

# **Natural Catastrophes in Russia**

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## Introduction

Nature and the elements, to the extent that they are not under man's control, can cause great harm to the assets of both the state and private individuals.

Natural catastrophes are those elemental events which create emergency situations, destroying people's normal way of life and the functioning of industry and infrastructure.

Natural catastrophes are unexpected and extreme by definition. They can wreck buildings and other structures, destroy valuable materials and equipment, interrupt production processes and cause the death of both people and livestock.

Each year an enormous number of hazardous events occur on this planet, but most of them do not cause catastrophic loss to governments or populations, because they take place in sparsely populated and economically insignificant areas. Additionally, in areas prone to such disasters, measures are taken to protect against the effects of the elements and to minimise material damage and loss of life.

Nevertheless, just one significant natural catastrophe occurring in an economically developed area can cause massive losses to a country's economy as a whole and to the insurance industry in particular. One example of this is Hurricane Katrina (USA, 2005), from which the insurance losses alone are expected to reach 45 billion USD.

The Russian Federal Ministry for Civil Defence, Emergencies and Natural Catastrophe Relief (MChS) gives the following figures for disasters in Russia in recent years:

<b>Year</b>	<b>Total number of disasters</b>	<b>Of which natural catastrophes</b>
2002	1,139	279
2003	838	286
2004	1,134	231
2005	2,720	198

(from figures on the official site of MChS RF, [www.mchs.gov.ru](http://www.mchs.gov.ru))

As can be seen from the above table, the total number of disasters in the Russian Federation has risen significantly year on year, while the number of natural catastrophes in recent years has gone down slightly. However, in spite of this positive trend, over a longer period the average number of natural catastrophes has remained at a significant level, averaging 279 emergency situations per year.

Typical natural catastrophes for the various regions in Russia include earthquake, flood, flash-flood, landslide, avalanche, storms and hurricanes, and fires.

Altogether around one million earthquakes take place each year, but no more than 20% of these cause significant economic losses.

Around 40% of the total area of the Russian Federation is considered to be under significant seismic threat, and this area contains about 14% of the population.

Of recent earthquakes in Russia, the most destructive were the Shikotansk earthquake (Kurill, 1994) measuring 8.4 and with an intensity of 9-10 points, and the Nyeft'yegorsk earthquake (Sakhalin, 1995), measuring 7.7 and with an intensity of 8-10 points.

The Shikotansk earthquake caused a tsunami with 8-10 metre waves, affecting 1,500 people and making 631 families homeless.

The Nyeft'yegorsk earthquake virtually destroyed the city of Nyeft'yegorsk, with the loss of 1,841 lives.

The most recent destructive earthquake in the Russian Federation was that of 21<sup>st</sup> April 2006 in the Koryaksky Autonomous Region. This had an intensity at its epicentre of 9-10 points, and caused damage valued at 55-60 million USD.

Extreme weather conditions, such as cyclones, tornados, rainstorms and blizzards, are amongst the most devastating acts of nature. Tropical cyclones, of which there are about 80 each year, are the most destructive.

The shores of southern Asia and the equatorial parts of Southern and Central America are most at risk from this type of hazard.

The most destructive weather conditions in Russia are squalls, hurricanes, cyclones, hail, tornados, rainstorms and storms, snowstorms and blizzards.

Regions of Russia most at risk from these conditions include the Primorskiy Krai and Sakhalin Oblast, various parts of the Urals, the northern Caucasus, and the Black Sea coast.

Altogether around 50-100 major natural catastrophes occur in Russia as a result of extreme weather conditions.

According to various estimates annual losses arising from such occurrences in the Primorskiy Krai are valued at 20-80 million USD, however this figure can be significantly higher in some years. For example in 1989 Cyclone Judy caused damage amounting to around 90 million USD.

More recently, the hurricane in Moscow in 1998 caused damage valued at around 1.6 billion USD.

Floods are also considered to be one of the most widespread and hazardous of natural catastrophes. In recent years, floods have taken place on practically every continent.

In Russia there are around 40-70 devastating floods each year. About 700 Russian cities and several thousand other population centres are subject to flooding. The total area of periodically submerged flood-plains in Russia is around 0.4 million square kilometres. The frequency of flooding in this territory is from once every 5-10 years to once every 15-20 years.

In addition to the elements, the poor condition of the majority of the water supply infrastructure is also factor. Around 12% of this equipment in Russia requires either major repair, reconstruction or demolition, and about 5% (1,500 sites) has been simply abandoned.

Flooding causes a vast amount of damage. In 1998 flooding on the river Lena (Yakutia) caused damage valued at 1.3 billion roubles.

In 2001 flooding on the same river was even more significant: the waters rose by 17 metres and completely flooded the city of Lensk, and 10 other administrative regions in Yakutia. The total loss was 5.9 billion roubles.

Losses from flooding in southern Russia in 2002, affecting 9 federal regions, amounted to around 500 million USD.

Although the economic losses arising from natural catastrophes is very great, insurances losses from these events as a rule are relatively limited.

For example, of the overall losses of 500 million USD caused by flooding in 2002, only 3-5% was borne by insurers.

The same is true for other natural catastrophes occurring in the Russian Federation.

This is because the majority of private, industrial, commercial and federal property in Russia remains uninsured.

One of the causes of this is the lack of development of an insurance culture in the country as a whole. The economic crisis of the 1990s, from which the country is still recovering, had an enormous negative impact on the development of insurance.

Official, published statistics relating to the damage caused by various catastrophes are likely to be underestimated, since there is a lack of realistic property valuations. It is therefore possible that real losses caused by natural catastrophes are higher than the officially declared figures, occasionally considerably higher.

According to estimates by the World Bank for Reconstruction and Development Russia sustains damage from natural catastrophes valued at around 30-60 billion roubles each year. The potential economic loss for Russia therefore can be as high as 5% of GDP.

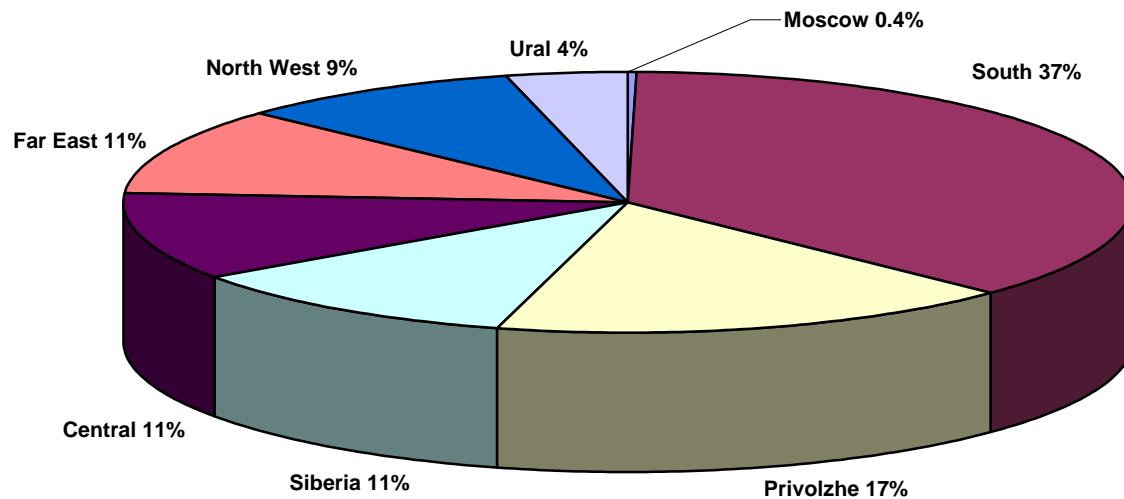
## Natural Catastrophes in Russia

Over 30 different forms of natural calamity have been observed in the Russian Federation. Those with the most serious consequences include earthquake, flood, drought, forest fires and extreme frosts.

One fifth of the territory, inhabited by one third of the country's population, is subject to seismic activity. Flood exceeds all other natural catastrophes both in terms of area affected and damage caused.

Four hundred thousand square kilometres of the Russian Federation is subject to flooding, an area with a population of 4.6 million. Povolzhe and the Northern Caucasus suffer droughts which occur every 2-3 years. Droughts are, as a rule, accompanied by major fires and these cause considerable damage, particularly in Siberia and the Far East. Extreme frosts occur in many areas in the winter causing heating networks to freeze.

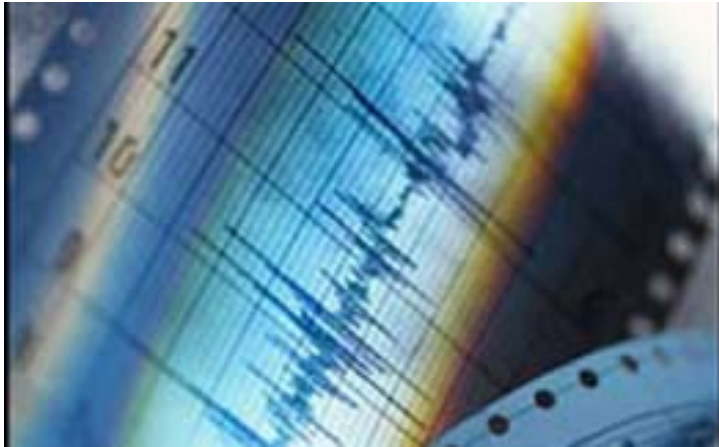
**Diagram 1. Distribution of natural catastrophes by Federal region**



The most significant losses of life in Russia are associated with floods (30% of fatalities), landslides and landslips (21%) and hurricanes (14%).

2,720 disasters occurred in the Russian Federation in 2005, of which 2,464 were technology-related, 198 natural catastrophes, 48 health-related and there were 10 major terrorist acts. These disasters caused 5,637 fatalities and 4,945,523 people suffered in some way (including the May 2005 energy crisis in Moscow and the four surrounding oblasts).

## SEISMIC ACTIVITY AND SEISMIC ZONING



In comparison with other countries in seismic zones, the Russian Federation is subject to moderate levels of seismic activity. The northern Caucasus, southern Siberia and the Far East are exceptions to this, with seismic shocks of up to 9-10 points on the 12-point macro-seismic scale. There are 6-7 point zones in the densely populated Western European part of Russia which also present a specific problem.

There are 330 major populations centres located within zones subject to seismic risk in Russia, including 103 cities, some of the most significant of which are Vladikavkaz, Irkutsk, Ulan-Ude and Petropavlovsk-Kamchatskiy.

The Verkhoyano-Kolymskiy region, Priamurye, Primorye, Koryakiya and Chukotka are less seismically active, but even here relatively strong earthquakes do occur.

Relatively low seismic activity is registered in the Eastern European plains, and the Skif and Western and Eastern Siberian platforms. In addition to local seismic activity, Russian territory also suffers the results of strong earthquakes in the surrounding states (Eastern Carpathians, Crimea, the Caucasus, Central Asia, etc.).

**European Russia.** The area of the European part of the country most at risk of seismic activity is the northern Caucasus. Earthquakes with a magnitude of around  $M=7.0$  and a seismic effect at the epicentre registering  $I_0=9$  points or higher are observable here.

The eastern part of the Northern Caucasus is the most active. The Eastern European plain and the Urals are subject to relatively low seismic activity, with earthquakes of a magnitude of  $M=5.5$  and intensity up to  $I_0=6-7$  points occurring only rarely.

Similar earthquakes occur in the Central Urals, in Preduralye, Povolzhe, around the Azov Sea and the Voronezh Oblast. More significant earthquakes can occur on the Kolsk Peninsula and surrounding area (White Sea, Kandalaksha, 1626,  $M=6.3$ ,  $I_0=8$  points). Weak earthquakes (measuring  $M=4.0$  and  $I_0=5-6$  points) can occur practically everywhere.

The north-west of Russia can suffer from earthquakes in Scandinavia (Norway, 1817), while in the south, strong earthquakes on the eastern coast of the Caspian Sea are felt.

Occasionally seismic shocks of up to 3-4 points are felt over a wide area, including both Moscow and St Petersburg, from deep seated, major earthquakes centred in the Eastern Carpathians (Romania, Vranca, 1802, 1940, 1977, 1986, 1990).

**Siberia.** The Altai, including Mongolian Altai, and Sayan are one of the most earthquake-prone intra-continental zones in the world.

In Russian territory, Eastern Sayan suffers strong local earthquakes, measuring  $M=7$ , and  $I_0=9$  points (1800, 1829, 1839, 1950). The strongest of the most recent earthquakes took place on 27<sup>th</sup> September 2003 in the mountainous Kosh-Agachkiy region of Altai ( $M=7.5$ ,  $I_0=9-10$  points). Earthquakes of a lower magnitude ( $M=6.0-6.6$ ,  $I_0=8-9$  points) had recently occurred in Russian Altai and Western Sayan.

**Far East.** The Kurilo-Kamchatsk region extends along the eastern shore of Kamchatka, the Kurill Islands and Hokkaido. This is the seat of the severest earthquakes in Northern Eurasia, measuring  $M=8$  and with a seismic effect of  $I_0=10$  points. Earthquakes linked to the activity of the Kamchatka volcanoes are particularly dangerous (in 1827, when the Avachinskiy volcano erupted, the intensity of the seismic shocks felt in Petropavlovsk-Kamchatskiy reached  $I_0=6-7$  points).

The Shikotanskiy and Kronotskiy earthquakes, (1994,  $M=8.0$ ,  $I_0=9-10$  points and 1997,  $M=7.9$ ,  $I_0=9-10$  points respectively), which took place in Southern Kurill and the eastern shore of Kamchatka, have been studied more closely. The Shikotanskiy earthquake was accompanied by a tsunami with waves reaching a height of 10 metres, and caused widespread damage on Shikotan, Iturup and Kunashir. There were 12 fatalities and considerable damage to property.

Sakhalin is the northernmost point of the Sakhalino-Japanese group of islands.

Until the catastrophic Neftegorsk earthquake (1995,  $M=7.5$ ,  $I_0=9-10$  points), moderate seismic activity had been recorded on the island. The Neftegorsk earthquake was the most destructive earthquake ever known to have taken place on the territory of the Russian Federation, with a loss of 2,000 lives.

It may be that technological factors, such as the uncontrolled pumping of oil, acted as a trigger to the expansion of geodynamic stresses which had built up in the region.

**During 2005** heightened seismic activity was observed in the Kurilo-Kamchatsky seismic zone, as has been typical for the past 3-5 years, and there was increased seismic activity in the Baikal and Altai-Sayansky zones.

An increased number of seismic events was observed in southern Yakutia.

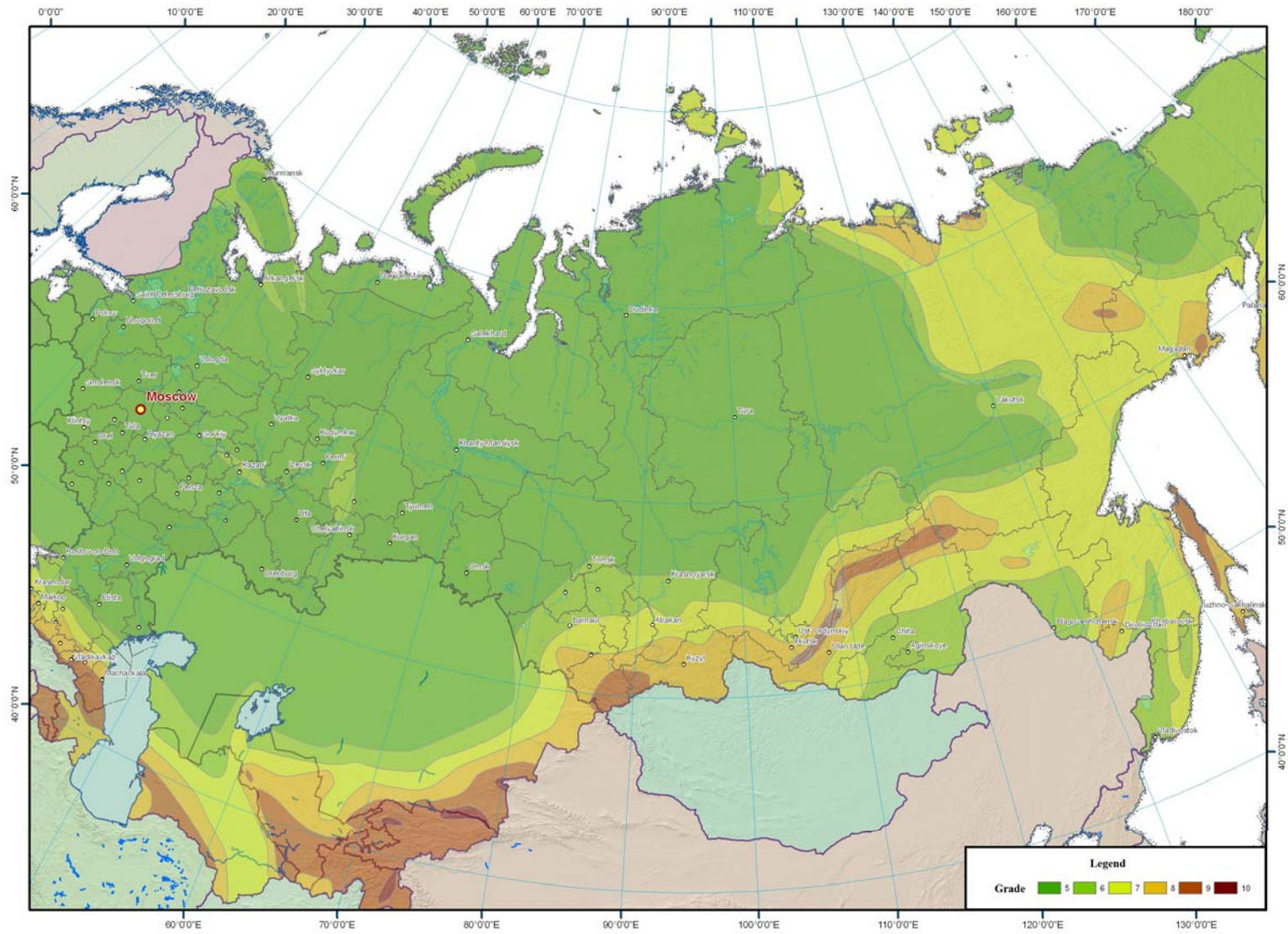
In the area of Sakhalin Island no significant changes took place.

Throughout the year a number of areas of seismic inactivity remained in the region of Avachinsky Bay, in the south of the Kamchatka peninsula, in the Kurill and Komandorskiy islands, Sakhalin, and in the republics of Dagestan and Chechnya..

At 3.25am Moscow time **on 21<sup>st</sup> April 2006** an earthquake occurred in the Olyutorskiy and Karaginskiy regions with a strength at its epicentre (460 km. North-east of the city of Palan) of 9.5 points. The earthquake was felt in 12 population centres. Those of Korf, Tilichiki and Khailino with a population of over 4,000. suffered the most.

As a result of this earthquake 377 residential buildings, 24 administrative and commercial buildings and the runway of Tilichiki airport were damaged, and heating, water and electricity supplies were interrupted. The damage is still being evaluated.

**For the future** MChsS predicts a continued high probability of seismic events registering M7+ in the south of the Kamchatka peninsula, northern and southern Kurill islands, in the region of the Komandorskiy islands and Sakhalin island, and events registering M6+ in the republics of Chechnya and Dagestan and the Baikal region.



## **VOLCANIC RISKS. KAMCHATKA AND THE KURILL ISLANDS**

Within Russia active volcanoes are located within the Kurilo-Kamchatskiy island group. The 50km wide zone extends 2,000 km from the Karyakskiy plateau to the island of Hokkaido. This area contains 12% of the active volcanoes in the world, and 80% of the eruptions which occurred in the 20<sup>th</sup> century from these volcanoes took place on Kamchatka itself.

The simultaneous eruption of two volcanoes on 2<sup>nd</sup> January 1996 caused ecological damage to an unpopulated, virtually undeveloped region of Kamchatka. The area surrounding the volcanoes was covered with a thick layer of volcanic ash. The Karymskiy shore was bombarded with volcanic rocks, the waters were overheated and poisoned, taking on a thick, brownish-green coloration and aquatic life was killed off.

The most dangerous of the Kurill volcanoes is the Mendelejev volcano. This is located near the population centres of Yuzhno-Kurilsk and Goryachiy Plyazh, where the majority of inhabitants of Kunashir island live.

## **TSUNAMIS AND TSUNAMI ZONES**

The risk of huge waves, tsunamis, is closely associated with underwater earthquakes and volcanic activity. In Russia, parts of the shores of Kamchatka, the Kurill islands, Sakhalin and Primorye are subject to this risk. This area includes 14 cities and dozens of towns and villages. Between 1737 and 1973 the shores of Kamchatka and the Kurill Islands suffered 35 tsunamis.

Tsunamis measuring 4 points occur once every 50-100 years, and weaker ones are ten times more frequent. The most destructive tsunami on record took place in October 1952, when the city of Severo-Kurilsk was almost totally destroyed and 14,000 people lost their lives.

## RISK OF LANDSLIDE

Examples of the damaging consequences of landslides in the Russian Federation between 1993 and 2001 are given in the table (details of destruction of property and loss of life as a result of landslides).

Major damage caused by landslides

Date of landslide occurrence	Location	Aftermath of landslide, structures destroyed or ruined, damage caused	Number of fatalities
26.03.1993	Shpakovsky region of the Stavropol Krai	Astrakhan-Nevinomyssk highway	-
20.04.1993	Karachayevo-Cherkessiya	Teberda-Dombai road	-
29.06.1993	Karachayevo-Cherkessiya, 4km. from the centre of Ust'-Djeguta	Collapse of the bank of the Grand Stavropolsky Canal, damaged valued at 120 mln roubles.	-
17.09.1993	Chitinskaya Oblast, between Mokhovaya Pad' and Belogorye stations	Railway lines	-
27.09.1993	Ingushetia, Alkun village (33 km from Nazran city)	Landslide and collapse with fatalities	15
9.09.1996	Kirov	Landslide with a volume of 8,200 cu.m. Water supply, telephone and road networks affected.	1
18.12.1997	Village of Yakor-Schel', by Sochi	The Maikop-Sochi gas pipeline was breached by a landslide, and gas supply to the Sochi region was interrupted.	-
12.01.1998	Sochi, Khostinsky region	Main water pipeline breached by landslide.	-
1-2.03.1998	Cherkessk, Karachayevo-Cherkessiya	Branches of the main gas pipeline were breached.	-
March 1998	Republic of Chechnya, mountain regions	Massive destruction as a result of landslide carrying away residential buildings (more than 600 homes), electricity lines and roads damaged.	-
04.04.1998	Ust'-Djeguta, Karachayevo-Cherkessiya	One residential building destroyed.	-
24.02.1999	Azov, Rostovskaya oblast	Eight private houses destroyed and 50 damaged.	-
24.03.1999	Zlato'ust, Chelyabinskaya oblast	Landslide with a volume of 3,500 cu.m. near a nine-storey building, electricity and water supply interrupted .	-
17.04.1999	Sarapul, Udmutriya	Breach of the main Yamburg-Yelets gas pipeline with subsequent ignition of gas.	-
8.06.2000	Sochi, bypass motorway under construction	Landslide overturned a GAZ-53 vehicle which then caught fire, and a Kato excavator was also damaged. Damage valued at 1 million roubles.	-
26.02.2001	Sochi, construction of bypass	800 cu.m. landslide destroyed a 170m length of overpass and its supporting walls, two single storey accommodation blocks and two	-

In the whole of the Russian Federation the areas most at risk of landslide are the mountainous areas of the Caucasus and the Urals, and narrow ribbons of land alongside the major rivers.

In European Russia the area most at threat from landslide is to the south of a line formed by the towns of Smolensk – Tver’ – Tula – Nizhniy Novgorod – Yushkar – Ola – Solikamsk, as far as the upper Don, Sredniye Povolzhe, the right bank of the Volga as far as Volgograd, and in the south-east as far as Orenburg and Orsk regions, including the southern Urals. In the Asian part of Russia the most significant risk of landslide occurs in the Kurgansk Oblast, the shores of the Irtysh river and upper sections of the Ob’ as far as Nizhnevartovsk, the southern parts of the Novosibirsk Oblast and the Krasnoyarskiy Krai, most of the Altaisk Krai, Hakasiya, Tyva, Priangarye, the river basins of Vitim and Olyomka, Priamurye, Primorye (mostly in the lands adjoining the sea shore), and most of Sakhalin and Kamchatka.

The rest of Russia, i.e. the vast majority of the territory of the Russian Federation, is at little risk of landslides.

## **AVALANCHE RISK**

More than 18% of Russia is subject to avalanches. These occur mainly from December to March in the Northern Caucasus, Altai, Sakhalin and Zabaikalye.

Several avalanches took place in January 1993 in the Rokskiy Pass in the Caucasus as a result of sustained and heavy snowfall. 47 lives were lost in these avalanches.

Although not on a large scale compared with other events, the sudden and unexpected nature of these avalanches means that they inflict substantial damage to plant and lead to loss of life.

**In 2005** two emergency situations arose due to avalanches (in the Southern and Far Eastern Federal Okrugs). There were 9 fatalities and 53 persons injured. In 2004 no such events were recorded.

## RISK OF COLLAPSE IN KARST REGIONS

Karst topography extends over about half of Russia's territory. Layers can be found both on the surface and at various depths, covered by quaternary or other sediments (the collapse at the Bereznikovskiy potassium salt deposits in 1984 took place at a depth of 400 metres).

Damage caused by karst erosion.

No	Location	Date	Event	Damage
1	Dzerzinsk, Electrical heating supply plant.	5.09.1961	Cone-shaped collapse, 26m diameter and 5.5m deep	Wall of single storey building affected.
2	Dzerzinsk region, 800m from Chernoye village school	25.11.1961	Collapse 7m diameter, 11m deep.	Excavator damaged in fall.
3	Moscow, 35/2 Khoroshevskoye Chaussée	October 1969	Two collapses, 10m diameter and 17 m deep	Five storey block of flats destroyed.
4	Moscow, 3, 4 and flat 2, no 5 Novo-Khoroshevsky Proyezd	April 1977	Subsidence with a diameter of 40m	Two blocks of flats destroyed and one severely damaged.
5	Towns of Irbit, Kamyshlev and others	1959-1960 and March 1983	Drop in water table and construction of water supply caused the development of a number of severe karst collapses	Foundations of buildings and other structures damaged
6	Town of Sol'-Iletsk	1979	Karst funnel with a diameter of 40m.	Mineshaft flooded.
7	Near Tula	October 1981	Collapse with a diameter of 50m.	Children's holiday camp put out of action.
8	Main gas pipeline south of Perm'	May 1983 to December 1984. 1985	24 collapses with a diameter of 2-2.5m, (70 collapses in one sq.km.), depth up to 2m. 134 funnels in one sq.km.	
9	Bereznikovskiy potassium mine no. 3	1986	40 x 80m collapse more than 150m deep. Influx of karst waters.	Mine destroyed and seam no longer workable.
10	Moscow, 17, ul. Marshall Tukachevsky	April 1987	Collapse with diameter of 15m, constantly recurring.	Threat of collapse of two blocks of flats.
11	Dzerzinsk, Nizhegorodskaya oblast	July 1992	Collapse with diameter of 30m, 15m deep.	Part of "DzerzinskKhimMash" factory destroyed – damaged valued at 700 million roubles (1992 values).
12	Smolenskaya oblast, Vazuza river	Autumn 1992	Karst collapse along the Vazuzsky reservoir dam.	Threat of collapse of Vazuzsky reservoir dam.

## FLOODS

Flooding and storms are the most perilous water-related risks. Strong winds causing water levels to rise in river mouths, spring snowmelts, heavy rainfall, and blockages of debris and ice on rivers are the main causes of flooding.

The total area of land within Russia which is subject to flooding is estimated at 350-400 thousand square kilometres. In any given year the area affected by flooding is about 100-150 thousand square kilometres. In years of heavy rainfall the total flooded area can amount to 2-2.5% of the country overall. Flooding occurs annually in Russia, and two or three times a year in some areas. Most regions suffer flooding once every 8-12 years or less.



## **RISK OF FLOODING DURING THE SPRING THAW**

Regions are divided into six types according to the degree of flooding risk:

The extreme flood risk zone, where water levels rise to more than 3.2m above the pre-flood level, is represented by fourteen relatively small areas totalling 910 thousand square kilometres. Of these areas eight, with a total area of 120 thousand square kilometres are in the Far East. The biggest area, measuring 510 sq. km. is on the middle and lower reaches of the Yenisei and its major tributaries. An area measuring 60 thousand sq. km. is located in the Tobol river basin in Zauralye.

The major flood risk zone, with waters rising to 2.1-3.2 metres above pre-flood levels consists of thirteen areas totalling 5.9 million sq. km.

The flood risk zone, where waters rise to 1.5-2 metres above pre-flood levels, also consists of thirteen areas totalling 2.2 million sq. km. The most significant of these areas extends from Russia's western boundary to the Tobol and Irtysh river basins and measures 1 million sq. km. The other 12 areas, totalling 1.2 million sq. km. are situated in Eastern Siberia and the Far East.

The moderate flood risk zone, where water levels rise to 0.8-1.4 metres above pre-flood levels consists of eleven areas totalling 5 million sq. km. The remainder of Russia is in either the minimal or insignificant flood risk zones.

The map shows population centres subject to flooding: total flooding, significant flooding (up to 50%), and partial flooding (up to 30%). This map was drawn up on the basis of information from the Hydro-Meteorological Services of the USSR and of the Russian Federation, The All-Russian Scientific Research Institute on Civil Defence and Emergencies for the Civil Defence Ministry, the Emergency Monitoring and Forecasting Unit, the All-Russian Centre for Emergency Monitoring and Forecasting for the Civil Defence Ministry and a number of other organisations.

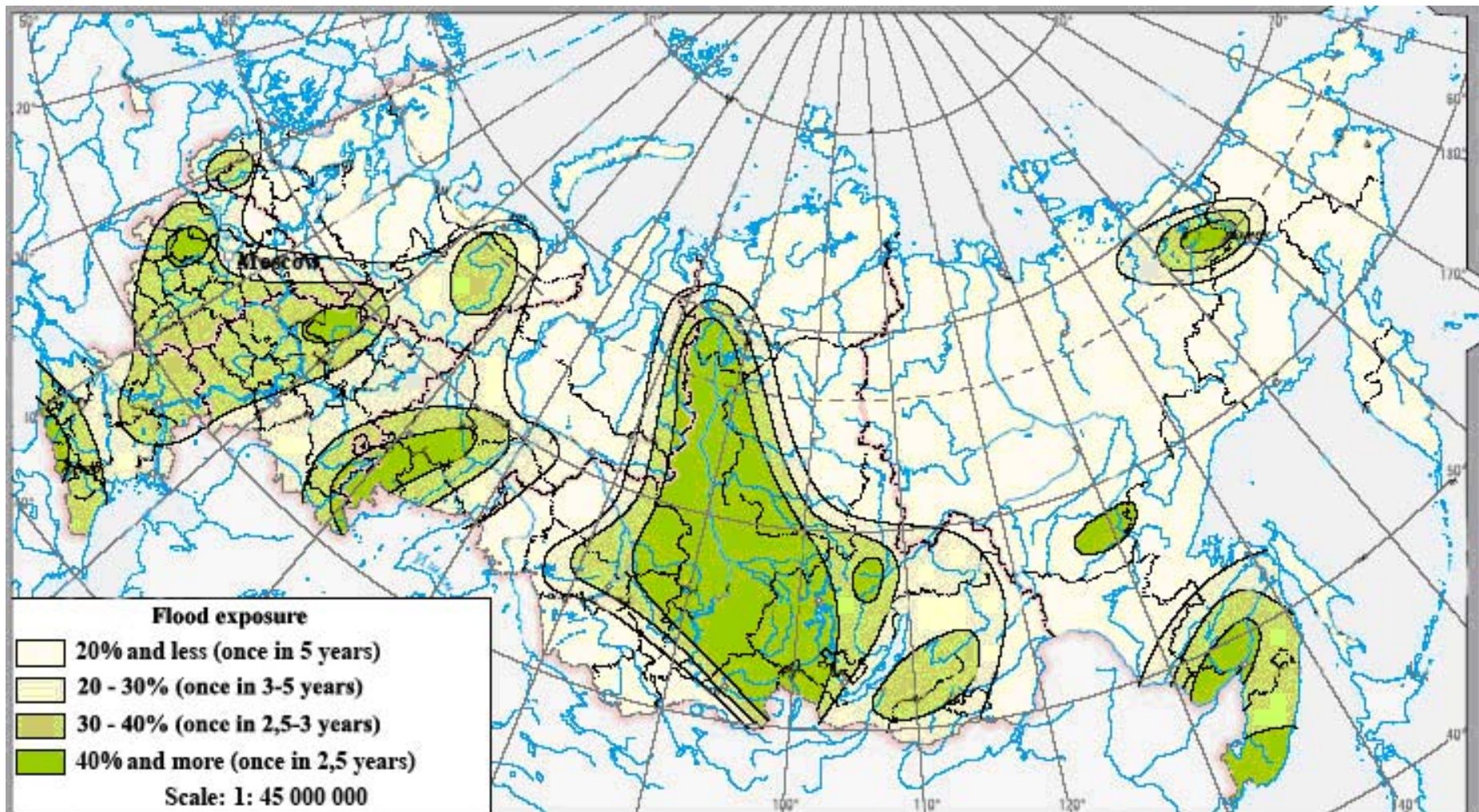
**In 2005** dangerous flooding was registered in 41 locations in the Russian Federation, resulting in 30 emergency situations.

A catastrophe was avoided by the timely analysis of a threatening development on the Volzsko-Kamsk reaches in April 2005 and prompt mobilisation of forces and resources in an area of potential emergency caused by raised water levels.

**In forecasts for 2006**, MChS RF has indicated a high probability of flooding creating emergencies in Siberia, the Urals and the Southern Federal Okrug.

Among the main indicators for emergencies arising are:

- Significant climate changes have increased the water flow of Russia's major rivers – the Volga, Ob', Yenisei, Angara, Lena and Tereka – by 7-10%.
- 50 million persons (35%) in the Russian Federation live in regions subject to dangerous flooding, and uncontrolled building on a large scale is taking place in flood zones;
- annual losses from flooding and inundation are estimated at 35-40 billion roubles (in 2005 funds directed to water management were increased tenfold in comparison with the previous year, to 12 billion roubles, however this is one tenth of the amount spent in the USA).



## **RISK OF FLASH FLOODING**

20% of Russian territory is at risk of flash-floods. 13 cities are directly at risk of flash-floods, and a further 42 are in areas potentially at risk. The regions most subject to flash-flood risk are in the Northern Caucasus, Altai, Sayan, Pribaikalye and Zabaikalye, Kamchatka and Sakhalin. A major disaster, caused by the occurrence of a series of destructive flash-floods, took place in Tyrnyauz (Kabardino-Balkarskiy Republic) in August 2000. Pulsating glaciers also present a significant threat. On 20<sup>th</sup> September 2002 the Kolka glacier in the Karmadonskiy gorge (Northern Ossetian Republic – Alaniya) was destabilised, leading to a natural catastrophe in which a flash-flood travelled almost 15 km. along the Genaldon river valley at a speed of more than 170 km/hour causing the loss of over 100 lives and the destruction of the village of Nizhniy Karmadon and a number of holiday centres.

The main regions where MChS RF predicts the possibility of emergencies caused by flash flooding in 2006 include the Southern Federal Okrug (the Krasnodarskiy Krai, the Kabardino-Balkardiya and Karachayevo-Cherkessk republics and Northern Ossetia-Alaniya) and the Siberian Federal Okrug (in the republic of Buryatia and the Irkutsk and Chitinsk oblasts).

## **RISK OF FROSTS, FREEZING AND DROUGHT**

Russia, with its long winters, frequently suffers severe frosts which are particularly damaging to the utility supply infrastructure. The most severe frosts occur in the intra-continental part of Russia in the north-east, where at Oimyakon (“the cold Pole”) a minimum air temperature of  $-67^{\circ}\text{C}$  has been recorded. Minimum temperatures of  $-40$  to  $-50^{\circ}\text{C}$  have been recorded in the Primorskiy regions. Most damaging are severe frosts lasting several days, but they occur less frequently than one-day frosts; in European Russia they occur on average once every few decades.

Droughts, in extended periods of high temperatures with no rainfall, occur in the central and southern regions of Russia (Sredneye and Nizhneye Povolzhe, Rostovskaya Oblast, the Stavropol and Krasnodarskiy krajs). Severe droughts occur in these regions once every five years, while in the Central-Chernozemniy region the frequency drops to once in twenty years. Zabaikalye also suffers severe droughts relatively frequently. Severe droughts are accompanied by damage to crops, and grass-, peat- and forest fires.

## RISK OF FOREST FIRES



The eastern and north-eastern parts of the Russian Federation bear the highest risk of extensive forest fires: here the discovery and control of such fires is difficult due to the enormous tracts of forestry and the inadequacy of the forces and means available (a small population, concentrated largely in cities). This means that large areas of forest are lost to fires before they can be extinguished.

The Khabarovskiy krai, Kamchatskaya and Sakhalinskaya oblasts, Evenkiyskiy Autonomous Region and Republic of Yakutia (Sakha) fall into this category. Western and Eastern Siberia (Tomskaya and Irkutskaya oblasts), the Far East (Amurskaya and Magadanskaya oblasts) are high-risk areas. Greater than average risk is present in the country's northern regions (Murmanskaya and Arkhangelskaya oblasts, and the Republics of Komi and Karelia), Eastern Siberia (Krasnoyarskiy and Primorskiy kraises, the Tyva Republic, Altai, Buryatia, Chitinskaya oblast and the Yevreyskiy Autonomous Oblast).

In Western Siberia the same degree of risk is suffered in the Tyumenskaya oblast; in the Chelyabinskaya oblast in the Urals; and in the Kostromskaya oblast, the Mariya El Republic and Chuvashia; and in north Caucasus in the Chechen and Ingush Republics. Average levels of forest fire risk are found in European parts of Russian territory (Vologodskaya, Kirovskaya, Nizhegorodskaya, Rostovskaya, Astrakhanskaya and Penzenskaya oblasts; the Republics of Mordovia, Northern Ossetia-Alaniya, Dagestan and Karachayevo-Cherkessiya); in Western Siberia

(Khanty-Mansiisk Autonomous Region); in Eastern Siberia (ust-Ordynskiy Buryatskiy Autonomous Region); and in the Far East (Chukotskiy and Koryakskiy Autonomous Regions).

The vast majority of Russian Federal territories have a lower than average risk of forest fires, due to the smaller extent of forestry, and to greater efficiency in discovering and extinguishing fires (greater resources per unit of forested land, a more developed road network to deliver those resources, and a higher level of fire-fighting infrastructure within the forested areas).

<b>Name of the region of Russian Federation</b>	<b>Frequency of forest fires (number of accidents on 1 mln. Ha of forest square)</b>	<b>Name of the region of Russian Federation</b>	<b>Frequency of forest fires (number of accidents on 1 mln. Ha of forest square)</b>
Kaliningradskaya obl.	304.9	Lipezkaya obl.	145.3
Arkhangelskaya obl.	15.5	Tambovskaya obl.	138.8
Vologodskaya obl.	14.7	Volgogradskaya obl.	103.6
Murmanskaya obl.	26.1	Samarskaya obl.	175.8
Respublika Kareliya	43.3	Penzenskaya obl.	60.3
Respublika Komi	14.8	Ulianovskaya obl.	80.9
Leningradskaya obl.	166.7	Stavropolskiy krai	216.3
Novgorodskaya obl.	34.6	Rostovskaya obl.	99.3
Pskovskaya obl.	79.8	Kyrganskaya obl.	165.7
Bryanskaya obl.	118.3	Orenburgskaya obl.	113.2
Vladimirskaya obl.	306.7	Chelyabinskaya obl.	185.6
Ivanovskaya obl.	141.5	Altaisky krai	113.2

Tverskaya obl.	37.4	Kemerovskaya obl.	15.0
Calyzhskaya obl.	42.1	Novosibirskaya obl.	32.9
Costromskaya obl.	34.4	Omskaya obl.	30.1
Moscowskaya obl.	245.0	Tomskaya obl.	14.5
Orlovskaya obl.	8.2	Tumenskaya obl.	89.4
Ryazanskaya obl.	83.7	Krasnoyarsky krai	18.6
Smolenskaya obl.	18.7	Irkytskaya obl.	19.0
Tylskaya obl.	4.7	Chitinskaya obl.	19.7
Yaroslavskaya obl.	28.8	Respublika Byrytiya	26.8
Nizhegorodskaya obl.	196.7	Primorsky krai	28.5
Kirovskaya obl.	24.9	Khabarovsky krai	9.1
Respublika Meri El	85.7	Amurskaya obl.	12.0
Respyblika Mordovia	67.7	Kamchatskaya obl.	3.0
Chyvashskaya respublika	70.7	Magadanskaya obl.	4.0
Belgorodskaya obl.	68.8	Sakhalinskaya obl.	13.9
Voronezhskaya obl.	530.2	Respublica Sakha	2.3
Kyrskaya obl.	120.5	Krasnodarsky krai	24.0

Predictions **for 2005** indicated an increased number of fires in comparison with the previous year, to reach annual average levels.

In fact the area affected by fires in the Russian Federation in 2005 increased by 20% over 2004 figures, equalling 60% of the annual average. The number of fires was also up by 15% on the previous year, and equal to 70% of the annual average figures.

Looking at federal okrugs individually, the annual average was exceeded - for area affected in the Ural Federal Okrug; - and for number of fires in the Privolzhskiy Federal Okrug. In the Southern Federal Okrug the number of fires was on a par with the annual average figure. In the Far East, Siberia, North-Western and Central Federal Okrug fire statistics did not reach the annual average.

**In 2006** annual average fire statistics are expected to be exceeded in the Russian Federation, both in respect of area affected and number of fires. Estimates of “higher than average” have been given for Siberia and the Far Eastern Federal Okrug (the greatest number of fires typically happens in these regions in May and July, while the largest fires tend to occur in September and October).

An increase in the number of fires is also predicted for the Central, Privolzhskiy and Southern Federal Okrug. The main reason for this is an rise in human factors (increased incidence of breaches of fire safety regulations in forests, growth in exploitation of forestry resources expected in the near future, and agriculture related fires).

## **RISK OF PEAT FIRES**

A high risk of peat fires is present in those areas with exposed peat fields (Novgorodskaya oblast and the Khanty-Mansiisk Autonomous Region). Kaliningradskaya, Pskovskaya, Tomskaya and Vologodskaya oblasts are exposed to greater than average risk where there is a greater concentration of population and peat fields in wooded areas. Average levels of risk are found in Moskovskaya, Smolenskaya, Ivanovskaya, Arkhangelskaya, Sakhalinskaya, Sverdlovskaya and Tverskaya oblasts and the Republic of Karelia. The remainder, and by far the largest part, of the Russian Federation is subject to lower than average or minimal risk of peat fires.

## CONCLUSION

Using statistics from the late 20<sup>th</sup> and early 21<sup>st</sup> century we can conclude that 280 catastrophes arising from natural causes take place in Russia annually, and that they are most likely to recur in the Southern and Far Eastern regions.

In the future a growth in emergency situations is predicted for susceptible zones (at risk of avalanche, landslide, flood, etc.), the uncontrolled development of which has taken place on a large scale in the last ten years (building in a landslide zone in Dagestan, avalanche and mountain-flood zones in KBP, KChR, RSO-Alania and the Krasnodarskiy Krai, and flood zones in the republic of Adygeya, the Stavropolskiy Krai, and the Vladimirskaya, Irkutskaya and Sverdlovskaya Oblasts).

Insurance against natural catastrophe is growing rapidly in Russia at present. Overall coverage of this line of insurance in Russia is relatively low, with the result that the bulk of payments made to victims of various natural catastrophes are made by government; the share paid by insurers is therefore minimal.

However, recently there has been a noticeable increase in insurances taken out against natural catastrophe in potentially high-risk areas. Specifically, this includes cover for heating and energy plants, and also small and medium sized businesses in these regions.

As insurance becomes more widespread, the growth in sums insured and in the number of risks insured will lead to a greater volume of insurance losses paid, as the demand for insurance and reinsurance protection against natural catastrophes increases.

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