

The mitigation of fire damage in natural ecosystems (the experience of the Republic of Belarus)

In the European Union there are about 176 million hectares of forest (i.e. 42% of the EU territory is covered by forests, which makes 5% of global forest resources). Since the sixties the forest area is increasing, although not in such a quick pace recently [1].

Forest fires are powerful natural and anthropogenic factors, significantly changing functioning and condition of the forest. Forest fires cause damage to the environment, the economy, and often human lives are at risk. For countries where forests cover a large area, forest fires are national problem, and damage to the real economy estimates of millions of Euros per year.

Number of forest fires in Europe over the past 10 years is not reduced, but there is a tendency to reduce the total area of the fires in Southern Europe, and, correspondingly, the average area of one single fire and the damage caused is reducing.

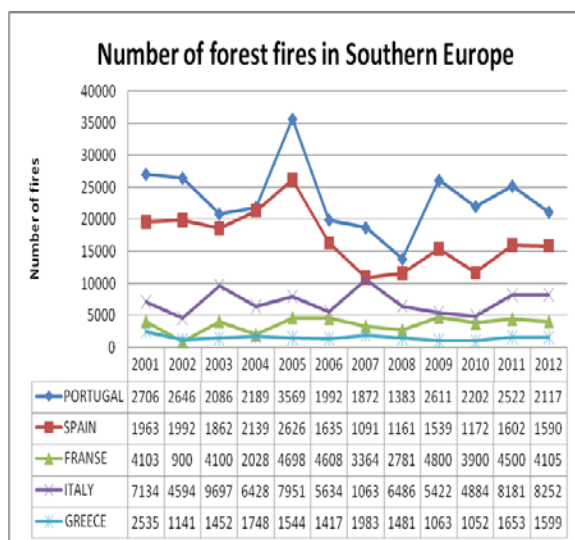


Figure 1 – Number of forest fires in Southern Europe in 2001 - 2012

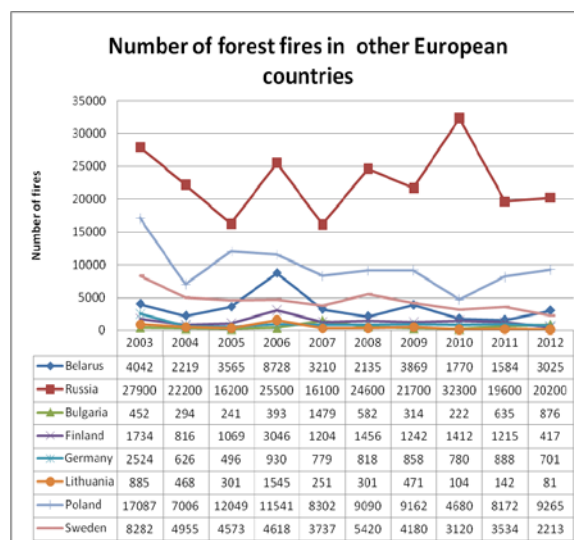


Figure 2 – Number of forest fires in other European countries in 2003 - 2012

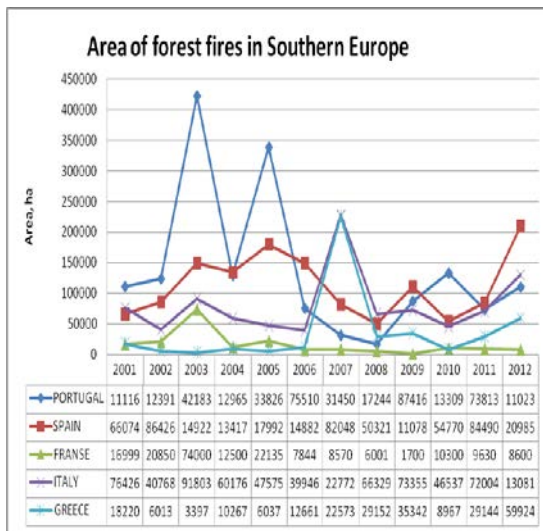


Figure 3 – Area of forest fires in Southern Europe in 2001 - 2012

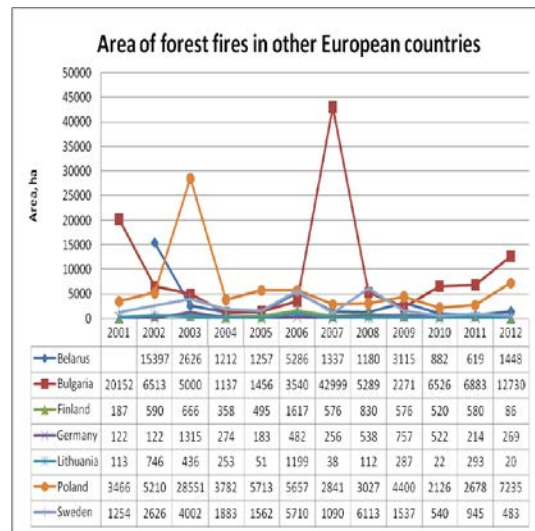


Figure 4 – Area of forest fires in other European countries in 2003 - 2012

Damage caused by forest fires includes economic, environmental, social, political and aesthetic aspects of fire attacks. Assessment of the socio-political and aesthetic aspects is very difficult due to the lack of standardized criteria and absence of developed techniques. Therefore, as a rule, only economic and environmental damage is calculated.

Economic aspect: In condition of forest fire there is a threat of adjacent settlements and enterprises destroying (burning of wood warehouses, wooden houses and other household objects). Destruction of wood, including valuable species results from it. Operation of aircraft on local airlines and riverboats is stopped because of the smoke in the atmospheric boundary layer in fire zone. Because of reducing the dose of solar radiation to the underlying surface agricultural plants are ripen later.

Ecological aspect: Forest fires lead to the destruction of existing ecosystems, destruction of forest ecosystems phytomass and animal resources. The pollution of the environment by toxic products of combustion (emissions of harmful chemicals in the surface layer of the atmosphere, smoke) is taking place. Soil erosion, reduction of river flow, desertification - all this is an after-effect of a forest fire. There is disruption of the natural carbon cycle, increasing the concentration of carbon dioxide and as a consequence - the contribution to global warming.

Socio-political aspect: There is a risk of direct exposure to those who are living near the forest, due to the smoke at the area, infrasonic waves influence. Forest fire puts in danger the lives of those who are staying in the area. Forest fires destroy people's property, their cattle, houses, etc.

Aesthetic aspect: Forest fires lead to a reduction of recreational areas, areas become unsuitable for recreation after a forest fires, time is need for recovery and using them again.

Analysis of fire after-effects shows that economic losses on 1 hectare grow with the increasing of average forest fire area. This is due to the fact that the elimination of large seats of fire requires greater number of means and forces, for example – aviation fire units.

For example, we can consider fire after-effects in Spain and in Belarus: according to the joint annual report of the Joint Research Centre and the Institute of Environment and Sustainable Development of the European Commission “Forest fires in Europe, the Middle East and North Africa 2012” loss from fires in 2012 in Spain amounted 74 327 182 Euros, the number of fires – 1590 on the area of 20985 hectares [2].

Therefore the average area of one fire in Spain was 13.9 hectares and loss on 1 hectare was 3 542 Euro. At the same time in Belarus was 544 forest fires, area is 176 hectares and loss was 56 908 Euro, average area of one forest fire was 0,31 hectares and loss on 1 hectare – 340 Euros. [3]

Comparative analysis of the ratio of single fire area and losses leads to the conclusion about the presence of objective laws, indicating fire loss increasing at the grow of a single fire area (the more the area of a fire, the more losses from it).

Loss from one fire on 1 hectare is in 10 times higher than the total loss from 10 single fires on the area of 0.1 hectare. This regularity caused by a necessity to involve more forces and resources for the extinguishing of already developed fire than for the fire of a smaller area.

It is obvious that the main way to reduce loss is prompt response and localization of separate fires on the minimal area by minimal forces.

Total area of forest resources in the Republic of Belarus is 9.42 million hectares, it occupies 38.5% of the whole country. Forest plants in the country have a high level of inflammability. Planting of the highest wildfire hazard classes occupies more than 70% of total area of the forest fund [4, 5].

The problem was escalated after the Chernobyl accident, the result of which was radioactive contamination of 1.84 million hectares of forest ecosystems, fire after-effects in which can worsen the ecological state of large regions, this is a major international problem [6, 7].

In order to reduce the number of fires and minimize losses a range of organizational, technical and fire prevention activities is carried out. To improve the efficiency of these activities the differentiated system of fire prevention activities for the forests of different classes of wildfire hazard was implemented, taking into account radioactive contamination zones.

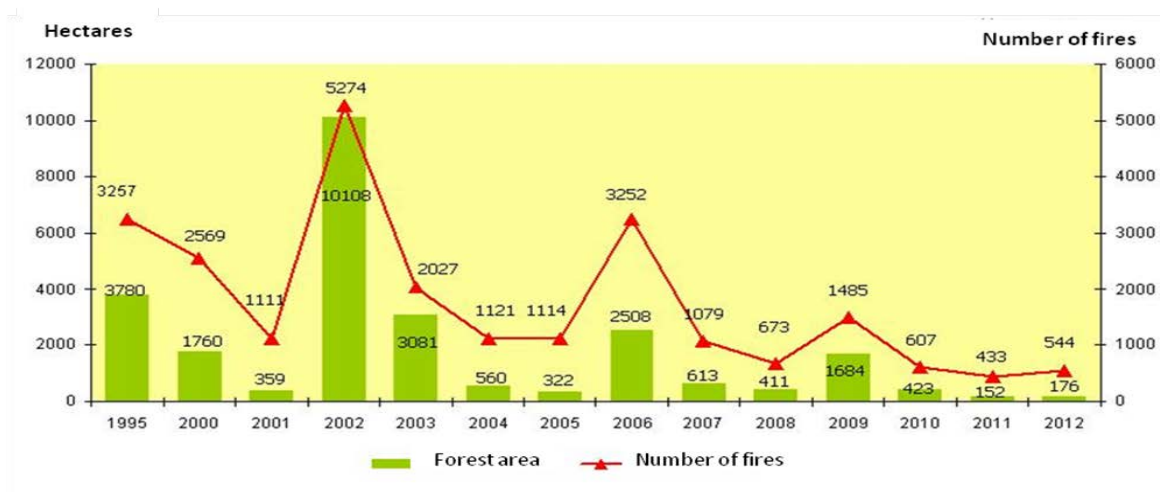
At present moment unmanned aircraft is being implemented for forests monitoring.

The space monitoring is used for the detection of fires after launching Belarusian space satellite in 2012.

The system of ground based detection of forest fires consists of 469 fire observation towers and 59 posts, more than 160 of which are equipped with video control systems for early detection of forest fires and monitoring near-by woodland territory [8].

In order to limit the spread of fires and to minimize its negative impacts on forest ecosystems in accordance with TKP 193-2009 (02080) "Guidelines of fire protecting measures for forests of the Republic of Belarus» are created fire barriers in the form of gaps and screens, mineralized bands, fire resistant plantings, a network of roads and fire ponds with its quantitative differentiation in the context of forest fire zones.

242 fire-chemical stations operate to fight forest fires, except emergency units. Stations are equipped with 445 units of firefighting equipment, water pumps of 510 different brands, 6000 sprayers, fire extinguishing means "Metaphosil" and other firefighting equipment. 1686 radio stations, including 731 stationary, 656 mobile, 299 handheld to control the forces and means during forest fires fighting [8].



Picture 5 – Forest fires in the Republic of Belarus (years 1995-2012)

Thus, the complex of fire protection measures that has been created in the Republic of Belarus ensures stable reduction of the number of forest fires, its area and damage caused by it (Picture 5).

Literature

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