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CLIMATE PASSPORT

Kola ¹ Ecoregion

Number in the WWF «Global 200»

N: 115, 198

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Almost every day we witness global climate changes; the weather gets more and more unpredictable and catastrophic floods, snow collapses, and mudflows occur with greater frequency. Another disappointing record was registered in 2002: arctic sea ice extent and area for the month of September reached their lowest levels since 1978 when systematic measurements began. This is a new minimum value for the whole 24-year period of detailed satellite observations and about 14% lower than the average value. Over the whole 20th century, temperature in the Arctic has increased by 5 °C compared to the global average of 0.6 °C. Scientists predict progressive development of this tendency, which would cause a threat of new natural disasters.

Arctic ecosystems are presently facing serious dangers and dramatic changes. That is why the Arctic has been chosen by WWF for implementation of the first special project on monitoring the impacts of climate change and creation of an action plan. The Kola Peninsula is among the priority areas of the project and is why the Climate Passport of the Kola Ecoregion is the third to be issued in the WWF-Russia series «Ecoregional Climate Change and Biodiversity Decline». The first and the second issues of the series were devoted to the Altai-Sayan Ecoregion and Chukotka and have already played positive roles in the development of the conservation programmes for these unique ecosystems.

This publication will provide you with information on the current climatic situation in the region and climate predictions. Climate changes have not been very pronounced there so far, but the region is potentially very vulnerable to them because of the immense effect of the warm Gulf Stream ocean current. It indicates the necessity of data analysis and monitoring of the situation for prevention of possible disastrous changes.



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Modern Climate of the Ecoregion

Fog and Rain Again and Again...

The climate of the Kola Peninsula is determined by its border position between the Barents Sea which is warmed by the Gulf Stream and cooled by the White Sea. Due to the warm waters of the North Cape Gulf Stream branch, the climate in the north-western part of the peninsula is the mildest over the entire Arctic coast in Russia. The sea is free of ice all year round. Average temperatures of the coldest month (February) drop only to 5–6 °C below zero, which is 10–15 °C higher than

the mean latitude temperatures. However, these places are unique for having the most variable and unstable pressure systems in the whole European part of Russia. Wind speeds can easily reach 50 m/sec and windless days are very rare. Severe weather is complemented with frequent fogs and dribbles, dense clouds, heavy storms, and a polar night lasting for more than two months.

High cyclonic activity is a characteristic trait of the climate in the ecoregion. It is particularly pronounced in winter when the

Average climate parameters of the region in 1961–1990

Station	Position (degree, min.)		Month	Air temperature, °C					Relative air humidity, %	Mean precipitation, mm	Mean monthly wind speed, m/sec
	Latitude, N	Longitude, E		average	average maximum	average minimum	absolute maximum	absolute minimum			
Vaida-Guba	69 56	31 59	I	-5.6	-3.0	-8.7	7	-25	83	51	8.3
			VII	10.2	14.0	7.5	32	0	82	45	4.8
			год	1.2	4.0	-1.5	32	-27	82	540	6.6
Nikel	69 24	30 14	I	-11.3	-7.6	-15.4	7	-38	81	31	3.8
			VII	12.9	17.6	8.8	34	0	69	55	3.5
			год	-0.1	3.4	-3.7	34	-40	76	463	3.8
Teriberka	69 12	35 07	I	-7.8	-4.2	-11.0	6	-26	79	34	8.4
			VII	11.2	13.5	8.2	35	2	78	50	5.1
			год	0.6	3.2	-2.5	35	-31	79	472	7.1
Murmansk	68 58	33 03	I	-10.5	-7.2	-13.8	7	-39	85	32	6.6
			VII	12.6	17.5	8.7	33	2	73	57	4.2
			год	0.2	3.6	-2.8	33	-39	79	488	5.3
Nivankiul	68 21	30 44	I	-13.1	-8.9	-17.9	6	-45	83	33	2.5
			VII	13.5	18.7	8.6	32	-1	72	74	2.6
			год	-0.5	3.6	-4.8	32	-45	79	546	2.5
Pulozero	68 21	33 18	I	-13.4	-8.8	-18.4	6	-47	85	24	2.7
			VII	13.4	18.5	8.4	33	-2	71	58	3.0
			год	-1.0	3.2	-5.5	33	-47	79	448	3.0
Kovdor	67 34	30 27	I	-13.5	-9.3	-18.9	6	-43	84	32	2.3
			VII	13.4	18.7	7.4	32	-3	71	78	2.3
			год	-1.3	3.0	-6.2	32	-44	79	569	2.3
Krasnoscheliie	67 21	37 03	I	-13.2	-9.1	-18.3	5	-45	86	27	2.6
			VII	13.2	18.8	7.9	34	-2	71	66	2.9
			год	-1.3	2.9	-5.8	34	-49	81	496	2.9
Tersko-Orlovskiy	67 12	41 18	I	-9.9	-6.5	-13.2	6	-38	87	26	8.1
			VII	9.0	13.5	5.6	34	-2	85	48	5.1
			год	-0.9	2.3	-4.0	34	-38	85	436	6.8
Umba	66 41	34 21	I	-11.0	-7.7	-14.8	7	-40	87	29	4.5
			VII	14.3	18.7	10.5	32	1	72	54	4.2
			год	0.5	4.0	-2.9	32	-40	80	498	4.6



Climate:

Mildest, but unstable
over the entire
Arctic coast in
Russia

Specific features:

Temperature of
February is 15°C
higher than the

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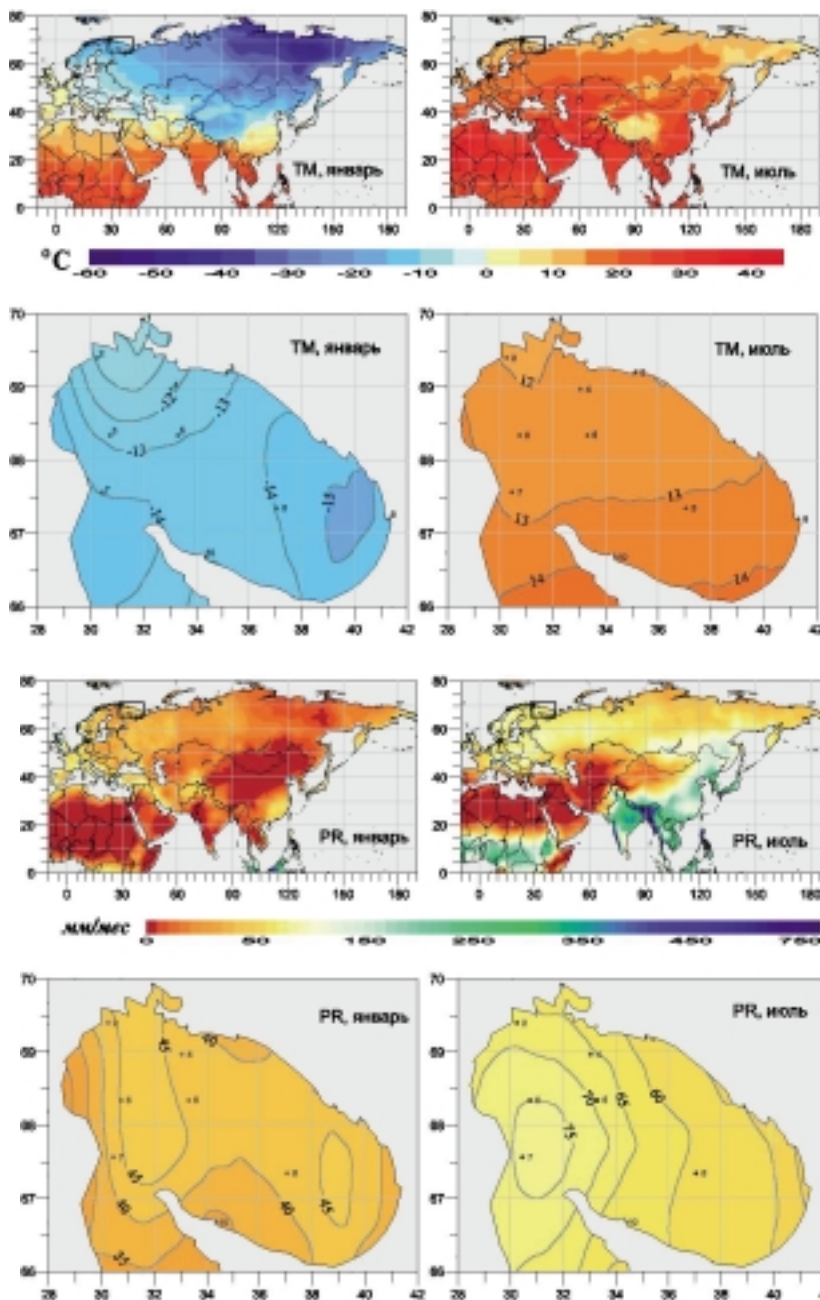
Modern Climate
of the Ecoregion

Icelandic Low, a semi-permanent pressure system in the North Atlantic, reaches its maximal development. The inflow of warm and humid sea air promotes considerable increase in the winter average air temperature. In summer, activity of the Iceland depression decreases, cyclone outbreaks become less intensive, and conditions become favourable for the formation of anticyclonic area (a high-pressure area) over the Barents Sea. Such seasonal pressure rearrangement is characteristic of the monsoon circulation more pronounced over the Kola Peninsula in winter than in summer.

On the whole, a maritime climate with mild, but long winters and cool summers is typical for the region. However, short and

severe frosts with temperatures that drop down to 30–40 °C below zero associated with inflows of the cold Arctic air are common. They are often followed by thaws where temperatures may increase up to 0 °C or more and can occur many times during the winter. In summer, hot days with the temperatures of up to +30 °C are common on the background of the cool weather.

Average for 1961–1990 air temperature, °C (up) and precipitation, mm/month (down) in Eurasia and in the Kola Peninsula in January (left) and July (right)



Climate Passport
of the Kola Ecoregion



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mean latitude
temperatures

Modern Climate
of the Ecoregion

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Warmth Comes from the North

Four climatic regions are distinguished on the Kola Peninsula as follows: the Murmansk coast of the Barents Sea; the centre of the peninsula; the White Sea coast; and the Kandalaksha Bay. The Murmansk coast is characterised by a maritime and relatively mild climate with a large amount of precipitation, frequent fog and wind. The climate of the rest of the peninsula is more continental. Winter isotherms are parallel to the coast, but the weather in this period is warmer in the north.

Summer is cool and rainy. Summer months get about 30% of the annual precipitation and almost half of all summer

days are rainy. The annual amount of precipitation ranges from 350 to 600 mm. The snow cover is formed already in late October. It is heavier in the inland areas (up to 60 cm on average) than in the coastal ones (20–40 cm), though its average thickness may vary in different years. In the mountains, snow is blown off the plateaus into the ravines and is stored there in such amounts that some snowdrifts persist even in summer. The snow banks along the roads has been known to reach 4–5 metres.

The climate of the White Sea coast and the Kandalaksha Bay is affected by the White Sea and the mainland in the south. The climate of the White Sea coast is more of a maritime one, whereas that of the Kandalaksha Bay is more continental. Average winter temperatures are much higher on the White Sea coast than in the Kandalaksha Bay. Amount of precipitation there, like in other regions of the Kola Peninsula, is greatest in summer. Up to 32 days in summer are foggy.

Climate Changes in the Past and Predictions for the Future

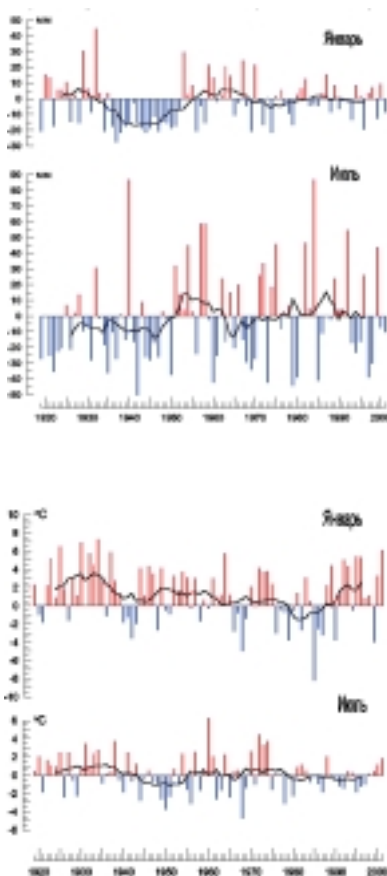
One Year Differs from Another

Large year-to-year variability, especially in shifts from one season to another, is the most important aspect of the regional climate. Inter-annual changes in the dates of stable transfer of the daily average air temperature over the thresholds of -5 , 0 , 5 , 10 °C is uniquely large and reaches 45–55 days in spring and 30–40 days in autumn. That is, the average spring temperatures become positive 1.5 months later in one year compared to another one. The duration of the growing season, where average daily temperatures exceed $+5$ °C, may also vary by 50–60 days, or 1.5 times, from year to year. However, year-to-year variability of the dates of phenological phenomena is much lower. The amplitude of sap running and leafing in birches is 30–35 days compared to that of the coltsfoot, rose bay, dandelions, and bird cherry blooming which are about 30–40 days. The dates of the first cuckoo calls differ by 20–30 days in different years and those of the leaf yellowing and the end of leaf shedding in birches vary within 25–35 days.

At the Terminal Point of the Gulf Stream

The climate of the Kola Peninsula totally depends upon the Gulf Stream, and any minor deviations at the «root» and «trunk» of this tremendous flow of warm water may affect its most remote branch warming this ecoregion. The Gulf Stream is a system of warm currents stretching 10 thousand kilometres from the Florida coast on the western side of the Atlantic, then north and east to Svalbard and the Kola Peninsula. It is caused by the wind water drift into the Gulf of Mexico resulting in difference of the water levels in the gulf and in the Atlantic Ocean. Water flow runs into the ocean at a rate of 25 million m^3/s , which is 20 times greater than the total flow of all the rivers of the planet. The speed of the Gulf Stream in the ocean

Precipitation mm/month (upper diagram) and air temperature, °C (lower diagram) in January (upper line) and July (lower line) in Murmansk, deviations from the 1961–1990 average.



reaches 6 km/h, the width of the flow is 75–120 km, and its vertical depth is 700–800 m.

Temperature changes in the Gulf Stream flow are closely correlated with the fluctuations of the Passat, – wind driving warm tropical waters into the Gulf of Mexico. Increase in power of the north-eastern Passate causes an increase in the temperature of the Gulf Stream within 3–6



Climate changes in the ecoregion:

- cooling was a general climatic trend in the XX century as a whole, it was replaced by warming in the late 1980s
- in XXI century warming can be predicted between $+1.5$

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Climate Changes in the Past and Predictions for the Future

months, while an increase in the strength of the southeastern passate produces its effect after 6–9 months. The temperature increases are followed by cooling periods, because the passate enhancement simultaneously causes the chilling of the ocean surface at the coasts of Africa by the cold waters rising from the depths.

In addition, the power of the Gulf Stream varies from year to year. This means that the causes of climatic changes on the Kola Peninsula are probably found thousand kilometres away from this ecoregion.