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Russian Federation

GEOGRAPHY, CLIMATE AND POPULATION

Geography

With a total area of 17.1 million km^2, the Russian Federation is by far the largest country in the world. The area of the second largest country in the world, Canada, is less than 60 percent of the area of the Russian Federation. The country covers the eastern part of Europe and the northern part of Asia. It has access to the Arctic Ocean in the north, the Pacific Ocean in the east, the Black Sea and the Caspian Sea in the southwest, and the Baltic Sea in the northwest. It borders 14 countries: The Democratic People's Republic of Korea, China, Mongolia, Kazakhstan, Azerbaijan, Georgia, Ukraine, Belarus, Latvia, Estonia, Finland, Norway and, with the province (*oblast*) of Kaliningrad, Poland and Lithuania.

The Soviet Union came to an end in late 1991 and the Russian Federation emerged as one of the 15 newly independent former Soviet republics. Administratively, the Russian Federation is divided into 46 provinces (oblasts), 21 republics, 4 autonomous okrugs, 9 krays, 2 federal cities (Moscow and Saint Petersburg) and 1 autonomous oblast. The capital is Moscow.

The Russian Federation is formed of three vast, low plains: the east European plain and the west Siberian plain, divided by the Ural mountains, and the Caspian plain in the southwest. In the northern part of these plains young glacial formations and swamps exist, especially in the west Siberian plain. South of the plains is a belt of loess with fertile black soils. In the European part poor semi-desert and desert soils occur south of the loess belt. In central and southern Siberia and in the far east, mountains of medium height predominate, with a peak of 4 506 m above sea level (Belukha in Altay). The highest peak in the country with 5 642 m above sea level is Mount Elbrus situated in the Caucasus near the border with Georgia.

The agricultural area, which is the sum of arable land, permanent crops and permanent meadows and pasture, is estimated at 217 million ha, which is 13 percent of the total area of the country. In 2013, the total physical cultivated area was estimated at 123.8 million ha, of which 99 percent (122.2 million ha) consisted of temporary crops and 1 percent (1.6 million ha) of permanent crops (Table 1).

Climate

Seven climatic zones can be distinguished within the Russian Federation. Their main features are presented in Table 2. In large regions, temperature is a major constraint on cropping.

Average annual precipitation ranges from less than 200 mm at the mouth of the Volga river in the southwest, in the central part of the far east (Yakutsk), and on the Arctic Ocean coast east of the mouth of the Lena river, up to 1 000 mm in the mountains of the far east. It ranges from 400 to 500 mm in most areas of the European part and western Siberia, and from 300 to 400 mm in central and eastern Siberia. The average annual precipitation for the country as a whole is 460 mm.

FIGURE 1
Map of Russian Federation

TABLE 1
Basic statistics and population

Physical areas:			
Area of the country	2013	1 709 825 000	ha
Agricultural land (permanent meadows and pasture + cultivated land)	2013	216 840 000	ha
• As % of the total area of the country	2013	13	%
• Permanent meadows and pasture	2013	93 000 000	ha
• Cultivated area (arable land + area under permanent crops)	2013	123 840 000	ha
- As % of the total area of the country	2013	7	%
- Arable land (temp. crops + temp. fallow + temp. meadows)	2013	122 240 000	ha
- Area under permanent crops	2013	1 600 000	ha
Population:			
Total population	2015	143 457 000	inhabitants
- Of which rural	2015	27	%
Population density	2015	8	inhabitants/km^2
Economy and development:			
Gross Domestic Product (GDP) (current US$)	2014	1 860 000	million US$/year
• Value added in agriculture (% of GDP)	2013	4	%
• GDP per capita	2014	12 966	US$/year
Human Development Index (highest = 1)	2014	0.798	-
Gender Inequality Index (equality = 0, inequality = 1)	2013	0.276	-
Access to improved drinking water sources:			
Total population	2015	97	%
Urban population	2015	99	%
Rural population	2015	91	%

TABLE 2
Climatic zones in the Russian Federation

Climatic type	**% of area of the country**	**Region**	**Temperatures ºC**	
			Warmest month	**Coldest month**
Polar	5	Far north	0	
Subpolar	10	North	10	
Moderately cool	50	Half of the country, with continental features increasing towards east	20	-20
Moderately cool, maritime	2	The coast near Japan	16	-10 to -16
Moderately warm	18	Moscow region (continental) and near Baltic Sea (transitional)	16 to 20	0 to -16
Moderately warm, semi-dry	10	At the shore of the Sea of Azov, in the Volga region and in the southern fringes of Siberia	20	-10
Moderately warm, dry	5	North-eastern foot of Caucasus up to the Volga mouth	20 to 25	0 to -10

Population

In 2015, the total population was about 143 million, of which around 27 percent was rural (Table 1). Average population density in the country is 8 inhabitants/km^2. It varies from around 60 inhabitants/km^2 in the central region, where the capital Moscow and the Kaliningrad oblast are located, to 2 inhabitants/km^2 in eastern Siberia and 1 inhabitant/km^2 in the far east. The average annual population growth rate in the 2005-2015 period has been estimated at -0.01 percent. The largest city is Moscow with 12 million inhabitants, followed by Saint Petersburg with 5 million inhabitants and 13 cities of 1-2 million inhabitants (FSSS, 2015).

In 2014, the Human Development Index (HDI) ranks the Russian Federation 50 among 188 countries, while the Gender Inequality Index (GII) ranks it 54 among 155 countries, for which information was available. Life expectancy is 71 years and the under-five mortality rate is 10 per 1000 births, both progressing from 64 years and 26 per 1000 in the 1990s. With no significant distinction between boys and girls, around 96 percent of the children in 2013 are enrolled in primary education (WB, 2015). Adult literacy is 99.7 percent in 2012 (UNDP, 2015). In 2015, 97 percent of the total population had access to improved water sources (99 and 91 percent in urban and rural areas respectively) and 72 percent of the total population had access to improved sanitation (77 and 59 percent in urban and rural areas respectively) (JMP, 2015).

ECONOMY, AGRICULTURE AND FOOD SECURITY

In 2014, the gross domestic product (GDP) was US$ 1 860 000 million. In 2013, agriculture accounted for 4 percent of GDP, while in 1993 it accounted for 8 percent.

The Russian Federation has moved from a centrally planned economy towards a more market-based economy since the end of the Soviet Union. Economic reforms in the 1990s privatized most industry, with notable exceptions in the energy and defense-related sectors. However, the protection of property rights is still weak and the private sector remains subject to heavy state interference. Russia is one of the world's leading producers of oil and natural gas, and is also a top exporter of metals such as steel and primary aluminum (CIA, 2015).

The agricultural production potential is distributed extremely unevenly within the country. It is limited mainly to the south of the European part and small areas on the southern fringes of Siberia as well as areas in the far east region. This distribution reflects the zonal diversification of the natural environment, from ice deserts in the north, through tundra, coniferous woods (*taiga*), mixed woods, to the fragments of steppes and semi-deserts in the south.

During the Soviet period, what was then Russia was a large grain importer. Since 2000 the Russian Federation has become a major grain exporter, but despite the large grain exports, the country overall is a much larger agricultural importer than exporter. The country has a large negative trade balance in agriculture and food because it exports bulks crops, such as grain and sunflower seed, while it imports high value products, like meat, fruits, vegetables, and processed foods (Liefert, 2015).

WATER RESOURCES

Surface water and groundwater resources

Most of the freshwater resources of the Russian Federation are contained in the permafrost which covers the north of the European part and western Siberia, all central and eastern Siberia and almost all the far east region. These resources, as well as the glaciers in the Arctic islands, in the Ural mountains and in the mountains of southern Siberia, are of no practical use.

It is only possible to use the resources of rivers, lakes and groundwater. There are 120 000 rivers with a length of more than 10 km each. Their total length within the country equals 2.3 million km, their total discharge to the sea is estimated at almost 4 223.8 km^3/year and to other countries at 25.4 km^3/year. About 71 percent of the total area of the country drains towards the north into the Arctic Ocean, 14 percent towards the east into the Pacific Ocean and 10 percent towards the south into the Caspian Sea. The remaining 5 percent drains towards the southwest into the Black Sea and the Sea of Azov and towards the west into the Baltic Sea.

Of the total annual RSWR, estimated at 4 249.2 km^3, 213.5 km^3 come from neighboring countries (Table 3). The remaining 4 035.7 km^3 are generated inside the country of which 75.2 percent in the Arctic Ocean basin group, 14.9 percent in the Pacific Ocean basin group, 6.3 percent in the Caspian Sea basin group and 3.6 percent in the Black Sea and Baltic Sea basin group.

TABLE 3
Renewable surface water resources (RSWR) by major river basin

Name of basin	Major region within the Russian Federation	Area of basin		Internal RSWR	Inflow		Total RSWR	Outflow to:
		Total	Rus. Fed.					
		1000 km^2	1000 km^2	km^3/yr	km^3/yr	from	km^3/yr	
Arctic Ocean								
Northern Dvina	Northern	358	358	148	-		148	White Sea
Pechora	Northern	322	322	129	-		129	Barents Sea
Ob	Ural, W.Siberia	2 990	2 337	364	38.0	Kazakhstan	0.6 401.4	Kazakhstan Kara Sea
Yenisey	Siberia	2 580	2 187	605	25.0	Mongolia	630	Kara Sea
Pyasina	Eastern Siberia	182	182	82	-		82	Kara Sea
Lena	E.Siberia, F.East	2 470	2 470	532	-		532	Laptev Sea
Khatanga	Eastern Siberia	422	422	88	-		88	Laptev Sea
Olenek	Far East	219	219	34	-		34	Laptev Sea
Indigirka	Far East	360	360	55	-		55	East Siberian Sea
Kolyma	Far East	647	647	126	-		126	East Siberian Sea
Other rivers		2 660	2 660	872	-		872	
Subtotal		**13 210**	**12 164**	**3 035**	**63.0**	**Subtotal**	**3 098**	**Subtotal**
Pacific Ocean								
Amur	E.Siberia Far East	1 855	784	225	119.04	Mongolia, China	344.04	Sea of Okhotsk
Kamchatka	Far East	56	56	33	-		33	Pacific
Anadyr	Far East	191	191	53	-		53	Berning Sea
Other rivers		1 412	1 412	290	-		290	
Subtotal		**3 514**	**2 443**	**601**	**119.04**	**Subtotal**	**720.04**	**Subtotal**
Caspian Sea								
Volga	Volga	1 360	1 360	230	-		230	Caspian Sea
Ural	Ural	270	112	5	-		5	Kazakhstan
Other rivers		160	160	20	-		3.6 16.4	Kazakhstan; Caspian Sea
Subtotal		**1 790**	**1 632**	**255**	**0.0**	**Subtotal**	**255**	**Subtotal**
Black/Baltic								
Dnepr (Dnieper)	Central	558	136	7.8	-		7.6 0.2	Belarus Ukraine
Don	N.Caucasus, C.Tchernozem	422	401	34.3	3.9	Ukraine	1.2 37.0	Ukraine Black Sea
Kuban	N.Caucasus	58	58	13	-		13.0	Black Sea
Western Dvina	Central	88	8	7.1	-		7.1	Belarus
Neva	Northern	281	221	66	16.0	Finland	82.0	Baltic Sea
Pregel	Kaliningrad	15	12	1	2.01	Lith 0.01,Pol. 2	3.01	Baltic Sea
Nemunas	Kaliningrad	98	2	1	8.845	Lith.,Belarus,Poland	9.845	Baltic Sea
Other rivers		23	21	14.5	0.677	Est. 0.007,Latvia 0.67	0.063 15.114	Estonia Black/Baltic/other
Subtotal		**1 543**	**859**	**144.7**	**31.432**	**Subtotal**	**176.132**	**Subtotal**
GRAND TOTAL		**20 057**	**17 098**	**4 035.7**	**213.472**	**TOTAL**	**4 249.172***	**TOTAL**

* Outflow to other countries is 25.363 km3/year as follows: to Kazakhstan: 8.6 (Ural-Caspian), 0.6 (Tobol-Tongal); to Belarus: 7.6 (Dnieper), 7.1 (Western Dvina); to Ukraine: 0.2 (Desna branch of Dnieper), 1.2 (Donets); to Estonia: 0.063 (Peipus).

The rivers of the Russian Federation freeze for from one month in the southwest between the Caspian and the Black Sea, up to 8 months and longer in the northern part of Siberia and the far east region.

The internal renewable groundwater resources are estimated at 788 km^3/year. This figure, however, does not include resources in the form of inland ice, glaciers and pergelisol (permafrost). For the regions of western and eastern Siberia alone, the quantity of ice of the arctic islands is estimated at 5 000 km^3 and that of the mountain glaciers at 170 km^3. The resources in the form of pergelisol are even larger. The overlap between surface water and groundwater resources has been estimated at 512 km^3/year, which brings the total renewable water resources to 4 525 km^3 (4 249+788-512) (Table 4).

TABLE 4
Renewable water resources

Renewable freshwater resources:			
Precipitation (long-term average)	-	460	mm/year
	-	7 865 000	million m^3/year
Internal renewable water resources (long-term average)	-	4 312 000	million m^3/year
Total renewable water resources	-	4 525 000	million m^3/year
Dependency ratio	-	5	%
Total renewable water resources per inhabitant	2015	31 543	m^3/year
Total dam capacity	2015	801 544	million m^3

Water resources in the Russian Federation are very unevenly distributed in relation to the population. The European part, where 80 percent of the country's population and industry is concentrated, has just about 10 percent of total renewable water resources. The huge distances between the Siberian and European basins make it practically impossible to transfer water from Siberia to Europe. Transfer projects were considered in the past but encountered several problems, including environmental ones.

In 2011, produced municipal wastewater was estimated at 12 320 million m^3.

Lakes and dams

There are about two million fresh- and saltwater lakes in the Russian Federation. The largest saltwater lake is the Caspian Sea, surrounded by the Russian Federation, Kazakhstan, Turkmenistan, the Islamic Republic of Iran and Azerbaijan. The largest freshwater lake is Lake Baikal, located entirely within the Russian Federation in the southeast of Siberia. With an area of 32 000 km^2, a mean depth of about 730 m and a maximum depth of 1 637 m it is the world's largest and deepest lake. It contains around 23 000 km^3 of water. The largest river flowing into Lake Baikal is the Selenge river, which annual flow of 58.75 km^3 is about half of the total supply of all rivers flowing into the lake. The only river flowing out of Baikal lake is the Angara river, its mean annual runoff being about 60 km^3.

Other important lakes in the country are Lake Ladoga with a capacity of 911 km^3, Lake Onega with 292 km^3 and Lake Khanka with 18.3 km^3 (Circle of Blue, 2009; FSSS, 2015).

Dams have been constructed on most large rivers in the country, mainly for hydropower, but also for irrigation and water supply. There are more than 2 220 water reservoirs and ponds in use with the volume of each exceeding 1 million m^3. All of them were constructed between 1926 and 1991. About 36 reservoirs exceed a capacity of 1 km^3. Almost all of these dams contain hydroelectric power stations with a total capacity of about 50 624 MW (IHA, 2016).

The total capacity of reservoirs and ponds is 801 544 million m^3. The largest reservoir in the country is the Bratsk reservoir in the Angara river with a total capacity of 169 000 million m^3, followed by the Krasnoyarsk reservoir in the Yenisey river (73 300 million m^3), the Zeya reservoir in the Zeya river (68 400 million m^3), the Ust-Ilim reservoir in the Angara river (59 300 million m^3) and the Kuibyshev reservoir in the Volga river (58 000 million m^3).

INTERNATIONAL WATER ISSUES

Some agreements have been signed for the cooperation in the field of protection and use of transboundary rivers between the Russian Federation and bordering countries (ECE, 2009):

- Agreement between the Russian Federation and Kazakhstan concerning the Joint use and protection of transboundary waters (1992). The Joint Russian Federation-Kazakhstan

Commission acts on the basis of this Agreement of 1992, and covers the rivers Irtysh, Ishim, Tobol, Ural, Bolshoy Uzen and Maliy Uzen. In 1997 the validity of the agreement was extended to 2002, and further extended for another five years to 2006.

- Agreement between the Russian Federation and Ukraine concerning Joint use and protection of transboundary waters (1992).
- Agreement between the Russian Federation and China concerning Protection, regulation and reproduction of living water resources in frontier waters of Amur and Ussury rivers (1994).
- Agreement between Estonia and Russian Federation on the Conservation and use of fish resources in lake Peipus, lake Lämmijärv and lake Pihkva (1994). The Russian-Estonian Intergovernmental Commission on Fisheries acts on the basis of this agreement.
- Agreement between the Russian Federation and Mongolia on the Protection and use of transboundary waters (1995).
- Agreement between the Russian Federation and China concerning Guidance of joint economic use of separate islands and surrounding water areas in frontier rivers (1997).
- Agreement between Estonia and Russian Federation on the Protection and sustainable use of transboundary watercourses (1997). The Agreement explicitly indicates that it applies to transboundary waters of the Narva river basin, including lake Peipus. The Joint Russian-Estonian Commission was established based on this agreement.
- Agreement between the Russian Federation and Belarus concerning Cooperation in protection and rational use of transboundary waters (2002).
- Agreement on inter-institutional cooperation signed by the Kaliningrad region of the Russian Federation, Lithuania and Belarus in the field of monitoring and exchange of data on the status of transboundary surface water bodies (2003).
- A draft agreement between Latvia, Belarus and the Russian Federation on the Western Dvina/Daugava river basin, establishing a joint commission, was finalized in 2003. The Latvian government approved the draft but it was not signed in 2003 as the Russian Federation and Belarus postponed the final decision several times due to various reasons. After Latvia joined the European Union (EU) in 2004, water quality became a topic of shared responsibility between the Member States and the EU. Therefore, any international agreement on water management between an EU Member State and a non-Member State requires the EU as a Contracting Party. Cooperation agreements were on the list of topics to be discussed during high-level meetings of the EU and the Russian Federation; however, this has not led to renewal of the negotiations concerning river basin management agreement.
- Agreement between the Russian Federation and China concerning Rational use and protection of transboundary waters (2008).
- Agreement on joint use and protection of transboundary water bodies between the Russian Federation and Kazakhstan (2010).
- The Russian Federation, Kazakhstan and Uzbekistan are exploring the possibility of diverting the Ob and Irtysh rivers through a canal from Siberia, across Kazakhstan, to Uzbekistan. In theory, the project would solve the problem of the limited water resources available to Uzbekistan. The project would also enable the Russian Federation to play a greater role in the region and especially in Uzbekistan.
- The governments of Lithuania, the Russian Federation, Belarus, and the European Commission have initiated the preparation of an agreement on cooperation in the use and protection of water bodies within the Nemunas River Basins Distric. A draft agreement has been drawn up but has not been signed yet. There have been no measures foreseen for Poland and Latvia because the part of the Nemunas RBD in Poland constitutes only 287 km2 (the upstream reaches of the rivers with no significant pressures), and the part of the RBD in Latvia constitutes only 100 km2 (the upstream reaches of the rivers with no significant pressures) and the results of water quality monitoring showed that the ecological status of the rivers along the Polish and Latvian border were good.

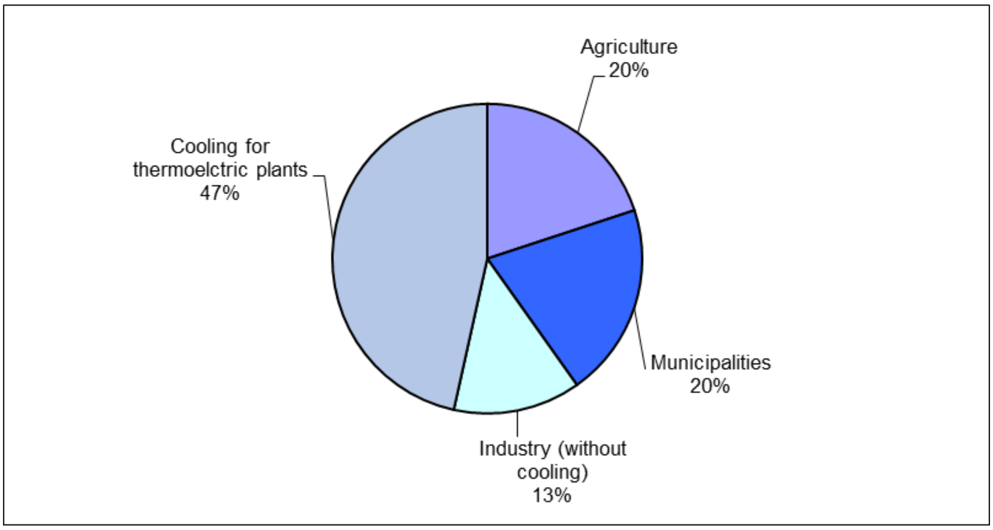
WATER USE

In 1982, the water withdrawal was 97.8 km^3, while in 1994 it had dropped to 77.1 km^3. This reduction in water consumption, which concerns industrial and irrigation water withdrawal, has been related to the difficult economic situation in the Russian Federation, which worsened in 1990. In 2001, total water withdrawal was estimated at 66 200 million m^3 of which 39 600 million m^3 (60 percent) for industry – including 30 800 million m^3 for cooling of thermoelectric plants –, 13 200 million m^3 (20 percent) for agriculture and 13 400 million m^3 (20 percent) for municipalities (Table 5 and Figure 2). In 2013, total water withdrawal was estimated at 61 000 million m^3 (FSSS, 2015).

TABLE 5
Water use

Water withdrawal:			
Total water withdrawal	2013	61 000	million m^3/year
- Agriculture (Irrigation + Livestock + Aquaculture)	2001	13 200	million m^3/year
- Municipalities	2001	13 400	million m^3/year
- Industry	2001	39 600	million m^3/year
of which cooling for power plants	*2001*	*30 800*	*million m^3/year*
• Per inhabitants	2013	425	m^3/year
Surface water and groundwater withdrawal (primary and secondary)	2013	61 000	million m^3/year
• As % of total renewable water resources	2013	1	%
Non-conventional sources of water:			
Produced municipal wastewater	2011	12 320	million m^3/year
Treated municipal wastewater	-	-	million m^3/year
Direct use of treated municipal wastewater	-	-	million m^3/year
Direct use of agricultural drainage water	-	-	million m^3/year
Desalinated water produced	-	-	million m^3/year

FIGURE 2
Water withdrawal by sector
Total: 66 200 million m^3 in 2001



About 70 percent of the population of the Russian Federation obtains drinking water from surface water sources. In rural areas, more than one-third of the population uses drinking water from non-centralized sources (Dudarev et al, 2013).

Permafrost which occupies about 65 percent of the country, including the whole Arctic and the bulk of Siberia and Far East, is the main cause of infrequent use of groundwater sources in the northern part of the country. In small settlements, in general, water pipes supply untreated and non-disinfected drinking water directly from surface water sources. A majority of these water supply systems in rural areas are used only in summer. In winter, water is mostly delivered from surrounding reservoirs due to the insufficient flow rates of open water sources. Some communities use constant water preheating during cold seasons. In severe cold climate zones, where wells are unavailable or impossible to construct, water will typically be delivered by trucks carrying water tanks in summer and sawn ice blocks in winter (Dudarev et al, 2013).

In 2011, the quantity of produced wastewater was estimated at about 12 320 million m^3.

IRRIGATION AND DRAINAGE

Larger scale irrigation and drainage works started at the beginning of the eighteenth century. The main goal of the water works was not the development of agriculture, but to use the water to generate power for the mines and steelworks of the southern Urals, and to drain areas near the then capital, Saint Petersburg. However, the damming up of water in the neighbourhood of the Urals also enabled the development of irrigation, while the drainage works turned some of the swamps into cultivable land. During the nineteenth century, irrigation developed slowly, mainly outside the territory of today's Russian Federation. In 1894, the first government land improvement institution was established, called the Department of Land Improvement, and water legislation was introduced in 1902. In 1916, about 214 000 ha of irrigated land and 890 000 ha of drained land were used for agriculture within the territory of the present Russian Federation. A sudden acceleration in drainage and irrigation work took place between 1920 and 1931, in connection with the great electrification programme (GOELRO). Initially, electrification always had priority over irrigation and drainage. Only in the 1950s, during the construction of the Volga cascade reservoirs, did irrigation become as important as hydroelectricity in water development design. In 1967, the irrigated area was 1.62 million ha, which was eight times the irrigated area of 1916, while the drained area of 1.64 million ha was almost twice that of 1916. By the end of the 1980s, every year, up to 200 000 ha of newly irrigated areas and 160 000 ha of newly drained areas were given for agricultural use. However, the scale of the negative effects resulting from the drying up of swamps and from the salinization of irrigated areas was increasing. The rhythm of development of irrigation and drainage work slowed down at the beginning of the 1990s.

Evolution of irrigation development

Based on climate and soil conditions, it is estimated that 15-20 percent of the cultivable area needs irrigation in the moderately warm dry semi-desert zone, 5-8 percent in the moderately warm semi-dry steppe zone, 2-5 percent in the moderately warm semi-dry forested steppe zone, and 1-2 percent in the moderately warm forest zone. Figures for irrigation potential are estimated at almost 29 million ha under permanent irrigation (Table 6). Other sources give a potential of more than 74 million ha of complementary irrigation.

In 1990, irrigation covered 6.12 million ha. In 1994, however, it had fallen to 5.16 million ha. One reason for the decrease was the economic recession. The sprinkler systems (accounting for almost 96 percent of the area equipped for irrigation in 1990) were overused, and there was no maintenance and operation system. This progressively resulted in the complete destruction and subsequent abandonment of the schemes. The largest irrigation development took place in the north Caucasian and Volga regions. Irrigation was undertaken mainly on huge *sovkhoz* and, to a smaller extent, on *kolkhoz*.

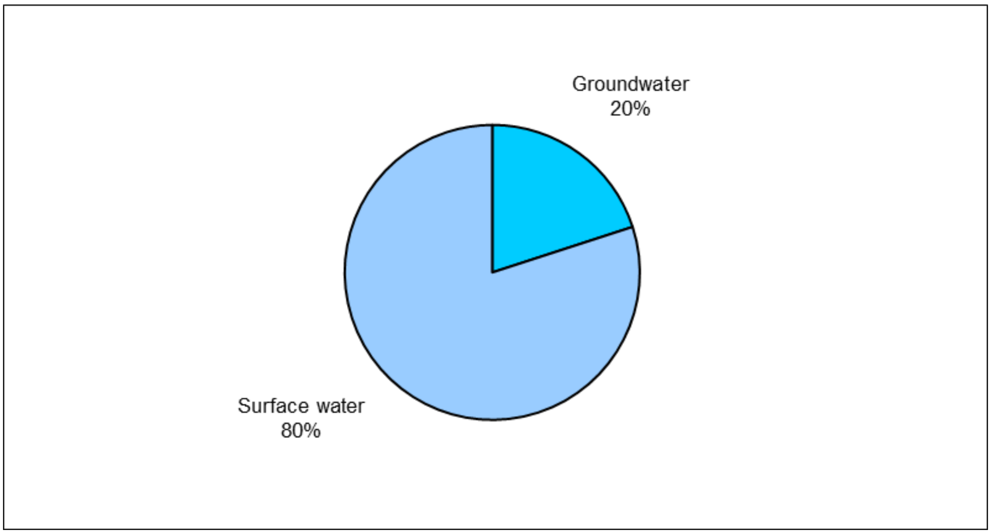
Most of the land under irrigation is commanded by reservoirs, and open canals convey the water to the irrigation schemes. The largest canals are: Saratovski, Donski, Magistral, Great Stavropolski, Tersko-Kumski and Kumo-Manycki. Within the schemes, underground pipes convey the water to the emitters (rain guns). In 1990, sprinkler irrigation was the most widely used technique (96 percent of the area), surface irrigation being used on the remainder.

TABLE 6
Irrigation and drainage

Irrigation potential	-	29 000 000	ha
Irrigation:			
1. Full control irrigation: equipped area	2006	2 375 000	ha
- Surface irrigation	-	-	ha
- Sprinkler irrigation	-	-	ha
- Localized irrigation	-	-	ha
• Area equipped for full control irrigation actually irrigated	2006	938 900	ha
- As % of area equipped for full control irrigation	2006	40	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)	-	0	ha
3. Spate irrigation	-	0	ha
Total area equipped for irrigation (1+2+3)	**2006**	**2 375 000**	**ha**
• As % of cultivated area	2006	2	%
• % of area irrigated from surface water	2006	80	%
• % of area irrigated from groundwater	2006	20	%
• % of area irrigated from mixed surface water and groundwater	-	-	%
• % of area irrigated from non-conventional sources of water	-	-	%
• Area equipped for irrigation actually irrigated	2006	938 900	ha
- As % of total area equipped for irrigation	2006	40	%
• Average increase per year	1994-2006	-6	%
• Power irrigated area as % of total area equipped for irrigation	-	-	%
4. Non-equipped cultivated wetlands and inland valley bottoms	-	-	ha
5. Non-equipped flood recession cropping area	-	-	ha
Total agricultural water managed area (1+2+3+4+5)	**2006**	**2 375 000**	**ha**
• As % of cultivated area	2006	2	%
Size of full control irrigation schemes: **Criteria**:			
Small schemes < - ha	-	-	ha
Medium schemes > - ha and < - ha	-	-	ha
large schemes > - ha	-	-	ha
Total number of households in irrigation	-	-	
Irrigated crops in full control irrigation schemes:			
Total irrigated grain production	-		metric tons
• As % of total grain production	-		%
Harvested crops:			
Total harvested irrigated cropped area	2006	938 900	ha
• Temporary crops: total	2006	694 900	ha
- Wheat	2006	61 300	ha
- Rice	2006	38 000	ha
- Barley	2006	26 000	ha
- Maize	2006	15 000	ha
- Other cereals	2006	23 000	ha
- Vegetables	2006	57 000	ha
- Potatoes	2006	82 000	ha
- Pulses	2006	32 000	ha
- Sugar beet	2006	32 000	ha
- Temporary fodder	2006	328 600	ha
• Permanent crops: total	2006	66 000	ha
- Fruit trees	2006	66 000	ha
• Permanent meadows and pastures	2006	178 000	ha
Irrigated cropping intensity (on full control area actually irrigated)	2006	100	%
Drainage - Environment:			
Total cultivated area drained	1994	5 027 000	ha
• Non-irrigated cultivated area drained	-	-	ha
• Area equipped for irrigation drained	-	-	ha
- As % of total area equipped for irrigation	-	-	%
Area salinized by irrigation	-	-	ha
Area waterlogged by irrigation	-	-	ha

In 2006, total area equipped for irrigation was estimated at 2 375 000 ha, of which 80 percent were irrigated by surface water and 20 percent by groundwater (Table 6 and Figure 3). About 938 900 ha, or 40 percent of the total area equipped for irrigation, was actually irrigated.

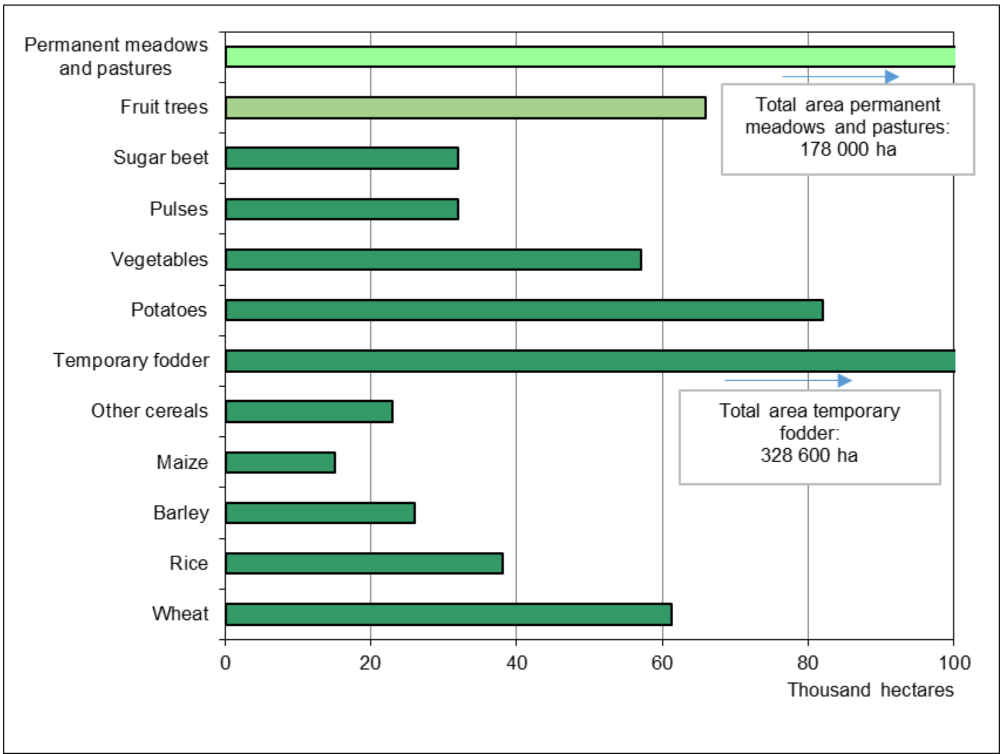
FIGURE 3
Source of irrigation water on area equipped for irrigation
Total: 2 375 000 ha in 2006



Role of irrigation in agricultural production, economy and society

In 2006, the total harvested irrigated cropped area was 938 900 ha, of which 35 percent were temporary fodder, 19 percent permanent meadows and pastures, 9 percent potatoes, 7 percent wheat, 7 percent fruit trees, 6 percent vegetables, 4 percent rice, 7 percent other cereals, 3 percent pulses and 3 percent sugar beet (Table 6 and Figure 4).

FIGURE 4
Irrigated crops on area equipped for full control irrigation
Total harvested area 938 900 ha in 2006 (cropping intensity on actually irrigated area 100%)



Yields of irrigated crops are higher than those of rainfed crops. Irrigated maize yields are about 2.7 t/ha compared with 1.7 t/ha for rainfed maize. For barley, the respective figures are 2.25 and 1.65 t/ha.

Status and evolution of drainage systems

In 1990, the drained area was 7.4 million ha, of which almost 44 percent was equipped with subsurface drainage systems and 56 percent with surface drainage systems. In 1990, only 21 percent of the irrigated land was equipped with a drainage system.

In 1994 the drained area dropped to about 5 million ha. This fall was due either to the breakdown of the infrastructure because of overexploitation without proper maintenance, or to the theft of pipes or the destruction of drains. In 1994, crops were grown on 2.45 million ha of drained land, the major crops being fodder crops followed by cereals. Yields of drained crops are somewhat lower than those of rainfed crops. This might be explained by the fact that drained land is already of marginal quality. Soils are very poor with a low pH and are not really suitable for cultivation. Another reason for the low yields might be the advanced state of degradation of large parts of the drained land.

In 1994, about 25.6 million ha were estimated to be excessively humid and marshy areas needing drainage. Over 15 million ha were estimated to be salinized and 24.3 million ha to have saline soils.

WATER MANAGEMENT, POLICIES AND LEGISLATION RELATED TO WATER USE IN AGRICULTURE

Institutions

The main institutions related to water resources management are:

The Ministry of Natural Resources and Environment (MNRE) is responsible for public policy making and regulation in the field of the study, use and conservation of natural resources, including the subsoil, water bodies, forests, fauna, hydrometeorology, wastewater, environmental monitoring and pollution control. The MNRE coordinates and supervises the following institutions (MNRE, 2016):

- The Federal Water Resources Agency is responsible of the organization and redistribution of water resources of federally-owned water bodies, the development of basin agreements on the restoration and conservation of water bodies; and the preparation and implementation of flood-control measures, water protection zones and measures to prevent and eliminate the harmful effects of water;
- The Federal Supervisory Natural Resources Management Service is responsible of nature management. Amongst other functions it controls and supervises the use and protection of water bodies.
- The Federal Service on Hydrometeorology and Environmental Monitoring carries out the functions of state property management and provision of public services in the field of hydrometeorology and monitoring of environmental pollution.
- The Federal Subsoil Resources Management Agency is responsible for geological study of the subsoil and its use.

The Russian Water Association (RWA) was established by the Prime Minister in 2009. Its primary goal is to support the water industry players' joint efforts aimed at reforming and modernization to industry to improve the performance of the Russian water enterprises, to liaise with the international water community, and to represent the country’s water-related interests abroad (RWA, 2016).

The Ministry of Agriculture (MoA), is responsible for drafting and implementing government policy and legal regulation in the agriculture and related industries, including livestock farming (including breeding of domesticated fish species), veterinary services, crop production, phytosanitary control, soil improvement and fertility, the food and food processing industry, and the sustainable development of rural areas (MoA, 2016).

Water management

In 2010, the Government approved the Clean Water Federal Target Programme through 2017, the main result of which shall be the access to the required amount of clean potable water for the entire community of the country. According to experts, this may improve the life expectancy in the country by 5-7 years. Its main objectives are the replacement of obsolete equipment, improvement of water quality and, generally, building a new efficient water industry. The programme concerns everyone, including the state, the business, and the community. Regions play the main role in implementation of the programme and almost all regions have submitted their water projects. A number of regions, such as the Republic of Bashkortostan, and Volgograd, Novgorod, Orenburg, Penza, and Yaroslavl regions have already started the implementation of the water projects on their own through attracting private investors and using the public-private partnership approach (Dudarev et al, 2013; Likhacheva, 2011; RWA, 2016).

The Russian Water Association has initiated the Water 2050 Foresight Project to conduct special studies to review the status of water resources in the Russian Federation and all over the world and to develop possible water challenge scenarios (RWA, 2016).

Finances

Federal and regional authorities will spend only 5 percent of the cost of the Clean Water Federal Target Programme. Thus, for the first time in modern history, the Russian Federation faces large-scale modernization of infrastructure mostly with private financing (Likhacheva, 2011).

Water fees were formally introduced in 1982. The recovery of operation and maintenance costs by revenues from water bills has improved over the last two decades. However, a substantial proportion of users enjoys water without water-use permit or contract and hence does not pay for the water they use.

Policies and legislation

The country still has no federal law on drinking water and drinking water supply. Such a law was elaborated and submitted for consideration 14 years ago but it was rejected by the upper chamber of Russian Parliament mainly due to disagreements with regard to the regulations governing the mechanism for the privatization of drinking water supply systems. In 2013, the Federal Law "On water supply and water outlet" was entered into force, but it regulates only economic and financial issues (Dudarev et al, 2013).

ENVIRONMENT AND HEALTH

The Russian Federation has a long history of serious environmental accidents, especially in the fuel and chemical industries.

The largest rivers in the country – Volga, Don, Kuban, Amur, Northern (Svernaya) Dvina, Pechora, Ural, Ob and Yenisey – are considered polluted. Some of their major tributaries – Kama, Donets, Tom, Irtysh, Tobol and Miass – are classified as 'highly polluted', while several water bodies are considered 'extremely polluted' (OECD, 2013).

The poor state of water supply systems owned by the state and the poor quality of drinking water is publicly admitted, particularly regarding the regions of the Russian Arctic, Siberia and Far East (Dudarev et al, 2013). About 11 million residents of the Russian Federation use water, which is unsuitable for drinking. One third of the population uses poor quality water daily (RWA, 2016).

In rural areas, more than one-third of the population uses drinking water from non-centralized sources. The quality of this water is low due to weak protection of aquifers from pollution from surface areas,

the lack of sanitary protection zones, and the delayed repair, cleaning and disinfecting of wells and interception ditches (Dudarev et al, 2013).
According to the Intergovernmental Panel on Climate Change (IPCC), climate change is likely to affect both the quantity and quality of water in the Russian Federation. On the whole, renewable water resources may increase in the country by 8–10 percent in the next 30 years, though their distribution will become more even. This change will bring certain positive impacts—including for hydroelectric generation. However, managing the increased flows will pose other problems, especially when these increased flows coincide with extreme weather events such as downpours, or springtime ice-clogged floods. In addition, increasing water shortages are predicted for southern parts of European Russia. Moreover, a number of densely populated regions that are already subject to water shortages are expected to face even more pronounced difficulties in decades to come (Climate Adaptation, 2015; OECD, 2013).

PROSPECTS FOR AGRICULTURAL WATER MANAGEMENT

In several water-scarce regions, water is becoming a constraint for further economic development. The poor condition of water infrastructure, which derives from under-funded maintenance and repair and lack of rehabilitation, can contribute to local shortages and poor water-related services. In 2020s-2030s, lack of water may create significant challenges for the growth and development of the main industrial and urban centers.

The state water management requires a shift in water resource management paradigm from the water resource distribution concept to the concept of managing a scarcer and deteriorating resource.

Exploitation of groundwater could help address local water shortages, but the level of knowledge and the extent of development of fresh groundwater resources are still low, except for five regions.

According to experts, due to its vast territories and moderate climate, the country can potentially become one of the major grain producers in the world. To achieve this, it is necessary that Russian agriculture switches to new water supply systems with the use of modern international technologies (OECD, 2013; RWA, 2016).

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