EUROPEAN UNION FOREST FIRES, CORRELATED WITH THE CLIMATE CHANGE

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ABSTRACT

Fire is a worldwide phenomenon that appears in the geological record soon after the appearance of terrestrial plants. Fire influences global ecosystem, including vegetation distribution and structure, the carbon cycle, and climate. Although humans and fire have always coexisted, our capacity to manage fire remains imperfect and may become more difficult in the future as climate change alters fire regimes (Bowman *et al.*, 2009). Estimates from the European Forest Fire Information System (EFFIS) show that 200 000 hectares of land in the EU have already burnt till august 2009, compared to a total of 180 000 in 2008. The most affected states were Spain and Italy because of the extreme fire weather conditions in the second half of July. Many studies from all over the world, demonstrated a strong link between the climate change and the increase of forest fires (Flannigand *et al.*, 2000). In the future, under a warmer climate, we expect more severe fire forests, more area burned, more ignitions and a longer fire season.

Key words: climate change, fire, greenhouse gases, damages.

INTRODUCTION

Information on forests is essential, as forests play a key role in aspects related to the protection of European ecosystems, biodiversity, the sustainable use of natural resources, carbon sequestration and climate change. Forests are the biggest and the most important CO_2 stocker and when this stocker is distroied of various activities such as deforestation or fires, the Earth mechanism suffers an enormous and bad imbalance. If a forest is distroied by fire, two negative phenomenon happen: less CO_2 is stored and important quantities of CO_2 and other greenhouse gases are released in the atmosphere. If the quantity of GES increases, the greenhouse effect is getting more and more emphasize. This leads to one fact: climate change.

RESULTS AND DISCUTIONS

Humans and climate both play a role in determining fire and, in turn, fire influences the climate system with the release of carbon. In a world without fire, more carbon would be stored in woody vegetation. If climate and fire regimes equilibrate, then fire-induced atmospheric CO_2 emissions are balanced by uptake from surviving vegetation or via regeneration. The individual contributions of landscape fires, biomass combustion for domestic and industrial uses, and fossil-fuel combustion to total carbon emissions remain difficult to separate (Bowman and co., 2009). Currently, all sources of fire (landscape and biomass) cause CO_2 emissions equal to 50 % of those stemming from fossil-fuel combustion. Forest fires in particular, are responsible for 1/5 of the atrophic greenhouse effect.

In Europe, each year thousands forest are affected by fire. Some fires long for days and weeks, leaving behind a desolated view and causing important economical damages. Also, every year civilians and firefighters lose their lives fighting against forest fires.

SOUTHERN MOST AFFECTED MEMBER STATES (1980 – 2008**)**

The long time series of forest fire data available for these 5 southern countries (Portugal, Spain, France, Italy, and Greece) justifies a separate analysis as has been the case in previous reports. During 2008, fires in these 5 countries burned a total area of 158 621 hectares, which is not only quite below the average for the last 29 years, but it is the minimum value since 1980. The number of fires that occurred (36.192) is also well below the average and the minimum since 1990 (Fig. 1and 2).

Fig. 1 Number of forest fires in the Southern Member States (2000-2008)

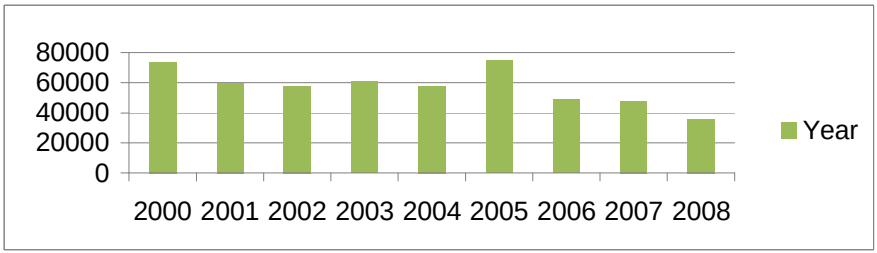
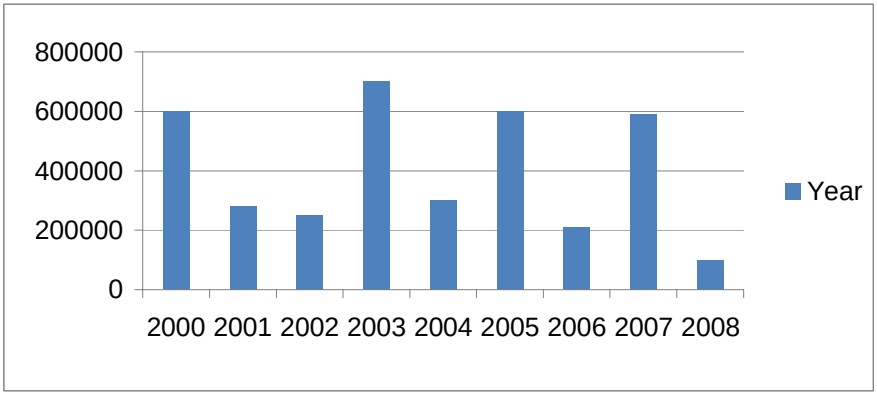


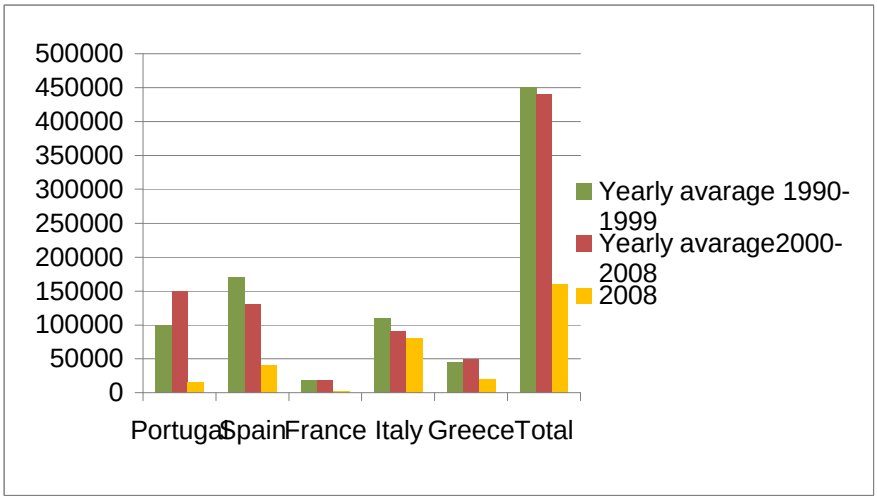
Fig. 2 Burnt area in the Southern Member States (2000-2008)



Since the area of each country is different, and the area at risk within each country is also different, the comparation among countries cannot be absolute. During 2008 the share of number of fires among countries is reflecting the averageshare during last decades, i.e., in a relative sense the fires were distributed among countries as usual. On the other hand the burned area was concentrated in Italy and Greece more than usually (60 % of the total burned area in southern Europe against an average of 35 %). (Fig. 3 and 4).

Over the last 8 years, the previous tendency of the five southern Member States towards an increase in the number of fires seems to be stabilized or even starting to decrease (EFFIS Report no. 9). This may possibly be due to the positive effect of the public information campaigns carried out in all the countries and the improvements in the prevention and fire-fighting capacities.

Fig. 3 Burnt area in the Southern Member States



The other European countries were also affected in a various way, depending of their climate. The situation for the other countries needs to be separately analyzed, because of the fact that the number of forest fires and burnt areas are very different compared to the five southern states presented above. A centralized data regarding forest fires in Europe can be observed in Table 1 and Table 2.

Tab. 1 Forest fires in Europe (2000-2008)

Nr. Crt.	Country	2000	2001	2002	2003	2004	2005	2006	2007	2008
1.	Austria	-	-	-	-	-	954	912	750	-
2.	Bulgaria	1.710	825	402	452	294	241	393	1.479	582
3.	Croatia	7.797	4.024	4.692	6.923	2.853	3.368	3.571	5.176	-
4.	Cypru	285	299	243	427	221	185	172	111	114
5.	Czech Rep.	1.499	483	604	1.754	873	619	697	-	-
6.	Estonia	-	-	356	111	89	65	248	64	71
7.	Finlanda	806	796	2.489	1.707	783	1.069	3.046	1.204	1.451
8.	FYROM	-	-	-	-	-	-	-	652	573
9.	Germany	1.210	587	513	2.524	626	496	930	779	818
10.	Hungary	811	419	382	375	104	150	97	603	502
11.	Latvia	915	272	1.720	900	647	365	1.929	425	700
12.	Lithuania	654	287	1.596	885	468	301	1.545	251	301
13.	Poland	12.428	4.480	10.101	17.088	7.219	12.803	11.828	8.305	9.091
14.	Romania	688	268	516	203	34	64	105	478	91
15.	Slovakia	824	311	570	872	153	287	237	463	182
16.	Slovenia	-	-	60	224	51	73	112	140	74
17.	Sweden	4.708	4.831	6.490	8.282	4.955	4.573	4.618	3.737	5.420
18.	Switzerland	49	48	67	154	49	63	46	39	46
19.	Turkey	2.353	2.631	1.471	2.177	1.762	1.530	2.227	2.829	2.135

Tab. 2 Burnt areas in Europe (2000-2009)

Nr. Crt.	Tara	2000	2001	2002	2003	2004	2005	2006	2007	2008
1.	Austria	-	-	-	-	-	74	75	48	-
2.	Bulgaria	57.406	20.152	6.513	5000	1.137	1.456	3.540	42.999	5.289
3.	Croatia	129.883	27.251	74.945	77.359	8.988	21.407	18.782	63.719	-
4.	Cipru	8.034	4.830	2.196	2.349	1.218	1.838	1.160	4.483	2.392
5.	Cehia	375	87	178	1.236	335	227	53	-	-
6.	Estonia	-	-	2.082	207	379	87	2.638	292	1.280
7.	Finlanda	262	174	584	664	351	495	1.617	576	824
8.	FYROM	-	-	-	-	-	-	-	32.665	5.915
9.	Germania	581	122	122	1.351	274	183	482	256	538
10.	Ungaria	1.595	-	1.227	845	247	3.531	625	4.636	2.404
11.	Letonia	1.341	311	2.222	559	486	120	3.387	272	364
12.	Lituania	352	113	746	436	253	51	1.199	38	112
13.	Polonia	7.013	3.429	5.593	28.554	4338	7.387	5.912	2.844	3.028
14.	Romania	3.607	1.001	3.536	762	124	162	946	2.529	373
15.	Slovacia	904	305	595	1.567	157	524	280	679	118
16.	Slovenia	-	-	161	2.100	138	280	1.420	128	75
17.	Suedia	1.552	1.254	2.626	4.002	1.883	1.562	5.710	1.090	4.280
18.	Elvetia	68	17	697	640	23	41	108	282	65
19.	Turcia	26.353	7.394	8.513	6.644	4.876	2.821	7.762	11.664	23.577

Of particular interest is the analysis of the damages caused by fires to the areas protected within the Natura2000 network, as they included habitats of especial interest which are home

for endangered plant and animal species. The category of Natura2000 areas only exists in the countries of the European Union. The area burnt within the Natura2000 sites in 2008 is presented in Table 3.

Tab. 3 Area burnt in 2008 within Natura 2000

Country	Area (ha)
Bulgaria	2228.02
France	1015.70
Greece	4561.20
Italy	5330.67
Portugal	838.98
Spain	4589.86
Total	18564.42

Forest fire damage in 2008 are the lowest on record. With a reported total of 158 621 hectares compared to an annual average of 483 896 hectares, the burnt area and damage assessed in 2008 have been the lowest on record since 1980 for Southern Europe. Last year's favourable meteorological conditions led to low fire danger levels around the Mediterranean with a few exceptions recorded in the South-East where drought conditions and a few extreme fire danger episodes caused a 1 362 hectare fire on the 18 th June in Cyprus, about 15 000 hectares burned in Greece (mostly in Rhodes) in the second half of July and almost 20 000 hectares burned in Turkey in the first week of August. In other parts of Europe the impact of forest fires was also below the average of the last 15 years with 22 000 hectares compared to an average of 30 000 hectares. Only Scandinavian countries experienced extreme episodes due to unusual drought and high temperatures during the first half of June (a 13 day fire in Sweden burned 1 170 hectares of forest, and a record fire in Norway burned more than 2 700 hectares – the largest fire in the country for the last 50 years). But, if 2008 was a "good" year, the recent records show that 2009 will be very affected by forest fires. In Romania, for example, till October 2009, 186 forest fires occurred, affecting a 974 ha surface, compared with 91 forest fires and 373 ha burnt in 2008 (Fig. 5 and 6):

Fig. 5 Number of fires in Romania during 1986-2009

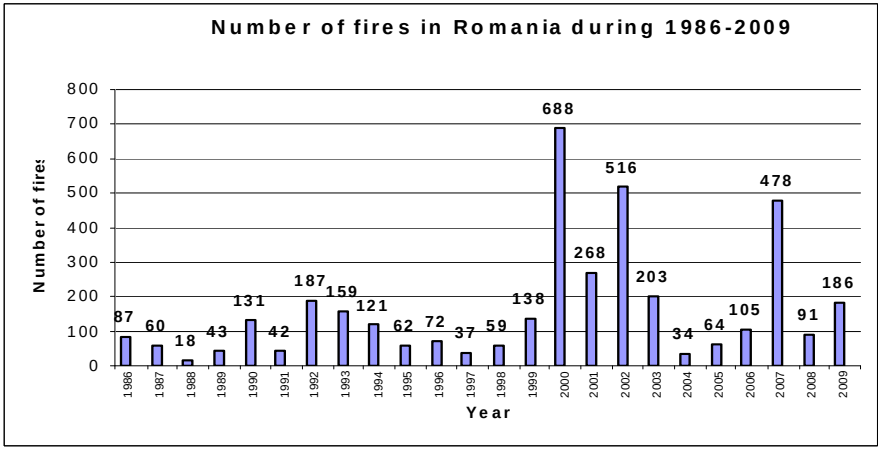
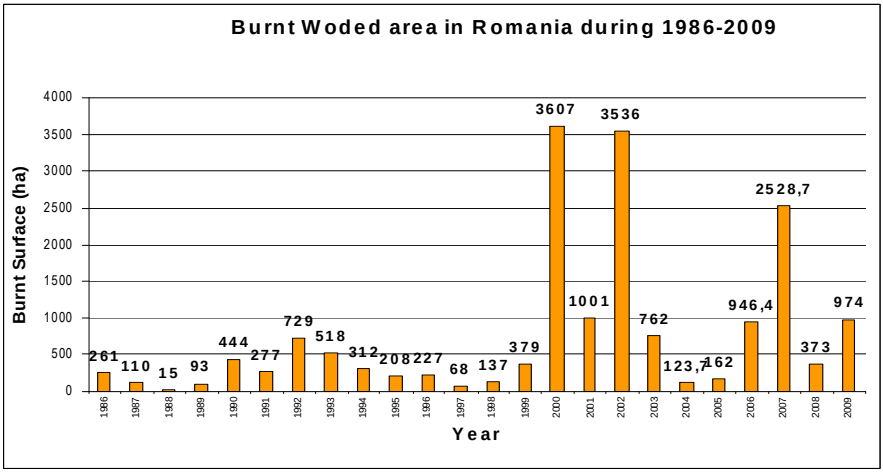


Fig. 6 Burnt woded area in Romania during 1986-2009



The couses of forest fires are various, starting with the natural once and ending with the criminal hand couse. Most european countries classify forest fire causes in the next main categories:

1. Unknown causes
2. Known causes
    - 2.1 Natural causes (climate change, lightning, vulcanos, earthquakes)
    - 2.2 Human causes
        - 2.2.1 Criminal causes
        - 2.2.2 Negligence causes
            - 2.2.2.1 Agricultural practices
            - 2.2.2.2 Pathways
            - 2.2.2.3 Public causes
            - 2.2.2.4 Electric lines
            - 2.2.2.5 Railways

The 2 main causes for forest fires are represented by the climate change (the weather is warmer and the temperatures are higher, fact that lead to forest autoignition) and human neglijence.

CONCLUSIONS

- Forest is a very important ecosystem, because it stores the biggest quantity of CO2 from the atmosphere and it is home for thousand plants and animals.
- Forest fires and climate change strongly interact.

- all sources of fire cause CO2 emissions equal to 50% of those stemming from fossil-fuel combustion.
- Forest fires in particular, are responsible for 1/5 of the atrophic greenhouse effect.
- In Europe, the number of forest fires seems to increase in 2009, compared to 2008.
- The countries most affected by the forest fires in Europe were: Portugal, Spain, France, Italy, and Greece.
- The 2 main causes for forest fires are represented by the climate change and human neglijence.

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