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Preliminary Assessment of the Fire Situation in Western Russia in 2010

by the Global Fire Monitoring Center (GFMC)
15 August 2010

Drought, heat, people and fire in Western Russia 2010

The severity of the current heat and drought episode in Western Russia seems to be unprecedented – an assessment that is based on the current public perception – and supported by a preliminary analysis of available weather data since the beginning of documented weather records 130 years ago.

While the current drought is a short-term event that has created conditions for easy ignition and fast spread of wildfires – there were no fires ignited by "natural causes". "Self ignition" was attributed to be a major cause in the beginning of the fire and smoke episode – a quite convenient explanation to detract attention from the fact that the vast majority of fires have been set by people. Negligent use of fire in agriculture, accidental fires caused by forestry operations, and most importantly leisure fires, such as barbecue fires or even fireworks, most likely have been the main causes of ignitions.

More important factors that have influenced the fire hazard of the region are the recent socio-economic changes in rural Western Russia. Similarly to many regions in Western Europe intensive traditional agriculture and pastoralism is being successively abandoned. Young people are urbanizing, and many former peasant villages are becoming now weekend or summerhouse resorts, with urban people living there temporarily in vacations, without having dependence on and responsibility for careful and sustainable management of lands that are surrounding these resorts. Barbecue fires running out of control, as well as abundant uncontrolled garbage pollution in forests and along rivers, are phenomena that had been noted increasingly over the last years – but society and authorities did not respond.

Public policies affecting fires

Another very recent development that had dramatic influence on the nation's capabilities in fire management is the enactment of the Russian Forest Code on 1 January 2007. Responsibility for forest management and forest fire protection transited to the regions. By summer 2010 many regions were not prepared to prioritize investments for capacity building, equipment purchase and the necessary wide range of measures in fire prevention and preparedness for wildfire situations. Private forest concessions that are sprawling all over the country are responsible for fire protection by law (the Forest Code) – but in reality are hardly following the rules. With the reported loss of workplace of about 70 000 forest wardens all over Russia the authority of the government to ensure sustainable forest management and to reduce illegal forestry activities has dramatically weakened. The traditional system of forest fire protection, coordinated and implemented from central level through the National Aerial Forest Fire Center *Avialesookhrana* and its 24 regional bases and sub-regional units with its specialized forest firefighters, has been abolished.

During the fire summer of 2010 the local fire brigades, the units of the Emergency Ministry EMERCOM and the Armed Forces tried to fill this gap, understaffed, with insufficient or inadequate firefighting equipment. The handful of firefighting airplanes in the possession of EMERCOM were a rather limited resource to cover a forest area of more than 600 million hectares of forests that are classified to be protected from fire (out of the total area of 1.14 billion hectares of the total Russian Forest Fund). Immediate availability of emergency funding, however, made EMERCOM a key player in handling the current situation.

Figures 1 and 2. The majority of wildfires unfortunately arose from traditional and careless burning of crop residues within and around rural hamlets and villages. ©Photos: GFMC.

Figure 3. The total loss of villages and garden / smallholder agricultural lands constitute a major humanitarian problem in Western Russia, especially affecting local food supply. The photograph dated 13 August 2010 shows Mokhovoe village, Lukhovitski district, Moscow region, that burned down on 30 July 2010. ©Photo: GFMC.

Relatively limited sized fires causing havoc

During the last weeks a densely populated region, with the capital region Moscow with more that 10 million inhabitants (totaling about 14 million people including the agglomerated suburbs), has been dramatically affected by fires that in total size are actually relatively small. So far wildfires in Western Russia have affected around 300 000 to 400 000 hectares. This is only a small fraction of the total vegetated land area affected by fire in Russia since the beginning of the 2010 fire season. According to satellite data received by the Sukachev Institute for Forest and EMERCOM (using NOAA AVHRR satellite data) and the Institute of Space Research of the Russian Academy of Sciences (using MODIS satellite data) published daily by the Global Fire Monitoring Center the total vegetated area affected by wildfires on Russia's territory has reached around five million hectares by early August 2010. Today, at the time of writing this essay, the vast majority of wildfires is burning in Central and Eastern Russia these days. They are huge in size, often burning in remote areas. In the past years fire smoke pollution repeatedly affected cities in the Far East of Russia, e.g. Khabarovsk, and smoke plumes have been drifting to Japan, North America or Europe. At that time there were neither any international concerns nor any political response during or after these smoke episodes. Only in August 2010 when fire smoke is blanketing the center of lifestyle and power of Russia, Moscow, the public and politicians are alerted.

Figures 4 and 5. A MODIS image on the left shows smoke plumes generated by wildland fires burning in the Transbaikal Region in early May 2003 extended to Sakhalin, Japan, Alaska and Europe. This phenomenon has been observed repeatedly. The right photograph shows fire-smoke pollution in Khabarovsk on 11 March 2008. These extended smoke pollution episodes received limited to none attention outside of the affected regions. ©Imagery / Photo: NASA, GFMC.

Comprehensive reports about the fire situation in the Russian Federation in the last two decades have been published in the pages of UNECE/FAO International Forest Fire News (IFFN) since the early 1990s.[1] During the 1990s the financial resources for fire detection, monitoring and suppression as well as for fire prevention decreased substantially as compared with the 1970s. At that time over 8 000 smokejumpers and rappellers had been employed in the Aerial Forest Fire Center *Avialesookhrana*. In the average they were able to suppress about 70% of the fires at initial stage. About 600 aircraft were rented from aviation enterprises. As a consequence of reduction of available aircraft, permissible flight hours and personnel (already in 2005 the amount of smokejumpers and helirappellers was cut half as compared to the 1970s) the detection of fires was delayed. Consequently the average size of fires at detection and initial attack constantly increased over the past decade resulting in an increase of the number of large fires (= fires >200 ha). At moment *Avialesookhrana* is employing only 2 000 smokejumpers and rappellers.

The comparison of data reported by *Avialesookhrana* and by an independent remote sensing institution of the Russian Academy of Sciences (Sukachev Institute for Forest, Krasnoyarsk) for the period 1996-2007 revealed these discrepancies. Indeed, in most countries of the Central Asian/Eurasian region, the data collected by agencies on the ground or by aerial monitoring in the 1990s and early 2000s are not

[1] http://www.fire.uni-freiburg.de/iffn/country/country.htm#RUSSIANFEDERATION

reflecting the full extent of wildland fires. On the one side conventional monitoring of an area of 690 million ha by *Avialesookhrana* in the 1990s and early 2000s relied on aircraft and ground reports. On the other side, the Krasnoyarsk satellite receiving station at the Sukachev Institute for Forest, capable of downloading and processing both AVHRR and MODIS data, began to record fires in the Asian part of Russia, approximately one billion ha of vegetated land area between the Urals in the West and Sakhalin Island in the Far East. The surveyed area included all vegetation types (forest, tundra, steppe, etc.). In this region the active fires depicted by satellites and the derived burned area, however, bore uncertainty and had to be adjusted. According to the Sukachev Fire Laboratory there is some overestimation of areas burned by small fire events due to the system-inherent low spatial resolution of the AVHRR sensor. On the other hand there are fire events that were not recorded by the satellite due to cloud cover and sensor detection limits. This may partially compensate the overestimation of burned area assessments by fire event counts.

Inter-comparison of data generated by various institutions, particularly involving different space instruments (multi-sensor analysis) have been used to verify the fire datasets. For instance, comparison of the 2002 fire dataset for Irkutsk Oblast with the products of the Irkutsk Institute of Solar and Terrestrial Physics reveals relatively similar levels of fire occurrence: The Krasnoyarsk Laboratory recorded 882 fire events affecting a total of 554 665 ha, whereas the Irkutsk Laboratory recorded 1 055 fires affecting a total of 625 800 ha (Goldammer et al., 2004a). As mentioned above, the fire data of 2010 by August show a total area burned (all vegetation types) in Russia of more than 5 million hectares, confirmed both by the Sukachev Institute, EMERCOM and the Irkutsk Institute of Solar and Terrestrial Physics.[2]

A recent multi-sensor analysis investigated the fires of 2003 occurring in the region around and Southeast of Baikal lake between 110.27°E to 131.00°E and 49.89°N to 55.27°N by evaluating scenes of MODIS, MERIS and ASTER and comparing these with NOAA AVHRR (Huang et al., 2009). The study revealed that on a total land area of 130 million more than 20.2 million ha of forests and other lands had been affected by fire in 2003 – an area larger than the 17.4 million ha reported by the Sukachev Institute (Figure 6).

There are some caveats concerning the interpretation and use of satellite-derived fire data. Without a clear reference to the ecosystem characteristics and fire regimes – particularly fire characteristics and impacts – satellite data should not be compared directly with agency reports. In most countries forestry agencies or aerial forest protection services are collecting data only for the protected forests and other protected vegetation under their respective jurisdiction. In the Russian Federation, for instance, fires on some protected reindeer pasture lands are included in the statistical database of *Avialesookhrana*. Otherwise Russia does not include any data on fires in grassland, steppe and peat bogs in the statistical databases.

According to on-site field research by the GFMC in Central Asia, fires are often reported only if protected forests have been damaged directly and visibly, e.g. by crown scorch, timber damage or foliage consumption with subsequent mortality. Thus, fires burning in so-called “grass forests” – open, park-like pine or larch stands with a grass cover which are regularly underburned – may not result in an immediately visible damage. However, these stands may be subjected to long-term degradation due to the increasing fire frequency of short-return interval fires.

[2] http://smis.iki.rssi.ru/fire_reports/sum2010/s2010.htm

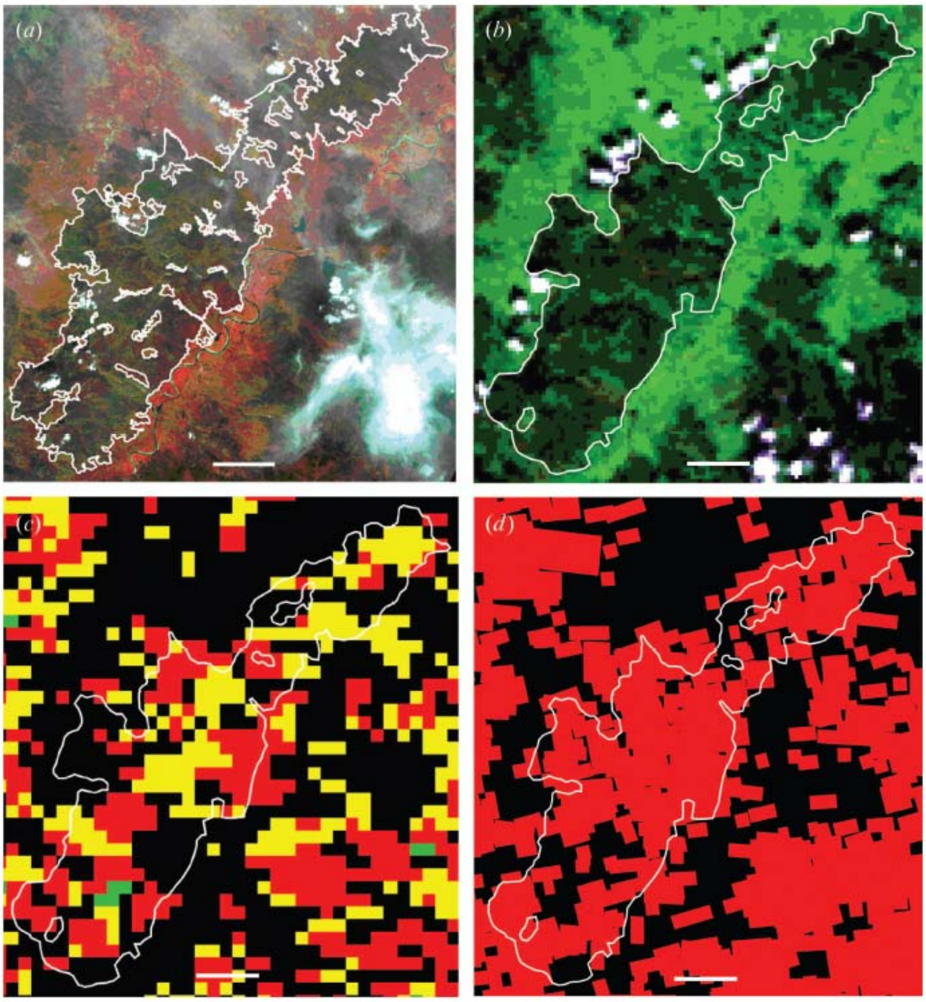

Figure 6. Comparison of a fire scar as detected by (a) ASTER acquired on 12 July 2003, R3G2B1, (b) MERIS acquired on 13 July 2003, R6G10B1, (c) MODIS hotspot composite acquired between 14 March 2003 and 11 July 2003 and (d) AVHRR fire product of 2003. Scale bar: 5 km. Source: Huang et al. (2009)

Weather, climate and fire

This year's extreme heat and drought provided conditions enabling the fires to grow and spread quickly. Is this extreme summer of 2010 a precursor of regional or global warming? The answer is not easy. This year we have seen extreme weather conditions in Western Russia, similarly to other parts of the world. On 11 August 2010 the World Meteorological Organization of the United Nations (WMO) cited the Russian Federal Service for Hydrometeorology and Environmental Monitoring *Roshydromet*, which classified July 2010 the warmest month ever in Moscow since the beginning of modern meteorological recording 130 years ago. According to *Roshydromet* the temperature of July 2010 exceeded the long-term average by 7.8°C (compared to the previous record in July 1938 with 5.3°C above average). Record high temperatures varying between 35°C and 38.2°C were registered for more than seven consecutive days end of July, with the heat wave continuing into August. The daily temperature of 38.2°C on 29 July was the highest ever in Moscow (compared to a long-term average of approximately 23°C). The minimum temperature of nearly 25°C (recorded during the night before sunrise) also scored a significant increase compared to the historical average of about 14°C. Those temperatures are characteristic for a heat wave of a rare intensity and duration.

The reasons for the heat waves are changing regimes of global weather patters that may affect the positioning of the Jet Stream, resulting in long-lasting episodes of injecting hot Saharan air masses to Europe – to Greece in 2007, and more eastward to Russia in 2010.

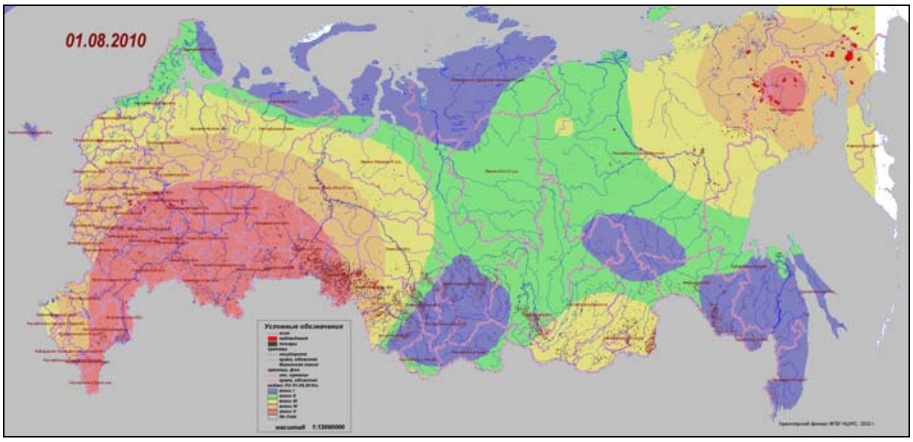

Figure 7. Fire danger forecast maps were provided daily, e.g. this map for Eastern Siberia for 1 August 2010. The upper right (northeast) part of the map shows extensive wildfires burning. ©Source: Sukachev Institute for Forest, Krasnoyarsk.

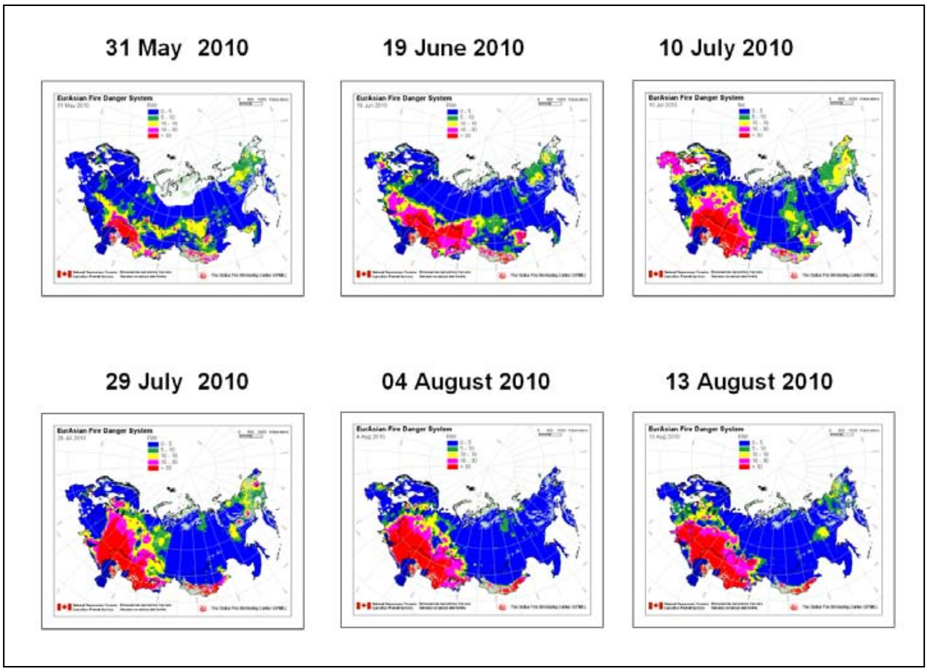

Figure 8. The Eurasian Experimental Fire Danger Rating system, a joint venture of the Canadian Forest Service (CFS) and the GFMC, showed increasing fire danger ("Fire Weather Index") starting in May 2010. ©Source: CFS/GFMC (http://www.fire.uni-freiburg.de/fwf/eurasia1.htm).

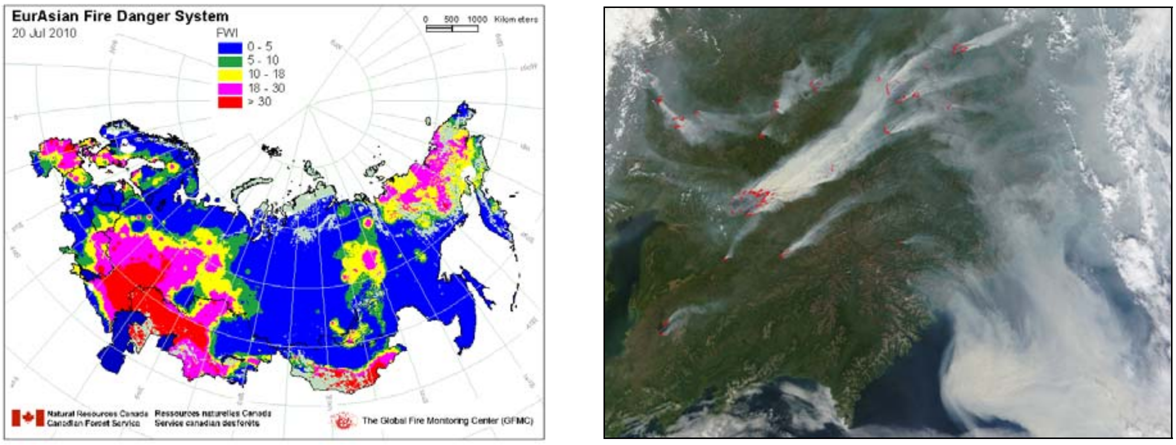

Figure 9. The FWI forecast for 20 July 2010 (left) reflects the drought in Western Europe, Western Russia and the Northeast of Russia where extended wildfires were depicted by the MODIS satellite sensor on 25 July 2010 (right). ©Source: CFS/GFMC and NASA.

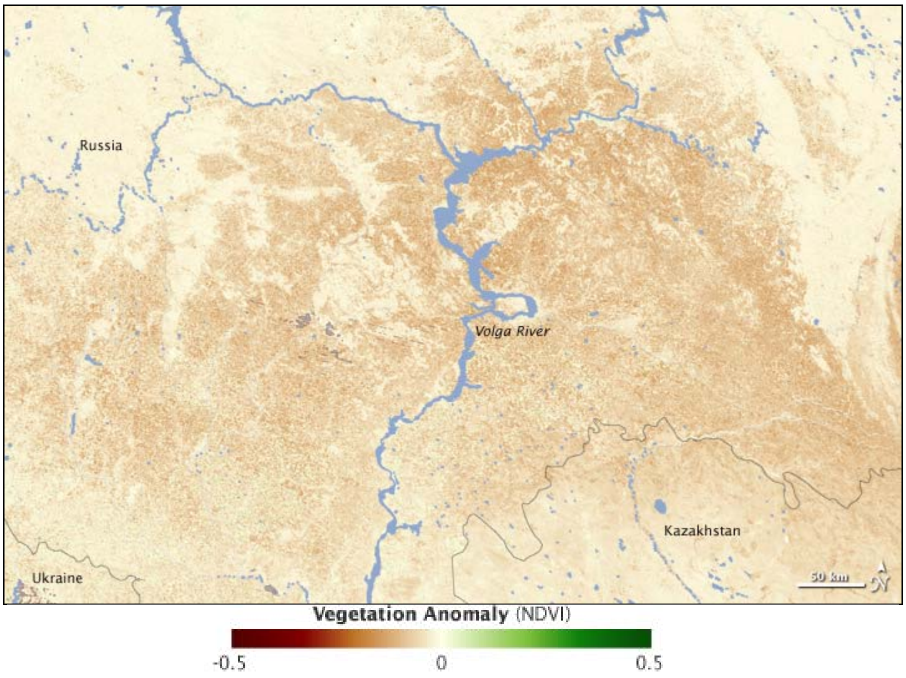

Figure 10. This satellite vegetation index image based on MODIS data on NASA's Terra satellite, shows the drought damage done to plants throughout southern Russia. The vegetation index is a reflection of photosynthesis. The index is high in areas where plants are dense, with plenty of photosynthesizing leaves. The index is low when plants are thin or not present. This image is a vegetation index anomaly image that compares photosynthesis between 26 June and 11 July 2010, to average conditions observed in late June and early July between 2000 and 2009. Below-average plant growth is shown in brown, while average growth is cream-colored. If there had been above-average growth in the region, it would have been represented in green. ©Source: NASA.

Climate change scenarios based on global circulation models for a warming world include predictions of an increase of recurrence and severities of extreme weather events. Thus, 2010 may fit well in daunting scenarios of a changing world.

Extended drought will fuel fires – but will fires and their greenhouse gas emissions contribute to accelerate climate change? This question is easy to answer, although not unidirectional. Yes, a broad suite of greenhouse gases is released by every vegetation fire, as it has happened over historic and prehistoric time scales. The magnitude of past fires, however, is difficult to be reconstructed. Nowadays there are satellite remote sensing studies and models that show us the magnitude of global fire and fire effects. Wildfires and application of fire in land use and land-use change are burning on about 300 million or more hectares every year, releasing about 2.5 billion tons of carbon to the atmosphere. Only a fraction of this amount, however, is remaining there. Regrowth of vegetation brings carbon back to the terrestrial carbon pool, in short cycles of up to a handful of years in agricultural, grassland, savannah or steppe fires, or in cycles of decades or centuries in forest ecosystems. Those forests that are degrading after fire and unsustainable exploitation do not sequester the carbon – and this effect of deforestation and degradation of vegetation resources results in a net release of carbon.

Some of the fire-affected lands in Western Russia will recover naturally or by proper management. But much of the organic matter and carbon of the peat bogs, which have been burning and smoking widespread in this fire episode, may be damaged and degraded for long time, or even forever.

In many regions of Western Russia peat bogs were drained and colonized in the Soviet era, particularly in the 1960s, for agriculture, settlements, and bioenergy production. Many of these formerly cultivated lands have been abandoned – but not restored to their original wetland character. Thus peat formation and bog recovery is extremely slow if not impossible. With the fires the process of peat bog destruction is accelerated and may become irreversible if regional drying would occur in the coming decades. Thus, the carbon emitted by the fires will remain in the atmosphere.

Figure 11. Vast areas of wetlands / peat-swamp biomes are covering the territories of the Russian Federation. Biomass stored in these wetlands may become volatilized if regional drying and fires will unlock the carbon to the atmosphere. ©Photo: GFMC, September 2006.

Figure 12. Wetlands in neighboring countries such as Kazakhstan (this aerial photograph) are also facing extended wildfires that are affecting carbon storage potential and biodiversity. ©Photo: GFMC, September 2009.

Figure 13. Fires in the drained peat bogs in Orekhovo Zuevo district (Moscow region), near the village Chistoe Severnoe, reached a size of 4000 ha by 14 August 2010. The nearby city of Elektrogorsk was founded in 1912 with the establishment of the first large peat-fired power station to supply electricity for Moscow region. It was the beginning of exploiting drained peatlands for electricity production. The fires of August 2010 entered deep turf layers, first causing trees to topple and continue to smolder despite of firefighting efforts. ©Photo: GFMC, August 2010.

One could cynically argue that wetlands are releasing more radiatively active trace gases, notably methane, a process that is ongoing year by year. So, why not to burn the peat bogs, saving fossil energy and reducing methane emissions long term? Anyway, with the decision of the government to flood around 230 000 ha of peat bogs in order to extinguish ongoing and to prevent future peat fires a decision has been made to restore wetland ecosystems and “natural” greenhouse gas emission regimes.

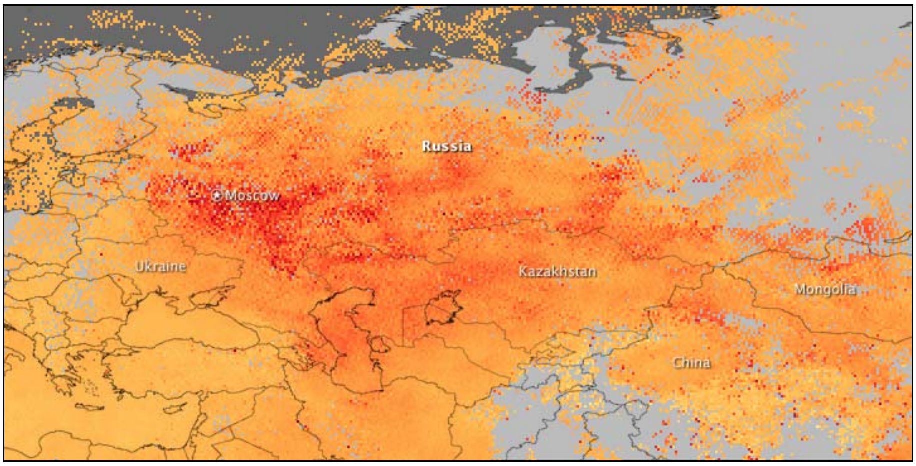

Figure 14. Data collected by „Measurements of Pollution in the Troposphere“ (MOPITT) sensor, flying on NASA’s Terra satellite, shows carbon monoxide concentrations over western Russia between 1 and 8 August 2010, largely a consequence of the ongoing wildfires. ©Source: NASA (http://terra.nasa.gov/About/MOPITT/about_mopitt.html).

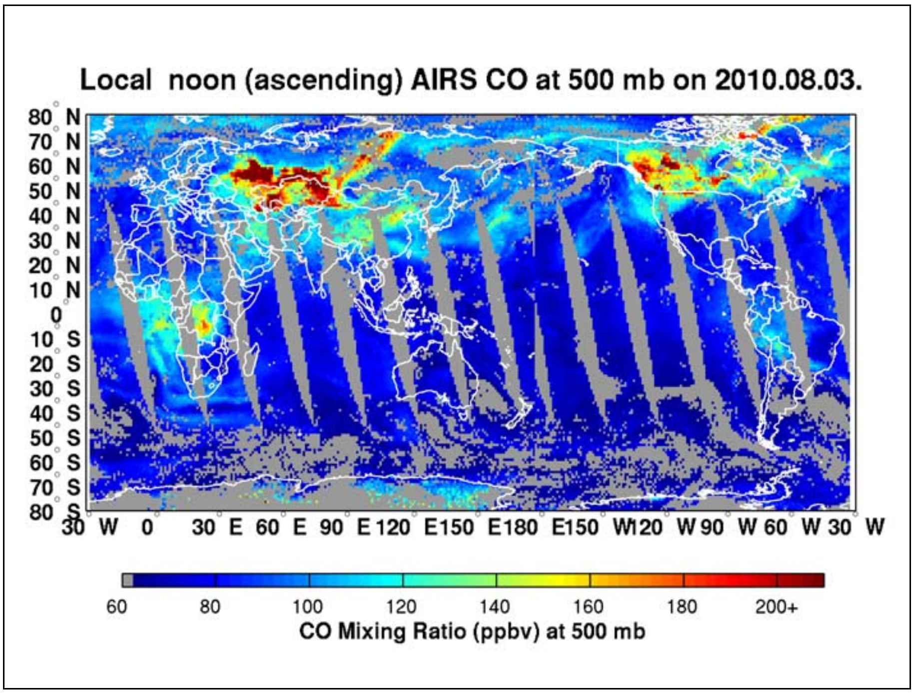

Figure 15. Atmospheric Infrared Sounder (AIRS) carbon monoxide measurements of 3 August 2010 reveal the extension of the smoke plume drifting towards the Trans-Baikal region. Similar CO plumes are observed over wildfires in Western Canada. ©Source: NASA (http://airs.jpl.nasa.gov/).

Another reason of concern are the emissions of soot particles (particulate matter) during spring fires. Agricultural burning in the early months of the year are quite common all over Eastern Europe / Western Russia. At that time of the year the airflows are driving the smoke to the Far North – to the Arctic.

Figure 16. Agricultural burning in spring and early summer is a common practice all over Eastern Europe and the CIS states. From a point of view of primary fire damage these burning activities may look harmless. However, the accumulated impacts of smoke pollution, including soot deposits in the Artic region, have a major impact on biogeochemical cycles and climate. ©Photo: GFMC, September 2006.

As a recent study of the U.S. Clean Air Task Force (CATF) revealed, by evaluating the comprehensive science on this issue, black carbon-containing particulate matter, a product of incomplete combustion of biomass and fossil fuels, is transported to the Arctic via smoke, remains in the atmosphere for about a week. During that time, it can disturb the local climate system in a number of ways. First, as black carbon settles in the Arctic's troposphere it absorbs solar radiation that would otherwise reach the surface. As the troposphere warms, it emits long-wave radiation downward. The net effect is a heating of the surface. Black carbon also affects the Arctic climate by reducing surface reflectivity, or albedo. As soot particles "wash out" of the atmosphere, they land on snow and ice, darkening surfaces in ways that are usually imperceptible to the human eye, but even these small concentrations are able to absorb significantly more of the sun's rays. As the surface warms, the snow crystals coalesce into denser, coarse-grained structures that further absorb energy and can speed the pace of melting. The combined effects account for as much as 30 percent of Arctic warming to date (CATF, 2009).

Figure 17. Ice and snow reflect solar radiation (left), Black carbon deposits darken surface and reduce reflectivity. ©Source: NASA/GISS (published in by CATF 2010).

The implications of agricultural burning in spring on black carbon emissions and arctic warming will be addressed is a workshop in November 2010 in St. Petersburg in Russia.[3]

Humanitarian impacts of the fires

The degree of air pollution in the greater Moscow region during the last days of July and in August has been extreme, resulting in unprecedented humanitarian problems. People with cardiovascular and respiratory diseases, elderly and very young people have been exposed to a high health risk, caused by the combustion products of burned organic matter, such as particulates, polynuclear aromatic hydrocarbons, carbon monoxide (CO), aldehydes, organic acids, semi-volatile and volatile organic compounds (VOC), nitrogen- and sulphur-based compounds, etc. (Goh et al., 1999; Schwela et al., 1999; Statheropoulos and Goldammer, 2007; Goldammer et al., 2009)

During the recent days the call for ambulances and hospital admissions increased as well as premature deaths – the average daily mortality rate of 350 to 380 persons in Moscow almost doubled to about 700 persons per day during the days of extreme heat and smoke pollution. At this stage it is not clear how many of premature deaths can be attributed to the heat wave alone, or to the combined effects of heat stress and smoke pollution.

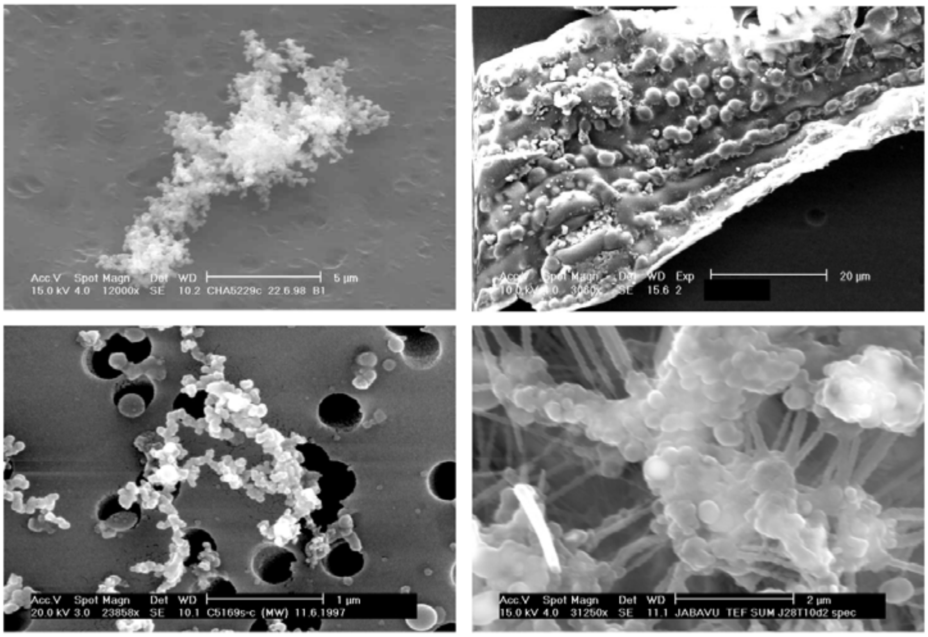

Figure 18. Examples of fire-emitted soot particles. ©Source: G. Helas, Max Planck Institute for Chemistry, Germany.

[3] http://www.bellona.org/fires-and-the-arctic. See also conference report in this issue of IFFN, pp. 129-132.

Figure 19. Wildfire blow-ups in Nizhniy Novgorod region on 26 July 2010, with smoke drifting towards the metropolitan area of Moscow. Source: NASA MODIS image. See also GFMC report:
http://www.fire.uni-freiburg.de/GFMCnew/2010/07/27/20100727_ru.htm

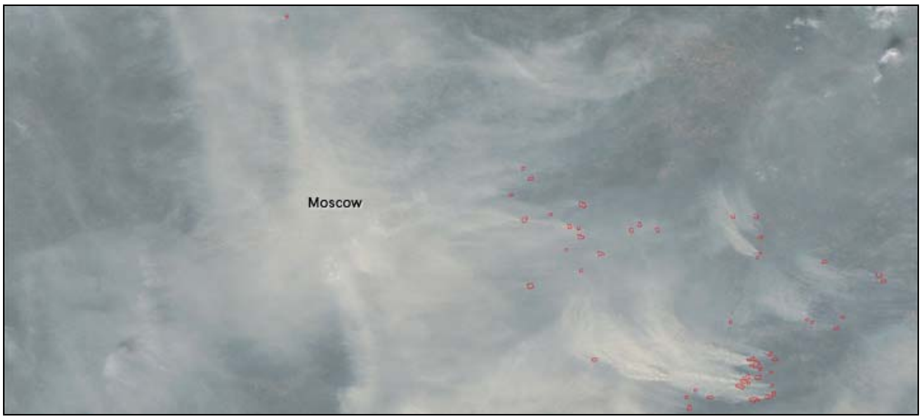

Figure 20. Smoke pollution in Moscow Region, 7 August 2010. ©Image: MODIS image provided by NASA.
http://www.fire.uni-freiburg.de/GFMCnew/2010/08/07/20100807_ru.htm

Figure 21. This satellite image shows two strong convective activities with *pyrocumulus* formation, representing intensive blow-up fires in forests and high peat-swamp vegetation. ©Image: MODIS Terra scene, acquired on 1 August 2010, 250m resolution.

Figure 22. Neighboring countries had been affected by the Western Russian smoke plumes. While in 2006 the smoke from Russia's peat fires drifted to West and North Europe, this image of 1 August 2010) shows the smoke plume from the greater Moscow region drifting to Ukraine – on a day when high fire-smoke alert had been declared in its capital Kiev. ©Image and interpretation: MODIS Aqua scene (acquired on 1 August 2010, 250m resolution) and GFMC.

Besides the smoke pollution the Russian fires so far have resulted in an unprecedented high number of casualties and losses of villages, individual houses and infrastructures. By the time of writing this assessment the total death toll has reached more than 50 people killed by fires, and at least 15 villages and towns have been affected in the Volgograd and Saratov regions, and a total of around 2500 houses have been burnt down, 2000 families left homeless, 52 lives lost and 1500 people injured.

Figure 23. Infrastructural damages caused by the 2010 wildfires in Western Russia are not yet accounted. ©Photo: GFMC.

Radioactive Fires ?

There were growing concerns that the fires have hit areas which suffered radioactive contamination from the Chernobyl nuclear disaster in nearby Ukraine, or other nuclear accidents like in the Urals. The fears that fire burning on contaminated terrain would release radiation into the atmosphere and result uncontrolled nuclear fallout – dependent on wind direction – are valid. The current public debate, however, is coming late. Too late in order to allow a rational public and political debate that should rather aim for efficient prevention of nuclear wildfires than causing panic.

The facts are clear: Radioactive particles like Cesium-137 from nuclear accidents and weapons tests are deposited in large tracts of lands. Russia alone has a total area of 7 million hectares contaminated by radioactivity – the highest concentration of radiation is on the 90,000 ha of the Chernobyl Exclusion Zone, and in nearby Gomel region of Belarus, and Bryansk region of Russia.

A thematic consultation on “Wildfires and Human Security - Fire Management on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines” had been held in Kiev and Chernobyl, Ukraine, in October 2009, organized by the Global Fire Monitoring Center (GFMC) and hosted by the National University of Life and Environmental Sciences of Ukraine and the Ministry of Emergencies and Affairs of Population Protection from the Consequences of Chernobyl Catastrophe. The recommendations that were forwarded to governments concerned included the need for investment in proper silviculture, land use and fire management to reduce the risk of size and intensity of wildfires on contaminated terrain. Indeed, advanced technologies of automated rapid fire detection – systems that would avoid to deploy fires guards to the contaminated terrains and exposing them to radiation – and forest management aiming at reducing excessive “fuel loads” that accumulated during decades of standstill, would clearly be instrumental to reduce the risk of high-intensity fires which would carry radioactive particles into the troposphere and thus allow their long-range transport.

The “Chernobyl Resolution on Wildfires and Human Security – Challenges and Priorities for Action to address Problems of Wildfires burning on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines” of 2009 should be read and implemented by political leaders (Goldammer and Zibtsev, 2009).[4]

It must be underscored that at moment the risk of excessive uncontrolled and long-range redistribution of radiation through smoke-emitted particles is limited, but this may change.

Fire Ecology of Cultural and Natural Landscapes

In terms of preventing the occurrence of very intense and severe wildfires is some ecosystems certain types of natural fires and prescribed management fires are playing an essential role. Would these targeted low-intensity management fires – if properly applied for forest “cleaning”, for fuel reduction purposes – have played a role in reducing the extent of the wildfires in Western Russia of 2010?

The answer is – no. Western Russia’s agglomeration of a mosaic of diverse natural and agricultural systems are not as fire adapted as forest and steppe ecosystems of Central and Southeastern Siberia. Agricultural burnings are detrimental to the Arctic environment, as shown above, and are a major cause of wildfires in summer and fall. The mixed conifer-deciduous forests consist of many fire-sensitive species, e.g. spruce and all hardwoods. And the drained or the seasonally drying peat bogs should not burn anyway.

Thus, the situation is entirely different from the “light taiga” forests that are governed by fire-adapted species, such as pines and larches. Indeed, fire ecology research in Northern Eurasia between the Nordic Countries and the Far East of Russia revealed that natural and management-set fires are essential to keep the forest debris down, to recycle periodically the accumulated organic matter and make the standing forest safer against an explosive release of energy accumulated in understorey biomass.

Nonetheless, prescribed burning for reducing excessive and dangerous fuels in Western Russia will have a place, as it has been done traditionally, but at that time with more consciousness and responsibility, and probably less wildfires escaping from these practices.

Figure 24. Setting a back burn during to control a 4000 ha wildfire near the village Chistoe Severnoe, Orekhovo Zuevo district, Moscow region, 14 August 2010. ©Photo: GFMC 2010.

[4] See summary of seminar contributions and the Chernobyl Resolution published in this issue of UNECE / FAO International Forest Fire News (IFFN) No. 40 (2010), pp. 76-113.

Figure 25. Training of Mongolian and Russian fire specialists in the use of prescribed fire in wildfire hazard reduction in pine / larch forest ecosystems of Central Asia. ©Photo: GFMC 2008.

Figure 26. Joint firefighting exercise of Russian fire agencies at the *International Conference on Cross-Border Forest Fires and Cooperation in their Suppression* (16-18 June 2010, Irkutsk) capabilities of advanced fire suppression, reconnaissance and operational decision-support systems were demonstrated to regional representatives and international participants – showing the potential for future strengthening of Russia's fire management capacity – if properly financed. ©Photo: GFMC 2008.

Russia – *Quo Vadis*?

The year 2010 will be a turning point. Despite of the warnings and recommendations by Russian and international foresters and fire scientists during the last two decades fires and smoke have entered the political arena inside Russia and Russia's European and Asian neighbor countries. Some years ago a new transparency created by the *space glasnost*, enabled by a suite of remote sensing systems on Earth observation satellites, revealed the magnitude of global to national fire problems and the rapid acceleration of destruction of vegetation resources all over the globe. Experience from other countries is telling that a disaster event is needed to wake up the postmodern, nature-estranged society. Politics and policies cannot hide any longer that investments are needed for the protection of vegetation resources. Russia's fires have shown – maybe for the first time revealed by public perception at large scale – that a highly developed urban society is increasingly dependent on surrounding natural and cultural landscapes that are sustainably managed and protected.

The current fire crisis in Western Russia falls in a time when the Victoria Bushfires Royal Commission published its report on the Black Saturday Fires of February 2009. On 31 July 2010 this in-depth analysis of the devastating fires in Victoria and the political and technical recommendations to cope with future similar extreme events. Being prepared for the future includes both lessons identified and looking at the new challenges ahead, be it from the point of view of climate change, or the changes of ecosystems and land use, or the mutual reinforcing of the effects of climate change and land-use change.

What are the lessons identified?

<u>The legal framework</u>

The implications of the new Forest Code on the weakening of fire management capability has been publicly discussed over the last days and weeks, and this leads to the conclusion that the legal framework that must be critically reviewed.

A letter by the Secretariat of the United Nations International Strategy for Disaster Reduction (UNISDR) addressed to the Permanent Mission of the Russian Federation to the United Nations Office in Geneva in November 2006, some weeks before the Forest Code was enacted, had informed the Russian authorities about experiences of other countries in decentralizing responsibilities in forest management but maintaining control in fire management at national level, by stating:

> *Countries with federal political systems that have decentralized responsibilities in forest management and forest fire protection from national to provincial (regional, state) levels in some cases have maintained responsibility for inter-agency and inter-regional coordination at federal level. Canada and Spain, both countries with high forest fire risk, have created such structures which will allow swift and efficient trans-provincial support in fire suppression once the fire situation in an individual province will exceed the province's capabilities to respond to the situation.*
>
> *The establishment of regional forest fire coordination centres in Russia (Far East, Siberia, Urals, and Northwest) is an important move of delegating authority to the regions. However, the national responsibility concerning the monitoring of forest fires and forest health, as well as monitoring of carbon stocks is certainly an extreme challenge for Russia, especially considering that Russia is the custodian of 22% of the World's forests and a large portion of the terrestrial carbon pool contained on forests and wetlands. These carbon pools are highly threatened by the consequence of regional climate change, increasing occurrence of droughts and fires.*

Indeed, an analysis of the Sukachev Institute of Forest in the early 2000s revealed the shifting of centers of extreme fire activities throughout Russia over the years 2000 to 2005. Each year a different region is experiencing an extraordinary situation – and this will require a strong national effort for coordination and for intervention.

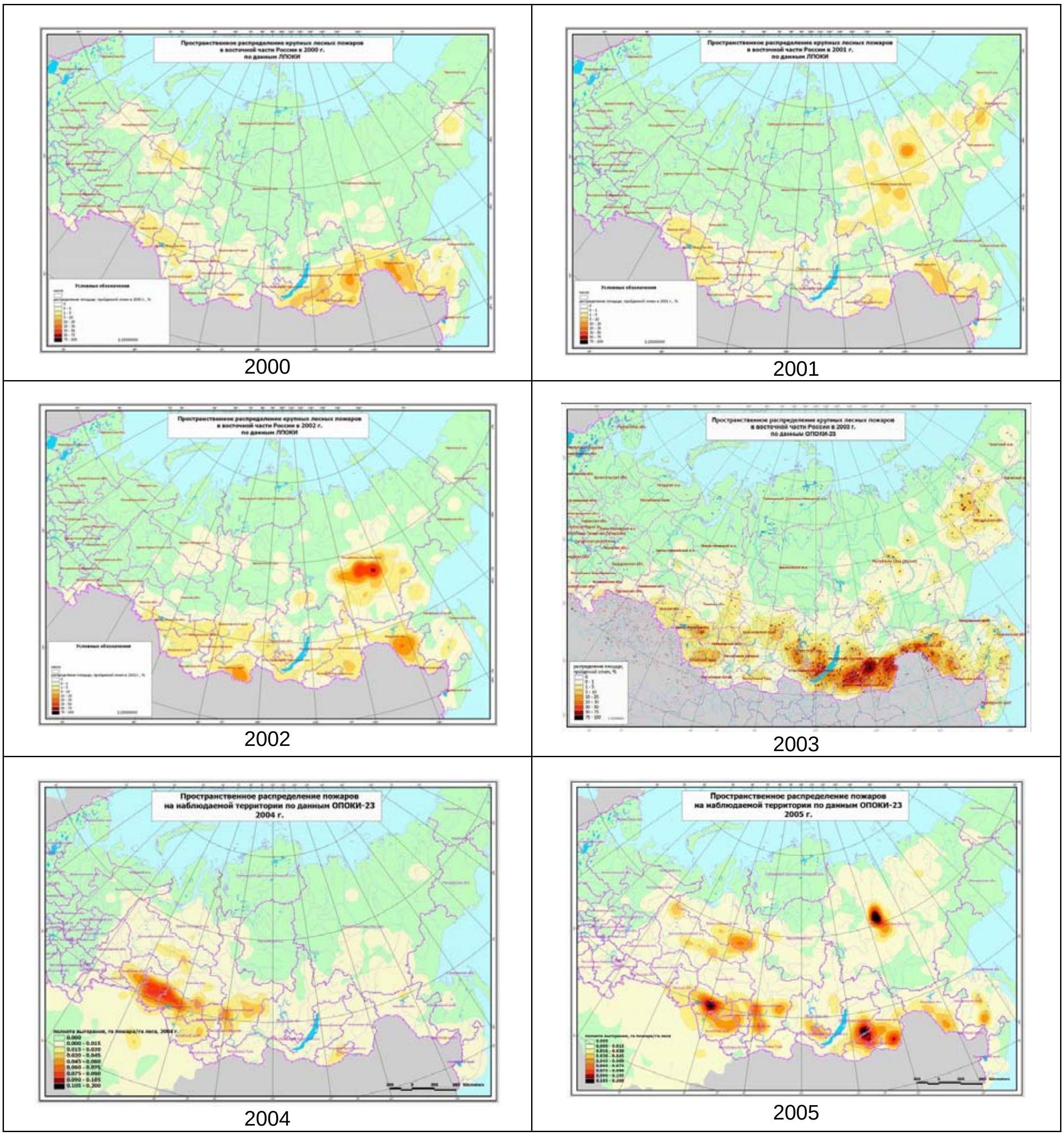

Figure 26. Spatial distribution of areas burned by different degree in the Central and Eastern Asian part of Russia in the fire seasons of 2000-2005, derived from interpolated NOAA AVHRR forest fire data. Zones are delineated by colors that represent the ratio of the burned area to the total area marked by the color. ©Source: A. Sukhinin, Remote Sensing Laboratory, Sukachev Institute for Forest, Krasnoyarsk, Russian Federation.

From the point of view of the Global Fire Monitoring Center (GFMC) it is mandatory that the central government of Russia should go back to resume control at national level – a modification of the Forest Code that would result in a balanced approach of regional (including of course local) and national responsibility.

The role of different institutions

Who should take the lead in a resumed national responsibility? From the point of view of the Global Fire Monitoring Center (GFMC) there is a clear international trend to rely on institutions that are concerned with land management and on specially trained and equipped personnel entrusted with fire management. Firefighting is just a part of a suite of measures ranging from fire prevention through public information and education, technical and forestry measures to reduce wildfire hazards, and the presence of personnel in regions or areas at high fire risk.

The fires of the last weeks that have extremely affected local communities should also bring up the issue of community involvement in fire management. Concepts of “Community-based Fire Management” have been applied all over the world where local people are often responsible for uncontrolled fire, and at the same time most affected by wildfires. Russia should have a careful look at the experiences in other regions of the world.[5]

The Ministry of Emergency Situation EMERCOM stepped in 2010 and prevented an uncontrollable escalation of many fires – and this indeed is a suitable task for this organization. The assistance of the Armed Forces was very instrumental and necessary in such a situation – as it practiced during emergency situation in other countries.

However, the day-to-day role in fire management, including fire prevention, monitoring and supervising, including law enforcement, and routine firefighting, should be clearly assigned to agencies responsible for forest management. Since agricultural fires are one of the major causes, however, arrangements should be defined to involve the private and communal agricultural sector.

Capacity Building: Professional Training in Fire Management

With the new insights on the role of natural and human-controlled fire in ecosystem management the traditional training concepts of Russian fire specialists, which focused on technical firefighting, must be re-oriented. The use of natural and human-caused fires as an integral part of managing natural forest ecosystems, but also intensively managed (plantation-type) forests, is a new and demanding challenge for capacity building in *Integrated Fire Management*. Many forest types, such as the open pine and larch forest of the light taiga of Siberia, co-evolved with fire. Up to a certain extent the stability of these forests is even dependent of fire, but at least tolerant to recurring low intensity fires. Such recurrent fires are clearing the hazardous combustible materials (fuels) without damaging the stands, but reducing the potential of highly intensive and destructive wildfires. Skills need to be developed to use the benefits of fire – and this is should be a new, additional way to train the modern forest fire manager in Russia.

Priorities for Investments

The traditional Russian fire establishment has proven that it is able to explore and apply new methods and tools for fire management. Avialesookhrana has demonstrated that they have first-class technologies for fire monitoring and control operations. The satellite-based fire reconnaissance, reporting and monitoring system is one of the most advanced globally. The use of aircraft has been proven efficient, and the exploration of the used of unmanned aerial systems (drones) for monitoring ongoing fires and delivering information for decision support are promising.

All what is needed is the proper financing of these tools to become available in the fire prone regions of the country. And not to forget: The current technical equipment for firefighting on the ground is often inadequate. Traditional firefighting vehicles of local fire brigades are not suitable for off-road conditions. Firefighting hand tools are lacking, and personnel protective equipment for firefighters is not adequate.

[5] Definition of Community-Based Fire Management (CBFiM): Fire management approach based on the strategy to include local communities in the proper application of land-use fires (managed beneficial fires for controlling weeds, reducing the impact of pests and diseases, generating income from non-timber forest products, creating forage and hunting, etc.), wildfire prevention, and in preparedness and suppression of wildfires. CBFiM approaches can play a significant role in fire management, especially in most parts of the world where human-based ignitions are the primary source of wildfires that affect livelihood, health and security of people. The activities and knowledge communities generally practice are primarily those associated with prevention. They include planning and supervision of activities, joint action for prescribed fire and fire monitoring and response, applying sanctions, and providing support to individuals to enhance their fire management tasks. Communities can be an important, perhaps pivotal, component in large-scale fire suppression, but should not be expected to shoulder the entire burden. See also the GFMC website on CBFiM: http://www.fire.uni-freiburg.de/Manag/CBFiM.htm

The forestry sector must urgently reinvest the income that has been generated by forest exploitation. This is currently only marginally the case. The announcement of the government to release funding for firefighting should go beyond the emergency response in the current situation: Flow of funding must be done in accordance with proper long-term planning, and must build sustainable structures. The demanding job of a rural firefighter must become a recognized profession based on specialized training and remunerated by adequate salaries. Otherwise the drain of qualified personnel and the rural exodus will continue to be a problem in recruiting personnel.

Ecosystem Restoration

In Moscow region and neighboring regions the above-mentioned peat-bog fires were reason for a public debate on the future of the formerly drained wetlands. With the announcement of the government to restore some of these wetlands a fundamental decision has been made that is directing the way to the future. Decisions will be rather demanding to balance the future use of these ecosystems as source of energy, as haven for biodiversity, or as a source of natural (non-fire triggered) greenhouse gases such as methane. The complexity of consideration for future wetland management concepts is quite demanding.

International Cooperation

During the last days Russia received offers from countries to assist managing the fire crisis. In June 2010 at the "International Conference on Cross-Border Forest Fires and Cooperation in their Suppression", held in Irkutsk, the Federal Forestry Agency consulted with neighbor countries about an improvement of the efficiency in transboundary fire management cooperation, notably addressing border-crossing wildfires and smoke transport. This consultation was ahead of the fire crisis in Western Russia by several weeks, and paved the way for smooth and efficient cooperation in July / August 2010, with the countries in lead that attended the Irkutsk meeting.

The next regional forum will be the International Conference "Forest Fires: Management and International Cooperation for Preventing Forest Fires in APEC region" in Khabarovsk (4-6 October 2010). At this forum the development and international acceptance of standards for cooperation in fire management need to be addressed with priority. For instance, during the aerial operations of international aircraft and EMERCOM aircraft there was often no air-ground coordination, and thus the operational efficiency of aerial means was limited. International standards such as the use of the Incident Command System (ICS) fir managing large wildfires, especially if foreign forces are involved, is mandatory (Goldammer, 2009).

The very recommendations of Irkutsk are calling for a swift and efficient cooperation in fire management between countries. Sharing of knowledge, expertise and resources, sharing of solutions that have to address the globally unifying issues that are affecting many countries: Change of land-use, climate and fire regimes, notably by:

- Rural pressure on ecosystems resulting in excessive fires
- Rural exodus resulting in increasing wildfire hazard and weakened professional and local community work force to deal with fires
- Urban exodus resulting in establishment of new or restructuring traditional rural communities that are becoming more vulnerable to wildfire
- The heritage of historic and contemporary fire exclusion resulting in increase of severe and often non-controllable wildfires
- Additional anthropogenic threats interacting with fire such as fires burning on terrain contaminated by radioactivity, chemical pollutants, land mines and unexploded ordnance
- Climate change resulting in increase of recurrence and severity of extreme droughts and wildfire episodes
- Increased vulnerability of human populations by wildfire smoke, as revealed in the current situation

The sharing of experience in Integrated Fire Management solutions is one of the tasks of a number of international bodies. Two of the are operating under the auspices of the United Nations:

- The Global Wildland Fire Network and the Wildland Fire Advisory Group working under the frame of the United Nations International Strategy for Disaster Reduction (UNISDR)[6]
- The UNECE / FAO Team of Specialists on Forest Fire, working under the auspices of the UN[7]

Russian fire specialists are members and taking lead. This cooperative work must be supported by flanking action allowing to transfer international knowledge to the Russian establishment, and also to allow the export of Russian expertise to other countries.

In conclusion of the evaluation of the current fire situation in Russia and the prospects for future solutions:

Since more than three years national and international fire specialists expressed warnings that the years of relatively low fire occurrence in Russia since 2007, which were determined by weather that was unfavorable for wildfires, would turn to become disastrous fire years once a drought and heat episode would affect a region of Russia. The heat and drought is currently on in West Russia – and inevitably the fires returned, powerful and disastrous.

To avoid future fire disaster politics and policies must give attention to the dramatic changes of society in Russia and the obviously changing climate. New priorities need to be set.

Editorial note

This report had been presented at the parliamentary hearing of the *State Duma* of Russia, Committee for Natural Resources, Nature Use and Ecology, on 23 September 2010. In October 2010 the Economic Development Ministry of Russia published Russia's mortality data of summer 2010 in the Moscow Times. [8] According to this report 55,800 additional (above long-years average) deaths were recorded in July and August 2010 in Russia, which are likely to be attributed to premature deaths as a consequence of both the extreme heat and extended fire smoke pollution. The total number of people directly killed by fire has been estimated 63, and 9 villages and a total of ca. 3000 houses and infrastructures were burned, besides other assets such as military equipment.

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[6] http://www.fire.uni-freiburg.de/GlobalNetworks/globalNet.html and http://www.unisdr.org/eng/task%20force/tf-working-groups4-eng.htm

[7] http://www.fire.uni-freiburg.de/intro/team.html

[8] Report of the Economic Development Ministry of Russia, published in The Moscow Times, 27 October 2010, on file at the GFMC repository: http://www.fire.uni-freiburg.de/media/2010/10/news_20101027_ru.htm

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