threat to the sustainability of forests, forestry and the role of forests in the stability of the country's environment and society.

By evaluating the multiple and cumulative effects of human-driven and natural developments on the vulnerability of FYR Macedonia to fire, and the whole Balkan region respectively, it is concluded that highest political priority should be given to strengthen the protection of forest and other vegetation

resources against the increasingly detrimental impacts of fire on ecosystem stability and society in the country and its neighbors.

Decisive action is urgently needed.

4.2 Current fire situation and fire management capabilities in FYR Macedonia

As a consequence of the weakened financial capabilities of all stakeholders concerned, the fire management capabilities in the country are extremely poor. In all regions visited and forestry and fire service units inspected the Fire Assessment Mission Team witnessed the almost non-existing capabilities in fire management.

Almost all local branches and fire service units had extremely small amounts of hand tools, often overaged and not functioning, limited to none means of transport, especially lack of off-road vehicles for transport of firefighters, no suitable fire trucks and limited amount of water tenders. There is no adequate personal protection equipment for the safety of firefighters available.

Special training required for professional forest (wildland) fire fighters does not exist in the country. Firemen are exclusively trained in structural fire fighting, or management of hazardous materials, but there was no indication of availability of training materials or procedures in forest fire fundamentals and suppression.

Several regional authorities underscored the lack of personnel, which is required by the Law on Local Self-government: "Fire Protection Provided by the Territorial Fire-fighting Units" i.a.w. the Law on Fire Protection (Official Gazette of the Republic of Macedonia No. 67/04), especially considering Article 6, which is stipulating the minimum number of firemen in the fire protection units i.a.w. the number of inhabitants of municipalities.

The responsible units of P.E. "Macedonia Forests" and the fire services reported that they were tackling large forest fires of sizes of up to several hundred or more than thousand hectares with virtually not tools at all. In some cases firemen had to use / borrow private vehicles to drive to the fire front.

4.3 Needs for improvement of fire management capabilities

The weak status of the forestry authorities and other forest owners, notably the private forest owners, as well as the catastrophically inadequate equipment, operational means and training of the fire service and rescue units require a swift and massive response towards the improvement of professional capacity and equipment of the authorities concerned with fire protection. The investments that will be required will be rather moderate.

5. Recommendations

5.1 Fire management training in FYR Macedonia

Given the lack of professional training of forestry and fire service personnel in the country is recommended to conduct a fire management capacity building programme for FYR Macedonia.

Given the fact that the countries in the Balkan region are suffering similar problems of shortcomings in fire management, and the fact that many fires are crossing the borders between all Balkan countries, it is strongly suggested to initiate a capacity building training programme at regional level. The programme should first focus of "training for trainers" from the Balkan countries.

This is in line with the recommendations of the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network and, among other, the recommendations of the 2007 UNDP-UNEP Fire Mission to Kosovo.³

³ UNDP / Joint UNEP/OCHA Environment Unit / GFMC, Fire Situation Assessment Kosovo, Final Report, 15 August 2007 (on file at Joint UNEP/OCHA Environment Unit and GFMC)

Given the interest and already existing engagement of the Environment and Security Initiative (ENVSEC) in addressing the increasing fire problem in the region – in particular with involvement of GFMC, UNEP and OSCE and considering the potential interests of NATO – it is recommended to implement this programme under the financing and implementation scheme of ENVSEC.

The Joint UNEP / OCHA Environment Unit and the Council of Europe (CoE) through its Euro-Mediterranean Major Hazards Agreement (EUR-OPA) have indicated a strong interest to partner in such a programme.

At academic level it is strongly suggested that the Forestry Faculty in Skopje should receive additional resources to enhance fire research and training of forestry students. Training courses for forestry students could also be conducted in conjunction with universities from neighbouring countries, e.g. in joint summer schools. This kind of academic training could be possibly financed by ENVSEC.

5.2 Fire management organization

The fire season of 2007 revealed that the land managers (forest managers, managers of other lands), who have primary responsibility for fire prevention and initial attack, need to be strengthened in performing their duties.

It is strongly recommended that the P.E. “Macedonian Forests” shall be strengthened through provision of professional training and equipment in order to improve forest fire prevention, preparedness and initial suppression capabilities.

Considering the increasing degradation and destruction of the forests of the country as a consequence of climate extremes, socio-economic changes and fire, as well as secondary damages or disasters following the fire, it should be considered to elevate the status of P.E. “Macedonian Forests” to a National Forest Service mandated to have primary responsibility and supervisory functions for forestry and forest protection, notably fire protection, in the whole country.

This would follow the principle of “land managers being responsible for fire management”. The negative experiences in other countries, notably in Greece, where urban-focussed fire services have prime responsibility for rural fire management, should be taken into consideration when taking decision to strengthen the land manager’s capabilities.

However, the improvement of efficient support of the professional and voluntary fire services to P.E. “Macedonian Forests” is very crucial.

Given the need on the one side, and the availability / willingness of civil society on the other side, to involve civil and voluntary engagement on forest fire management it is urgently recommended to implement Article 22 (1) (11) of the Law on Local Self-government: “Fire Protection Provided by the Territorial Fire-fighting Units” i.a.w. the Law on Fire Protection (“Official Gazette of the Republic of Macedonia” No. 67/04), especially considering Article 7, which is stipulating:

(1) For the purpose of extinguishing fires in woods and open spaces, under circumstances of increased danger of occurrence of such fires, the municipalities – at a request of the Protection and Rescue Directorate – shall engage seasonal firemen, who operate as part of the units of Article 5 herein. Priority in engaging seasonal firemen is given to firemen working in voluntary firefighting units and associations in which they have been active for at least two years.

It is recommended that UNDP to sponsor the national dialogue necessary for the development of a national fire management strategy. A National Round Table on Fire Management could be facilitated through the GFMC and the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network. This network can contribute with relevant expertise.

5.3 Fire suppression hardware

As reported by local / regional authorities and confirmed by the Mission, the firefighting equipment in FYR Macedonia is obsolete. In most regions the firefighting equipment is outdated, often broken.

Besides a need for fire management training there is a need to strengthen the technical capabilities of the Fire Services by upgrading the fire suppression hardware

It is suggested that UNDP take the lead to support the country in resources mobilization and procurement of services and equipment for improving fire management capabilities. This project would constitute the hardware delivery and should be closely coordinated with the “soft” component of capacity building of human resources, tentatively to be covered by the ENVSEC / CoE EUR-OPA mechanism (cf. 5.1). The hardware to be purchased would constitute a number of model units for wildfire response, fully equipped with vehicles, tools and personal protective equipment (PPE).

The purchase of hardware component through a UNDP initiative should support the Government of FYR Macedonia in making decisions for further investments in forest fire management.

5.4 Rehabilitation and securing the stability of fire-damaged forests and other lands

The rehabilitation measures to be taken in order to secure regeneration or reforestation of fire-damaged lands and to prevent secondary pests (e.g., bark beetle infestation) or secondary disasters and other detrimental post-fire effects (loss of topsoil and soil nutrients by erosion; landslides, mudslides, flash floods and extended floods as a consequence of increased surface runoff) need to be planned carefully. This task is primarily conducted by P.E. “Macedonian Forests”. The decision about the future stocking of the fire-damaged lands must be taken carefully. Pine reforestations will continue to be vulnerable to wildfire, particularly on areas with limited access, e.g. on steep terrain and lacking forest roads. It is strongly recommended to analyze the historic and potential natural vegetation of fire-affected sites in order to avoid reforestation with the wrong species (e.g. pine reforestations in places that should better be reforested with oak species), and to consider future climate conditions and the overall wildfire risk.

Securing of the stability of fire-damaged stand must include carefully sanitation cuttings, particularly for the prevention of mass outbreaks of bark beetles in fire damaged opine forests. Attention should be paid, however, to avoid cutting of partially fire-affected trees (scorched trees) which could survive if properly protected from bark beetle infestation. Monitoring of bark beetle populations with pheromone traps is recommended.

Sensitive watersheds must be reforested with highest priority in order to prevent the loss of soil and excessive surface run-off of water during heavy rainfall events. P.E. “Macedonian Forests” must be provided the necessary funding to implement the rehabilitation of the damaged areas during the winter 2007-2008.

5.5 Proposal for a EU Twinning project for fire management

As the FYR Macedonia is aiming at joining the EU, it should be considered to initiate a “Twinning” (or Twinning Light) project between FYR Macedonia and a EU member state, to adapt Macedonian legislation and practical procedures in forest and fire management. The GFMC and the Forestry Faculty of Skopje / UNISDR Regional SE Europe / Caucasus Wildland Fire Network are available to facilitate the development of a Twinning request.

5.6 Proposal for a coordinated regional (Balkan) fire management strategy

The concurrent problems and needs of all neighbouring Balkan countries to improve fire management capabilities are implying a regional approach to be taken in which the limited capabilities of the Balkan countries to encounter the fire problems would be strengthened by coordinated, collective and mutually enabling action. In 2006-2007 the UNISDR Regional SE Europe / Caucasus Wildland Fire Network developed a draft regional strategy on cooperation in wildland fire management, which is offering an initial concept of regional cooperation (Appendix 5). There is a need to further develop the strategy at inter-governmental level.

UNDP, through the GFMC and the UNISDR Regional SE Europe / Caucasus Wildland Fire Network, flanked by ENVESC and CoE / EUR-OPA, could support the endeavors to strengthen the regional dialogue and networking.

Concrete proposals for immediate action, e.g. the establishment of a Regional Fire Monitoring Center for the Balkan region or the inclusion of the Balkan languages into the international Wildland Fire Management Glossary could be implemented relatively swiftly and at moderate costs.

5.7 Proposal for a Balkan Regional Fire Crisis Conference or Summit

At the time of delivery of this report the fire season in the FYR Macedonia and neighbouring countries is almost over. From Bulgaria in the North down to Greece in the South of the Balkans all countries have suffered an unprecedented severe fire season in 2007. The severity of the fire season – and this should be evaluated. Decisive action must be taken to address the underlying causes for the extreme fires and to reduce the increasing vulnerability of forests and society to fire.

The Balkan countries have recognized the inter-connectedness and interdependence of the natural space and its protection efforts. The autumn rains have begun. The region should not go to hibernation. Instead, it is suggested to call urgently for a “Regional Balkan Wildland Fire Crisis Conference” (or “Summit”), in which highest-level possible government commitment should be sought. The summit should

- Address the underlying causes of increasing threats of wildfires to the environment and society, notably the consequences of land-use change and climate variability
- Outline the need for the development of national policies and strategies addressing land-use, forestry and forest protection, nature conservation and fire management
- Elaborate agreement for strengthening fire management capabilities in the region through standardized and joint regional training and introduction of improved technologies for wildfire suppression
- Development of border-crossing mechanisms and agreements on mutual assistance in fire emergency situations

The Global Fire Monitoring Center (GFMC) through the UNISDR Global Wildland Fire Network and its regional network – the UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network – are available to facilitate this process.

This crisis summit should be co-sponsored by those who have been involved in mastering the fire crisis in the region in 2007 and / or are available to assist the region to build capabilities in fire management. It is suggested that the main actors to be invited to provide joint auspices would include, among other, UN specialized agencies and programmes (UNDP, UNEP, the Joint UNEP / OCHA Environment Unit, FAO), the European Commission, Council of Europe / EUR-OPA, ENVESC, OSCE and NATO.

6. Appendices

1. Weather pattern 2007 and data long-term average climatological data
2. Forest fire statistical data (long-term and 2007 fire season)
3. Satellite reconnaissance of fires and international assistance
4. Photographs of the mission

Appendix 1

Weather Pattern 2007 and Long-term Average Climatological data

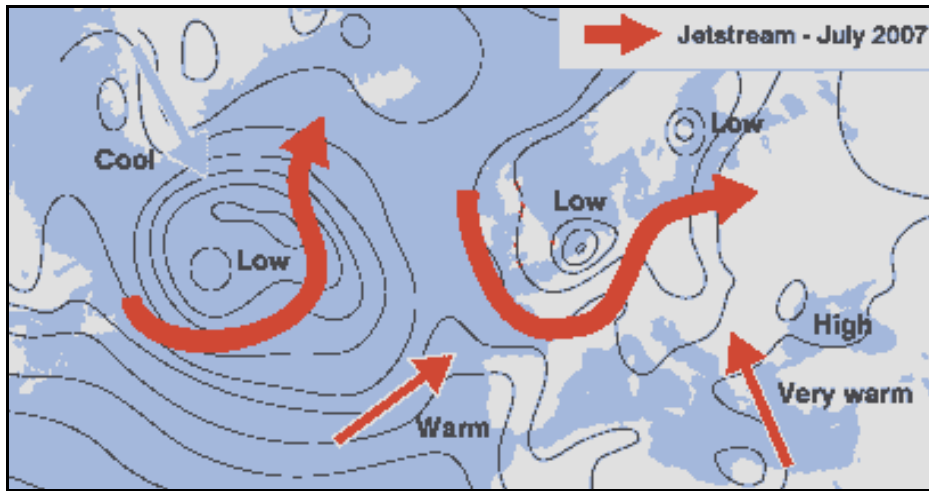


Figure 1. In summer 2007 the jet stream was flowing further south as compared to average years, allowing low pressure systems to sweep over Western / Atlantic Europe. Warmer air was pulled from Africa, which was sweeping over Southeastern Europe. Example of pressure chart: 24 July 2007. Source: UK Met Office

Table 1. Climatological information for FYR Macedonia: Average weather data provided by WMO

Month	Mean Temperature °C		Mean Total Rainfall (mm)	Mean Number of Rain Days
	Daily Minimum	Daily Maximum		
Jan	-3.6	4.0	36	10
Feb	-1.3	8.4	36	9
Mar	1.9	13.6	40	10
Apr	5.4	18.6	40	10
May	10.0	23.9	60	11
Jun	13.0	27.4	46	10
Jul	14.8	29.8	34	7
Aug	14.6	30.0	27	6
Sep	11.4	26.1	36	6
Oct	6.3	19.5	42	7
Nov	1.4	11.2	56	9
Dec	-2.2	5.3	51	11

Source: WMO <http://worldweather.wmo.int/090/c00199f.htm#wxforecast>

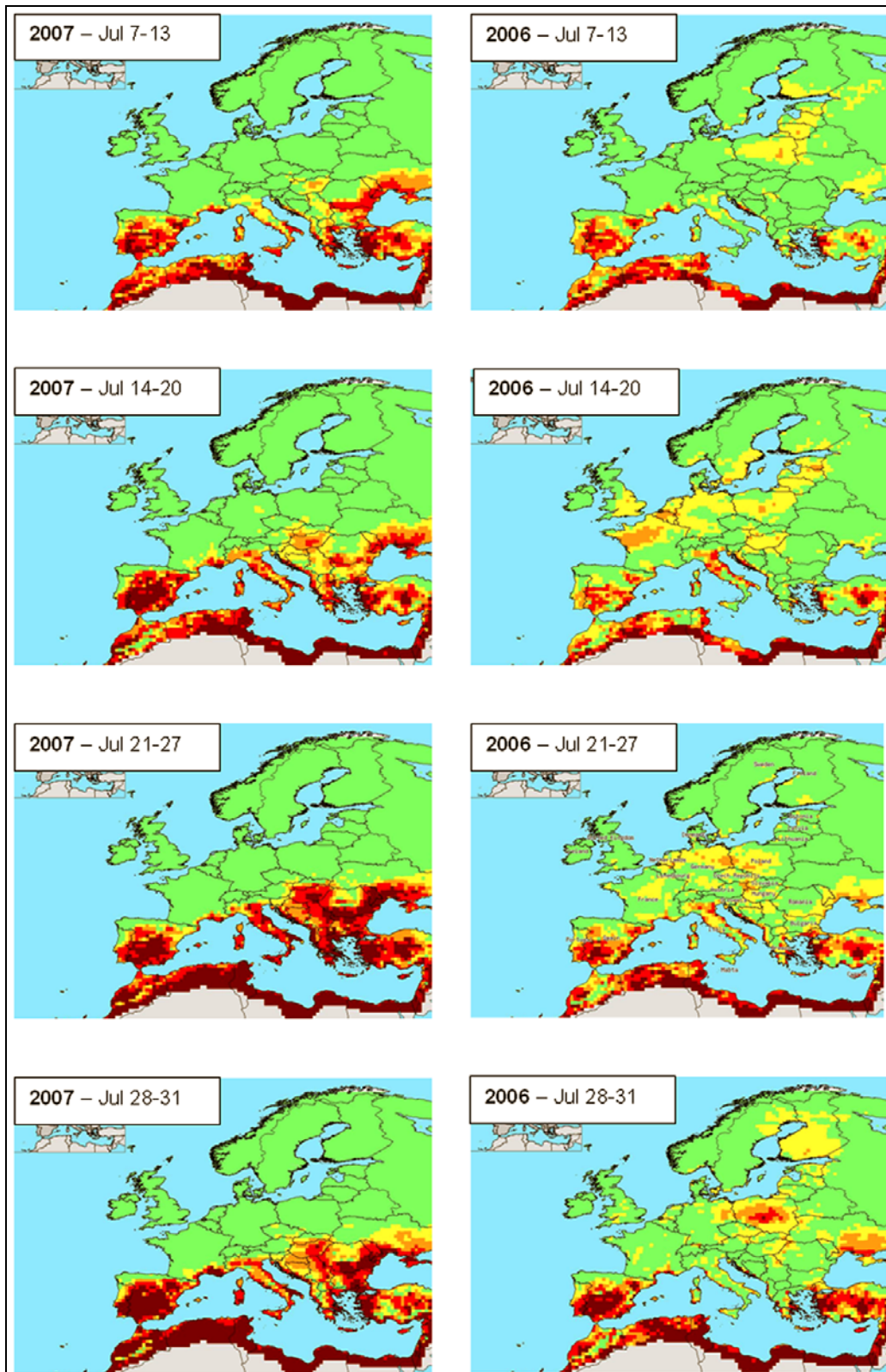


Figure 2. The extreme heat and dryness in the Balkan region is reflected by the weekly averages of fire danger level, which were determined by the Joint Research Center (JRC) using the Fire Weather Index (FWI). An example for the month of July for Europe including the Balkans (left column) as compared to 2006 (right column) has been extracted from the European Forest Fire Information System (EFFIS) Newsletter No. 7 (6 September 2007).

Appendix 2

Forest Fire Statistical Data: Long-term and 2007 Fire Season

Table 2. Overview of forest fires in the FYR Macedonia for the period 1 January to 31 July 2007. Source: Private Enterprise "Macedonian Forests". Note: 1 Euro = 60 denars. The total damages / costs of 1,255,626,112 denars correspond to 21 million Euro.

	Administrative Unit	Number of Fires	Burned Area (ha)	Burned Timber (m ³)	Suppression Costs (denars)	Total Damages / Costs (denars)
1	Malesevo - Berovo	17	1548.8	163931.0	567,556.00	75,265,125.45
2	Ravna Reka - Pehcevo	23	424.0	800.0	436,001.00	1,815,285.00
3	Osogovo - K.Palanka	15	179.7	1436.2	254,054.00	13,104,280.00
4	Kratovo - Kratovo	4	105.0	3300.0	245,719.00	1,621,159.00
5	Osogovo - Kocani	17	403.1		544,287.00	544,287.00
6	Serta-Stip	6	443.6	8446.0	342,000.00	80,534,800.00
7	Plackovica - Radovis	19	486.8	4236.0	441,100.00	1,920,900.00
8	Plackovica - Vinica	43	733.0	2000.0	750,370.00	4,802,675.00
9	Belasica - Strumica	33	2346.8	816.0	431,304.00	520,584.00
10	Salandjak - Valandovo	6	28.5	184.0	55,500.00	398,650.00
11	Kozuv - Gevgelija	14	1855.2	31254.0	565,560.00	16,583,041.77
12	Demir Kapija - D.Kapija	8	124.5	615.0	200.,00.00	687,610.00
13	Bor - Kavadarci	12	245.5	197.0	334,869.00	8,077,429.00
14	Crn Bor - Prilep	18	664.0		502.,07.00	502,107.00
15	Babuna - Veles	47	2396.9	40196.0	2,688,137.00	66,572,582.00
16	Sumarstvo - Sv. Nikole	7	93.0		475,800.00	475,800.00
17	Kajmakcalan - Bitola	10	6022.0	132020.0	727.,60.00	298,013,230.00
18	Bigla - Demir Hisar	24	1165.6	42444.3	1,158,305.50	14,852,867.63
19	Lipa - Krusevo	2	462.0	21489.0	47,650.00	8,997,462.00
20	Prespa drvo - Resen	6	110.0		225,860.00	375,860.00
21	Galicica - Ohrid	15	452.3	1826.0	279,952.00	3,115,129.00
22	Jablanica - Struga	16	632.0	350.0	478,860.00	478,860.00
23	Stogovo - Debar	5	28.0	195.0	18,000.00	388,500.00
24	Lopusnik - Kicevo	55	1696.8	14640.0	1,506,054.00	80,474,289.50
25	Sandanski - M.Brod	32	1374.5	34022.5	1,422,720.00	49,608,975.00
26	Sar - Gostivar	17	1395.2	26317.2	334,689.00	15,818,196.00
27	Lesnica - Tetovo	41	1739.4	9417.0	176,285.00	125,956,647.60
28	Karadjica - Skopje	52	3297.9	46397.5	2,736,250.00	361,380,750.00
29	Kumanovo - Kumanovo	12	1831.0	5395.0	1,017,740.00	22,461,160.00
30	Golak - Delcevo	13	379.9	80.0	277,870.00	277,870.00
	Total	589	32,665	592,005	19,243,360	1,255,626,112

Table 3. Number of forest fires in FYR Macedonia for the period from 1989 to 2005 (Source: Ministry for Internal Affairs - MIA)

Land Use	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	Average
Deciduous	33	65	9	57	111	68	9	15	26	26	256	395	58	26	25	22	13	1 214	71.4
Coniferous	11	43	6	32	50	23	3	18	36	20	34	133	26	5	22	22	18	502	29.5
Mixed	31	73	11	98	141	65	9	40	78	73	82	454	60	21	41	26	20	1323	77.8
Shrub forests	9	37	4	26	43	14	0	5	10	11	-	-	7	4	0	1	1	172	10.1
Other	11	23	8	22	45	25	3	12	24	21	80	205	14	3	8	2	6	512	30.1
Total-forests	95	241	38	235	390	195	24	90	174	151	452	1187	165	59	96	73	58	3723	218.9

Table 4. Burned area in FYR Macedonia for the period from 1989 to 2005 (Source: MIA)

Land Use	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	Average
Deciduous	172.2	1 987.6	49.5	904.4	6 034.3	1 486.3	47.5	54.3	271.0	160.9	1062.2	16 182.9	2 468.7	472.3	491.7	890.00	766.5	33 502.3	1 970.7
Coniferous	40.5	1260.6	5.7	208.2	1 368.2	2 523.1	1.3	100.6	1 299.7	156.7	332.1	1 660.5	1 007.7	5.2	115.6	92.87	227.1	10 405.67	612.1
Mixed	118.8	876.4	35.9	7 632.9	4 446.8	1 471.8	5.4	429.8	652.7	1 282.1	343.2	17 345.4	2 888.6	111.1	3 025.8	589.18	2985.7	44 241.58	2 602.44
Shrub forests	1 258.8	1 214.0	345.0	359.6	462.9	174.3	0.0	85.0	1 138.3	21.5	0.0	0.0	77.5	44.5	0.0	1.50	1.0	5 183.9	304.9
Other	43.1	421.8	7.7	285.1	2 111.6	146.2	51.2	316.4	2 12.1	268.0	254.5	2 739.7	224.3	26.0	303.2	10.50	36.3	7 457.7	438.7
Total-forests	1 633	5 760	444	9 390	14 424	5 802	105	986	3 574	1 889	1 992	37 929	6 667	659	3 936	1 585	4 017	100 791	5 929

Appendix 3

Satellite Reconnaissance of Fires and International Assistance

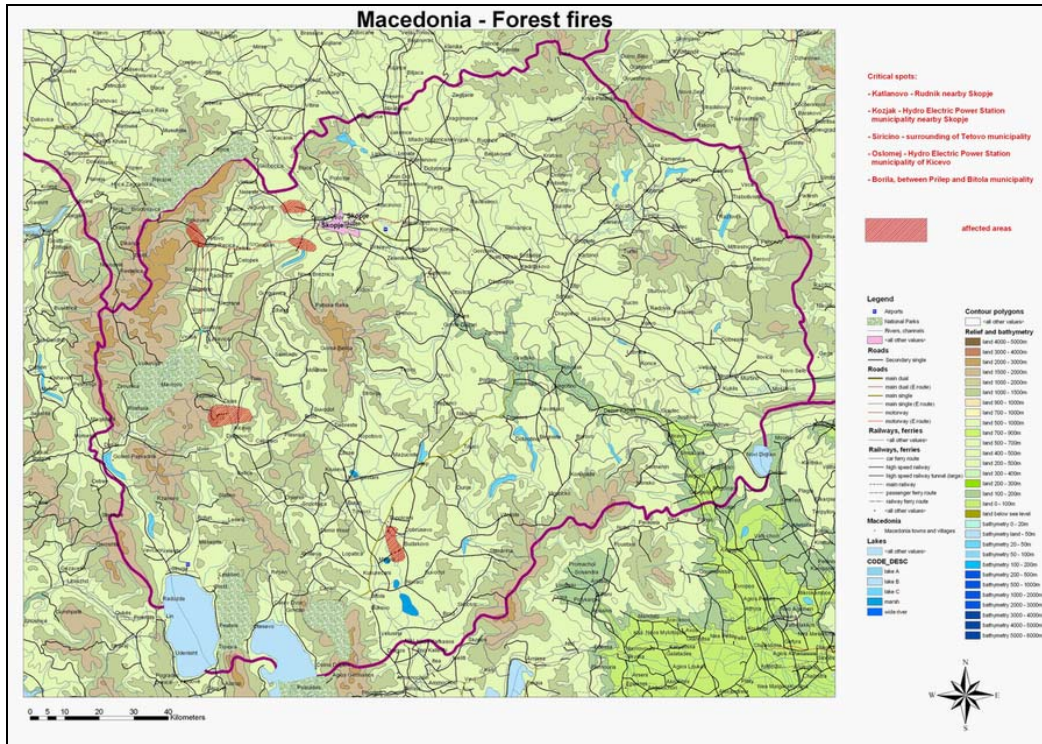


Figure 3. Fire location map provided by Relief Web (27 July 2007)

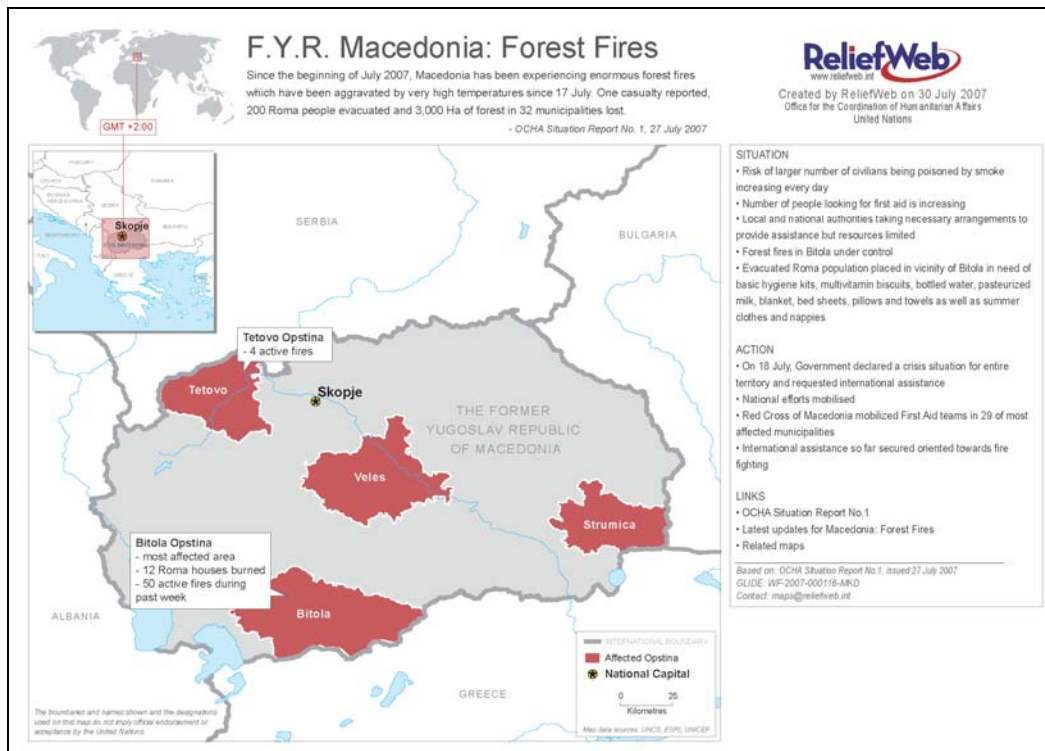


Figure 4. Fire location map provided by Relief Web (30 July 2007)

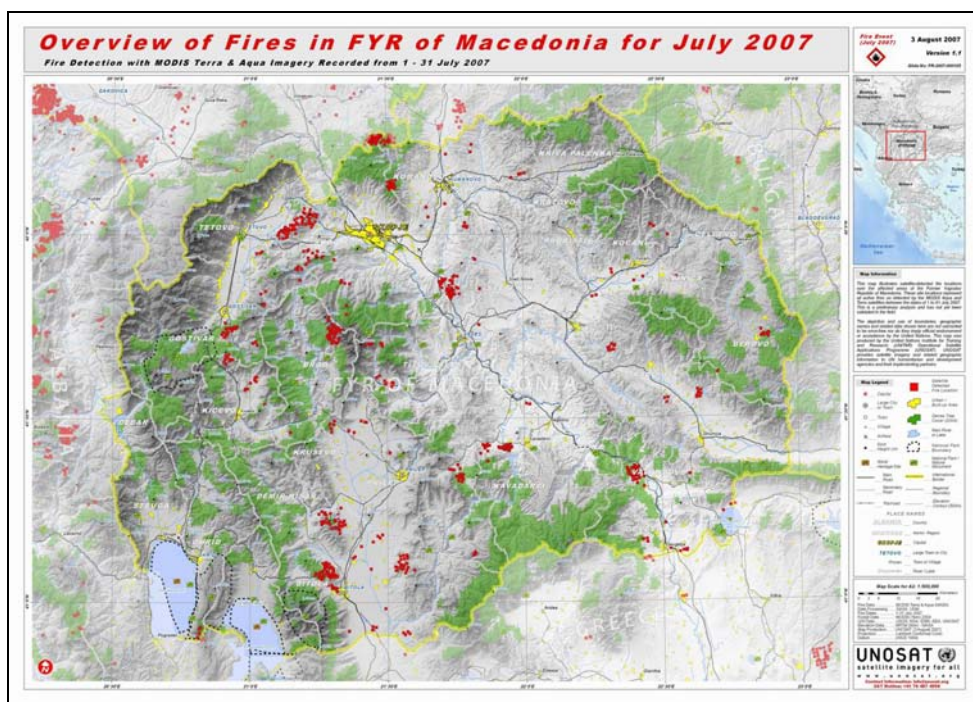


Figure 5. Fire location map provided by UNOSAT for the period 1-31 July 2007

Table 5. Received assistance for the fire crisis situation in 2007

Received Assistance for the Wildfire Crisis Management						
	State or Institution	Assistance in FF equipment	Assistance in expertise	Financial assistance	Value (\$US)	Value (€)
1.	Norway	FF equip.				494,963
2.	Sweden	FF equip.	2 experts		110,375	
3.	France	1 FF vehicle	6 experts			
4.	Austria	FF equip.	2 experts			7,100
5.	Germany	FF equip.				50,000
6.	Poland	FF equip.				110,000
7.	Czech Rep.	FF equip.				
8.	U K	FF equip.	4 experts			
9.	Estonia	/				31,956
10.	Denmark	FF equip.				
11.	Israel	FF equip.				
12.	Lithuania	FF equip.				
13.	UNDP	/		100,000	100,000	
14.	UN OCHA	Relief items		30,000	30,000	
15.	UNICEF	Relief items		100,000	100,000	
16.	USAID	/		50,000	50,000	
				Total	390,375 \$US	694,000 €

Appendix 4 - Photographs

Selected photographs illustrate main fire phenomena encountered during the field mission.



Burned pine forest on a site with high erosion risk



Fire-affected informal settlement of Roma at the outskirts of Bitola



Infrastructure, e.g. telephone lines and electric power transmission lines at risk



Unexploded Ordnance (UXO) collected in the surroundings of Bitola and stored in the Army Base Bitola: During the fires in July 2007 more than 70 explosions of WW-I grenades and other UXO were recorded nearby Bitola.



The electric power plant Oslomej near Kicevo was at threat to be affected by wildfires burning at the very edge of the facility (left in the photograph) by burning embers (spot fires) falling out on the structures of the power plant.