Country Level Impacts of Climate Change (CLICC) Project

CLICC Pilot template for Russian Federation

Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet)

"Institute of Global Climate and Ecology of Roshydromet & Russian Academy of Sciences"

Moscow, 14 March 2016

The CLICC templates are the result of a pilot study designed to test the feasibility of presenting country-level climate impacts information in a consistent and transparent manner. These CLICC pilot products are just the start of the CLICC process. The CLICC template is under continuous development and will improve over time.

Table 1. Observed climate impacts.							
Sector	**Observed climate impacts**	**Global impact rating**	**National impact rating**	**Confidence rating**	**Data quality rating** *(Please see Annex 1)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1)*
Freshwater resources	• Increase in annual river runoff for almost all parts of the country	Low	Low	High	High	1981-2012, 1981-2010, 1990-2010, Base period: 1936-1980	1.1
	• Substantial increase in river runoff in winter season, due to increase in winter temperature and frequency of thaws	Low	Low	High			
	• Increase in frequency of floods in the Black Sea coast of the Caucasus, the Kuban and Amur basins due to extreme precipitation	High	Medium	High		1990-2012	
	• Growth of hydropower in Volga-Kama cascade due to increase in winter river runoff	Low	Low	Medium		1978-2010, Base period: 1946-1977	
Human health	• Additional morbidity and mortality due to increasing frequency of heat waves	High	Low-Medium	High	Medium	1999-2012	1.2
	• Deterioration of human health due to air pollution from forest fires and anthropogenic emissions	Medium	Low-Medium	High	Medium	1999-2012	1.2
	• Increase in incidences of infectious diseases due to increase in air temperature and precipitation amount	Low	Low	High	High	1944-2011, 1992-2011, 1993-2012	1.3

Table 1. Observed climate impacts.							
Sector	**Observed climate impacts**	**Global impact rating**	**National impact rating**	**Confidence rating**	**Data quality rating** *(Please see Annex 1)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1)*
Terrestrial permafrost	• Melting of permafrost upper layer for the most parts of Russian permafrost zone due to increase in soil temperatures and anthropogenic factors • Destruction of ice-containing Arctic sea coasts due to increase in sea water temperature and decrease in sea ice extent • Intensification of thermoerosion and thermokarst processes in permafrost zone due to ice melting • Destruction of buildings and infrastructure in Russian permafrost zone	High High High High	High High High High	High High High High	Medium	1984-2012 1940-2000 1978-2010 1948-2012	1.4

Table 2. Projected climate impacts.						
Sector	**Projected climate impacts**	**Impact rating**	**Confidence rating**	**Data quality rating** *(Please see Annex 1)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1)*
Freshwater resources	• Insignificant increase in annual river runoff for almost all parts of the country, due to increase in winter runoff	Low	High	High	2011-2040 2046-2065 2041-2060 2080-2099	2.1
	• Decrease in annual river runoff in Southern regions of European Russia	Medium	High			
	• Increase in potential water availability for the entire Russia, but at the same time a decrease in water availability in the densely populated Central and Southern parts of European Russia	Low-Medium	High		2010-2039	
	• Increase in water inflow to the most Russian reservoirs	Low	High		2010-2039, 2011-2040, 2031-2060	
	• Reduction of the ice-covered period on rivers	Low-Medium	High			
	• Increase in frequency of floods and mudflows due to increase in precipitation amount	Low-Medium	High		2099-2100	

Table 2. Projected climate impacts.						
Sector	**Projected climate impacts**	**Impact rating**	**Confidence rating**	**Data quality rating** *(Please see Annex 1)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1)*
Human health	• Increase in morbidity and mortality due to increasing frequency of heat waves	Low	Low	Low	2041-2060	2.2
	• Deterioration of human health due to air pollution from forest fires and fuel combustion	Low	Low	Low		
	• Increase in incidences of infectious diseases due to extension of vectors distribution to the north and north-east	Low	High	High	2011-2030 2034-2053 2041-2060 2080-2099	2.3
Terrestrial permafrost	• Degradation of the upper layer of Russian permafrost zone due to increase in soil temperatures	High	High	Medium	2040-2050 2090-2100	2.4
	• Destruction of buildings and infrastructure in Russian permafrost zone	High	High			
	• Reduction of the accessibility of remote settlements in Russia currently serviced by ice roads	High	High			

Annex 1: Metadata and data quality assessment tables.

Metadata	
Metadata identifier	**1.1**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	The annual river runoff in Russia in 1981—2012 relative to 1936—1980 increased by 4.8% on average. Its highest increase is observed in the largest rivers of the Arctic Ocean basin. **Low – Positive:** • In the last three decades the total power generated by nine hydropower plants of the Volga-Kama cascade has grown by 13%. • The availability of water to ensure upstream water levels suitable for navigation has increased. • Was observed an insignificant increase in water availability per capita in almost all parts of Russia, except Southern regions of European Russia. **Medium – Negative:** The amount of floods and mudflows increased in the first decade of XXI century in 1.5 times. In regions where maximal water discharges are formed by rainfall floods (the Black Sea coast of the Caucasus, the Kuban and Amur basins) the never-seen before catastrophic floods occurred in the late 20th — early 21st century. The catastrophic storm rainfall-induced flood occurred on the Adagum River (of the Kuban River basin) in summer 2012 and led to significant loss of life in Krymsk (the Krasnodar Territory). During the extreme flood of 2013 resulted from about two months of intensive rainfall in the Far East of Russia and in the northeast of China, the maximal water discharges on more than 1000 km-long stretch of the Middle and Down Amur exceeded historical maximums for over a hundred year period of hydrological observations. Total economic loss from extreme flood of 2013 was equal to 527 billion RUR (about 7 billion USD). The mean annual economic loss from floods in Russia is about 43 billion RUR (562 million USD).
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	**High:** large amount of evidence based on reliable analysis of long-term rows of Russian rivers runoff (60–120 years) using statistical methods, with widespread agreement between studies and experts **Medium:** significant evidence of hydropower increase in the last decades is based only on detailed statistical analysis of water inflow to reservoirs of the Volga-Kama cascade.
Climate projections, emissions scenarios, or models used (if relevant)	N/A
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its

Metadata	
	consequences in Russian Federation. Moscow, Roshydromet, 2014.
Datasets (if applicable)	River Runoff from State Water Cadastre of Russian Federation
Additional assumptions (if applicable and not covered by common ratings approach)	N/A
Additional limitations (if applicable and not covered by common ratings approach)	The rating for hydropower changes was based only on the data for Volga-Kama cascade
Metadata identifier	**1.2**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**Low – Medium – Negative:** • According to the research in Tver, increase in maximal daily temperature by 10°C can cause an increase in mortality by 8%. Fatalities in individual cities during different heat waves - form 0,01 to 0,08 % of population; disastrous heat wave in 2010 – fatalities up to 0,05 % of Russia's population (about 50 thousand people), economic loss of 1-2% GDP of Moscow. • Air smoke from forest fires during heat wave in 2002 in Moscow caused 103 fatalities. Concentrations of air pollutants at the beginning of august 2010 in Moscow exceeded the daily threshold limit values in 5-17 times. • During catastrophic heat wave in Moscow in 2010 the amount of suicides doubled.
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	**High**: large amount of evidence based on reliable analysis of several heat waves in Russian cities with widespread agreement between studies and experts
Climate projections, emissions scenarios, or models used (if relevant)	N/A
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014.
Datasets (if applicable)	Morbidity and mortality from heat waves
Additional assumptions (if applicable and not covered by common ratings approach)	Air pollution in big cities has been increasing during the last decades not only because of increase in air temperature, but mainly because of anthropogenic fuel combustion.
Additional limitations (if applicable and not covered by common ratings approach)	The rating assessment was made according to the information about heat waves in several Russian cities

Metadata	
Metadata identifier	**1.3**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**Low:** Geographic distribution of the following infectious diseases vectors has been expanding to the north and north-east for the last decades: Crimean hemorrhagic fever, tick-borne encephalitis, Lyme disease, human malaria. Correlation between salmonellosis incidence and air temperature has been detected. The West Nile fever outbreaks occurred in the last 15 years (1999, 2010, 2012). By the end of XX century the morbidity from tick-borne encephalitis in Russia reached 10000 events (6,5% of Russian population). By 2011 the morbidity from Lyme disease in Russia increased in 4 times and reached about 10000 events. By the end of XX century the morbidity from Malaria in Russia reached 1107 events and then started to decrease.
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	***High*** – large amount of evidence based on reliable analysis of 20-120 years statistics of infectious diseases incidences with widespread agreement between studies and experts
Climate projections, emissions scenarios, or models used (if relevant)	N/A
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014.
Datasets (if applicable)	Morbidity due to infectious diseases
Additional assumptions (if applicable and not covered by common ratings approach)	Additional factors influence on morbidity from infectious diseases: anthropogenic use of natural forest and soil systems lead to expansion of tick-borne encephalitis distribution; the birds migrations increase potential distribution of The West Nile fever; labour migrations of people from Tropical countries to the Central part of Russia can cause additional distribution of Malaria.
Additional limitations (if applicable and not covered by common ratings approach)	N/A
Metadata identifier	**1.4**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**High:** • Since the middle of the 1990s many monitoring sites have shown an increase in depth of permafrost seasonal thawing. In Western Siberia it has increased by 1—2 cm and in the European part of Russia by 2—6 cm.

<table>
<tr><th colspan="2">Metadata</th></tr>
<tr><td></td><td>

- About 30-60% of Russian arctic cities buildings have deformations due to changes in permafrost state, a significant part of them is in emergency conditions (e.g. Fig. 1) and need to be reconstructed;

Figure 1. Destruction of the building in the centre of Yakutsk (Eastern Siberia), 1999.

- Rock deformation and permafrost melting led to deformation of railways (Fig. 2), sometimes up to 50% in permafrost regions of Russia, which can have serious consequences for Russian transport system.

Figure 2. Deformation of the Baikal-Amur Mainline railway.

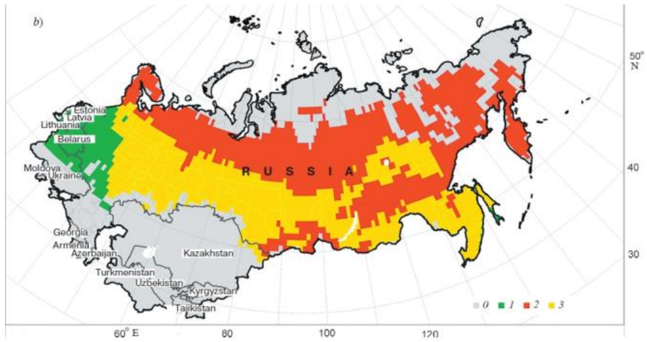
- Changes in permafrost state (melting, rock depression, thermokarst) cause accidents and emergency situations (e.g. about 1900 per year in Khanty-Mansiysk region) near the oil pipelines; up to 55 billion RUR (about 700 million USD) are spent annually to correct deformations and maintain operation of pipelines.
- Due to coastal erosion in Russian Arctic more than 50 km^2 coastal areas are usually lost per year, several Arctic islands are gone for the last century. Intensive coastal erosion leads to the deformation of constructions in coastal areas.

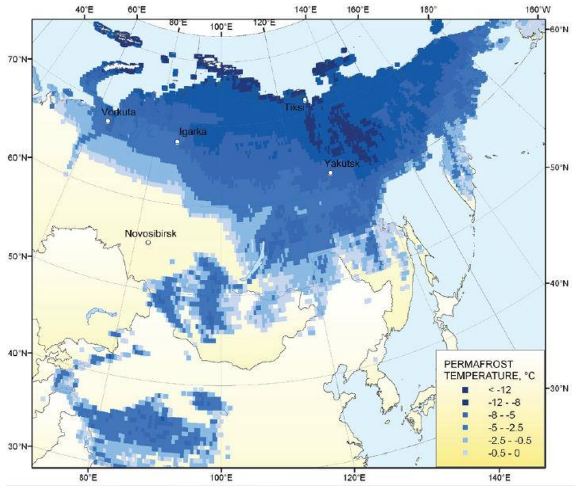
</td></tr>
<tr><td>Explanation for Confidence rating (Explanation of the confidence rating given and how it relates to the specific information in question)</td><td><u>High </u>– large amount of evidence based on reliable analysis of long-term rows (10-60 years) of permafrost characteristics and Russian infrastructure state, using statistical methods and with widespread agreement between Russian and international studies and experts.</td></tr>
<tr><td>Climate projections, emissions scenarios, or models used (if relevant)</td><td>N/A</td></tr>
<tr><td>Source(s) (e.g., document, study, report, etc.)</td><td>1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru.</td></tr>
</table>

Metadata	
	2. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014.
Datasets (if applicable)	Permafrost characteristics by meteorological and geocryological data; State of infrastructure in Russian permafrost zone.
Additional assumptions (if applicable and not covered by common ratings approach)	Destruction of buildings and other constructions in Russian permafrost zone is usually caused by combined effect of climate change and anthropogenic impact: mechanical and temperature effect from constructions, chemical contamination (e.g. salinization), under flooding of anthropogenic waters, etc.
Additional limitations (if applicable and not covered by common ratings approach)	N/A
Metadata identifier	**2.1**

Metadata	
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**Low – positive:** • Insignificant increase in annual river runoff for entire Russia by about 5% • The potential water availability per capita may grow by 5—10% for the entire Russia due to an increase in water resources expected in the context of current demographic tendencies. • Increase in water inflow by 5-15% to reservoirs of Volga-Kama cascade, reservoirs of Northwest Federal District of Russia, Angaro-Yenisei cascade. A considerable growth of river runoff in the low water period (primarily in winter) is generally favorable for the hydropower generation, but may require a revision of management procedures for water resources in reservoirs and cascades. • Reduction of ice-covered period on Kama river and Siberian rivers by 20-27 days with the decrease in ice thickness by 20-40%. **Low–medium–negative:** • Decrease in annual river runoff at Southern part of European Russia by 10%-60%. • Decrease in water availability per capita by 5-15% in Central Federal District, the Southern Federal District and the North Caucasian Federal District of Russia due to climate change, water consumption increase and population growth; in the years with little water contain the water availability in Southern regions of European Russia may reach critical values. • Summer precipitation patterns may become more extreme in the Caucasus mountain regions, Siberia and the Far East by the middle of the 21st century leading to more frequent and higher rainfall and snow-and-rainfall floods. The increase in winter precipitation amount by 10-25% for Lena-Yenisei basin and increase in annual and spring runoff at Northern part of European Russia by 10-30% will lead to more frequent floods in these areas. The most dangerous floods may occur due to combine effect of increasing precipitation and melting of mountain glaciers in the Caucasus mountain regions.
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	**High** – the calculations are based on reliable and verified climate and hydrological models, widespread agreement between studies and experts.
Climate projections, emissions scenarios, or models used (if relevant)	Water-balance Model of Russian State Hydrological Institute; Ensemble of 11 models from CMIP3 Project; Ensemble of 31 models from CMIP5 Project; Scenarios IPCC A2 and B1;

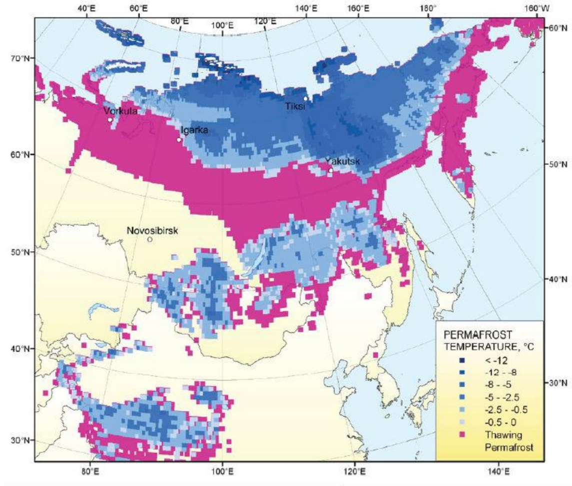
Metadata	
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014. 3. Methods for assessment of consequences of climate change for physical and biological systems / Semenov S. M., ed. Moscow, Roshydromet, 2012, 510 pp. (in Russian). 4. Effects of possible climate warming in the 21st century for Northern Eurasia / A. Kislov, V. Grebenets, V. Evstigneev et al. // Vestnik Moskovskogo Unviersiteta, Seriya Geografiya. — 2011. — no. 3. — P. 3–8. (in Russian). 5. Kattsov V.M., Govorkova V.A. Expected surface air temperature, precipitation and annual runoff changes over the territory of Russia: projections with an ensemble of global climate models (CMIP5). // Proceedings of the Main Geophysical Observatory, 2013, No. 569, p. 75-97 (in Russian).
Datasets (if applicable)	N/A
Additional assumptions (if applicable and not covered by common ratings approach)	N/A
Additional limitations (if applicable and not covered by common ratings approach)	The base period for climate projections using CMIP3 models: 1961–1990, CMIP5 – 1981–2000.
<u>Metadata identifier</u>	**2.2**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**<u>Low:</u>** • In the middle of XXI century the additional mortality from heat waves in Arkhangelsk will increase by 80%. • It is difficult to estimate the future rate of changes in air pollution due to forest fires and fuel combustion.
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	**<u>Low:</u>** a few studies of potential mortality during future heat waves in some Russian cities.
Climate projections, emissions scenarios, or models used (if relevant)	IPCC A2 scenario by 9 Global Circulation Models
Source(s) (e.g., document, study, report, etc.)	1. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014. 2. Shaposhnikov D. A., Revich B. A., Meleshko V., Govorkova V., Pavlova T., 2011. Climate change may reduce annual temperature-

Metadata	
	dependent mortality in Subarctic: a case-study of Archangelsk, Russia Federation Environment and natural research, vol. 1, no. 1, pp. 75–91.
Datasets (if applicable)	N/A
Additional assumptions (if applicable and not covered by common ratings approach)	N/A
Additional limitations (if applicable and not covered by common ratings approach)	The base period for climate projections: 1980–1999
<u>Metadata identifier</u>	**2.3**
Explanation for *Impact* rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)	**<u>Low:</u>** Vector species of many infectious transmissive diseases in XXI century will be expanding northward, northeastward and eastward: vectors of human malaria, arboviruses, tick-borne encephalitis, Lyme borreliosis, rickettsiosis (ixodic ticks *Ixodes ricinus* and *Ixodes persulcatus*, e.g. fig. 3).  *Figure 3. Projected changes in the climatic range of ixodic tick Ixodes persulcatus in 2080—2099 relative to 1981—2000 under RCP8.5 (the extreme scenario). 0 — vector is not present in 1981—2000 as well as in 2080—2099; 1 — decrease of the range; 2 — expansion of the range; 3 — vector is present in 1981—2000 and will be present in 2080—2099.*
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	**<u>High:</u>** the calculations are based on two different approaches, using reliable climate models, the results are agreed with each other.
Climate projections, emissions scenarios, or models used (if relevant)	Climate "+1.5 °C" from the base period 1981-2000; Ensemble of 31 models from CMIP5 Project; Scenarios – RCP4.5, RCP8.5.
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its consequences in Russian Federation. Moscow,

<table>
<tr><th colspan="2">Metadata</th></tr>
<tr><td></td><td>Roshydromet, 2014.
3. Model assessment of distribution for vectors of some human diseases in XXI century in Russia and adjacent countries. // Problems of Ecological Monitoring and Ecosystem Modelling, Moscow, IGCE, 2013, vol. 25, pp. 395-427 (in Russian).</td></tr>
<tr><td>Datasets (if applicable)</td><td>N/A</td></tr>
<tr><td>Additional assumptions (if applicable and not covered by common ratings approach)</td><td>N/A</td></tr>
<tr><td>Additional limitations (if applicable and not covered by common ratings approach)</td><td>The base period for climate projections: 1981–2000</td></tr>
<tr><td></td><td></td></tr>
<tr><td><u>Metadata identifier</u></td><td>2.4</td></tr>
<tr><td>Explanation for Impact rating (The impact rating is based on expert judgement, in the right column the examples for specific years and periods are presented)</td><td><u>High </u> –
• According to model simulations, the permafrost will thaw at the surface on most of the northern European Part of Russia by the middle of the 21st century; in Western Siberia the boundary of sporadic permafrost at the surface will follow the Arctic Circle (Fig. 4). By the end of the 21st century, permafrost will completely thaw at the surface on about 50% of the present permafrost zone, and the permafrost table will go deeper.


a)</td></tr>
</table>

Metadata



b)

Figure 4. Annual mean ground temperature at the lower part of a layer of seasonal thawing (freezing) in Northern Eurasia for the 1990—2000 (a), 2090—2100 (b). Areas of permafrost thawed at the surface are shown in pink.

- Some permafrost zones in central and southern part of Siberia and Far East will disappear to the middle of 21st century (violet color on Fig. 5). In Northern Arctic regions intensive permafrost melting and erosion processes will lead to decrease in permafrost bearing capacity and cause deformations in buildings and infrastructure.

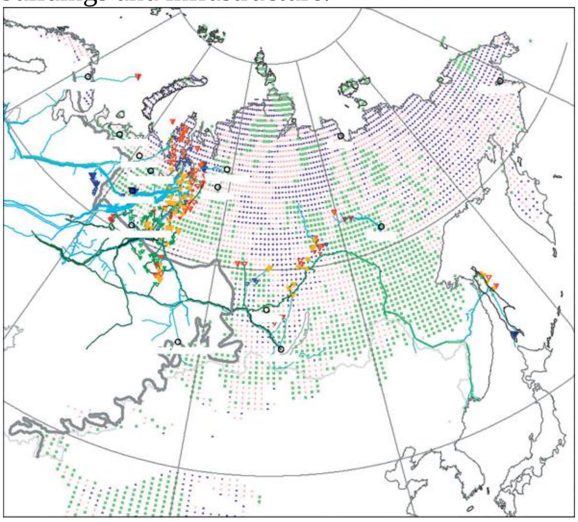


Figure 5. Geocryological hazard index based on the climate projection for the middle of the 21st century calculated with the HadCM3 model for B2 scenario. Low hazard possibility – green dots, medium – yellow, high – violet.

- The accessibility of remote settlements in Russia currently serviced by ice roads will reduce by 13% by the middle of the 21st century.

Explanation for *Confidence* rating (Explanation of the	***High*** – the calculations are based on reliable climate models, verified by real observations in Russia and with a strong theoretical basis; widespread agreement

Metadata	
confidence rating given and how it relates to the specific information in question)	between studies and experts.
Climate projections, emissions scenarios, or models used (if relevant)	Models: CGCM2, CSM–1.4, ECHAM, GFDL–R30c, HadCM3, GIPL2; Scenarios: A1B, B2.
Source(s) (e.g., document, study, report, etc.)	1. Assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2008. www.climate2008.igce.ru. 2. Second assessment report on climate change and its consequences in Russian Federation. Moscow, Roshydromet, 2014. 3. Romanovsky V. E., Drozdov D. S. Oberman N. G., Malkova G. V., Kholodov A. L., Marchenko S. S., Moskalenko N. G., Sergeev D. O., Ukraintseva N. G., Abramov A. A., Gilichinsky D. A., Vasiliev A. A., 2010. Thermal State of Permafrost in Russia, Permafrost and Periglacial Processes, vol. 21, pp. 136–155.
Datasets (if applicable)	N/A
Additional assumptions (if applicable and not covered by common ratings approach)	N/A
Additional limitations (if applicable and not covered by common ratings approach)	N/A

Data quality assessment		
	Data quality assessment	
Dataset:	**River Runoff from State Water Cadastre of Russian Federation**	
Data Quality Criteria	**Levels**	**Score**
1. Transparency and auditability	**1. Data unavailable to public**	
	2. Limited summary data available	**2**
	3. Full raw/primary data set and metadata available	
2. Verification	**1. Unverified data**	
	2. Limited verification checks in place	**2**
	3. Detailed verification in place and documented	
3. Frequency of updates	**1. Sporadic**	
	2. Every 3-5 years	
	3. Annual or biennial	**3**
4. Security	**1. Future data collection discontinued**	
	2. Future data collection uncertain	
	3. Future data collection secure	**3**
5. Spatial coverage	**1. Partial national coverage**	
	2. National coverage, some bias	
	3. Full national coverage, including adjacent	**3**

	marine areas, if and where appropriate	
	TOTAL	13
Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)		High
Dataset:	Morbidity and mortality from heat waves	
Data Quality Criteria	Levels	Score
1. Transparency and auditability	1. Data unavailable to public	
	2. Limited summary data available	2
	3. Full raw/primary data set and metadata available	
2. Verification	1. Unverified data	
	2. Limited verification checks in place	2
	3. Detailed verification in place and documented	
3. Frequency of updates	1. Sporadic	1
	2. Every 3-5 years	
	3. Annual or biennial	
4. Security	1. Future data collection discontinued	
	2. Future data collection uncertain	
	3. Future data collection secure	3
5. Spatial coverage	1. Partial national coverage	
	2. National coverage, some bias	2
	3. Full national coverage, including adjacent marine areas, if and where appropriate	
	TOTAL	10
Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)		Medium
Dataset:	Morbidity and mortality from infectious diseases	
Data Quality Criteria	Levels	Score
1. Transparency and auditability	1. Data unavailable to public	
	2. Limited summary data available	2
	3. Full raw/primary data set and metadata available	
2. Verification	1. Unverified data	
	2. Limited verification checks in place	2
	3. Detailed verification in place and documented	
3. Frequency of updates	1. Sporadic	
	2. Every 3-5 years	
	3. Annual or biennial	3
4. Security	1. Future data collection discontinued	
	2. Future data collection uncertain	
	3. Future data collection secure	3
5. Spatial coverage	1. Partial national coverage	
	2. National coverage, some bias	
	3. Full national coverage, including adjacent marine areas, if and where appropriate	3
	TOTAL	13

Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)		**High**

Dataset:	**Permafrost characteristics by meteorological and geocryological data**	
Data Quality Criteria	**Levels**	**Score**
1. Transparency and auditability	**1. Data unavailable to public**	
	2. Limited summary data available	**2**
	3. Full raw/primary data set and metadata available	
2. Verification	**1. Unverified data**	
	2. Limited verification checks in place	**2**
	3. Detailed verification in place and documented	
3. Frequency of updates	**1. Sporadic**	
	2. Every 3-5 years	
	3. Annual or biennial	**3**
4. Security	**1. Future data collection discontinued**	
	2. Future data collection uncertain	
	3. Future data collection secure	**3**
5. Spatial coverage	**1. Partial national coverage**	
	2. National coverage, some bias	**2**
	3. Full national coverage, including adjacent marine areas, if and where appropriate	
	TOTAL	**12**
Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)		**Medium**