

# COMBAT DESERTIFICATION, DEFORESTATION AND DROUGHT

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## Summary

The article considers the desertification, drought and deforestation in Russia. Specific features of Russia distinguishing it from other countries subject to desertification and drought are given, and the main directions of combat against desertification and drought. Reforestation in Russia is considered. The most important tasks for the near perspective are shown.

## 1. Introduction

According to UNO Convention to Combat Desertification (1994) *desertification* is land degradation in arid, semi-arid and dry sub-humid regions as a result of the effects of different factors, including changes of climate and human activity: and *drought* is a natural phenomenon arising when the amount of precipitation is much lower than the normal fixed levels which causes a serious disturbance in hydrological balance unfavorably telling on the productivity of land resources.

According to existing estimates, climatic zones where the appearance of desertification

and droughts is most likely occupy about 47.5 % of the land. 69% of these arid regions are involved in the desertification process. Now about 30% of irrigated, 47% of boghara and 73% of pasture lands have degraded. There are arid territories in more than 110 countries of the world and they are under the threat of desertification and drought. Over 10 million people have had to change their place of residence as a result of droughts and desertification.

Combat against desertification and drought is one of the most important tasks of humanity. This problem is global, both because it covers enormous territories of land and because it requires unification of the whole world community for its solution. As far back as 1977 the UNO Conference to Combat Desertification adopted a plan of action to combat desertification. In 1992 the UNO Conference on Environment and Development adopted the “Agenda 21” where a special Chapter 12 is devoted to the combat against desertification and drought. In 1994 a UNO Convention on Combat against Desertification in the countries which suffer from serious drought and/or desertification, especially in Africa, was adopted. Nowadays over 170 countries are participants of this Convention.

## **2. Desertification and Drought in Russia**

According to the UNO Convention on Combat against Desertification, arid, semi-arid and dry sub-humid territories are determined as areas (with the exception of polar and sub-polar regions) where the ratio of the mean annual precipitation level to potential evapotranspiration varies within the range of 0.05 to 0.65.

Arid, semi-arid and dry sub-humid regions occupy a significant part of Russia. According to existing calculations, the area of dry and arid regions, where for many years the ratio of precipitation to potential evapotranspiration is less than 0.65, amounts here to 0.6 million square km as a minimum. Among CIS countries, only in Kazakhstan is this territory larger. The main arable lands and pastures in Russia are located (with the exception of deer pastures) solely in dry and arid regions. It is here that the bulk of agricultural products are processed. The majority of the rural population of Russia lives in this territory.

Even larger in area are territories subjected to the effect of drought. Areas where there is a 25% likelihood of drought, in addition to the dry and arid regions, include a significant part of the south of Russia: the areas where there is a less than a 25% possibility of drought include even more northern territories up to Saint Petersburg in the European part of the region (60°N), part of southern Siberia and even Central Yakutia.

By recent estimates, the total area of desertification in Russia amounts to over 1.27 million square km, including 0.3 million square km. of land suffering the very worst conditions.

Desertification and its reasons	Area of distribution, thous.square km
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Area of lands subject to desertification including:	1,276.6
ground water level rise and salinization as a result of hydro-technical construction, irrigation and natural processes	153.0
soil desiccation	99.7
pasture digression	368.7
incorrect soil plowing	597.4
use of heavy agricultural technique	1.7
industrial, communal and road construction	14.5
wood felling	142.0
steppe fires	0.6

Table 1: Desertification and its reasons in Russia

As you see from this table, the primary causes of desertification in Russia are incorrect soil plowing, overgrazing, irrigation and deforestation.

Other causes include water erosion, deflation, alcalination and salinization.

Main desertification processes	Area of distribution thous.square km	% desertification territories
Water erosion	532.7	33.8
Deflation	290.9	18.4
Salinization	103.5	6.6
Alcalination	154.1	48.1
Soil solidification	1.7	0.1
Sub-flooding	14.9	0.9

Table 2: Distribution of the main desertification processes

Part of the agricultural land in Russia is disturbed as a result of water and wind erosion. In the North Caucasus, practically all agricultural plots are eroded or in danger of erosion. In the Volga area, South Urals and West Siberia not less than 25% of arable land is subject to erosion. The area of eroded lands increases by 4-5 thousand square km every year. In the steppe zone alone the decrease in soil fertility and the soil erosion led to a fall in arable land productivity of 36%.

Degradation of the vegetation cover in Kalmykia and Astrakhan oblast' alone exceeds 60 thousand square km. As a result of this, pasture productivity is reduced by 40-60%.

In the deserts and semi-deserts only 15-20% of pastures are in satisfactory condition, 30-40% of the area is occupied by moderately worn out pastures, 30-40% by chronically damaged pastures and 15-20% of pastures have been withdrawn from agricultural use and degraded to beaten down sands and bad lands. Within sand pastures the area of open and moving sands increased from 5-10 % to 20-30%.

Between 100 and 129 million hectares of lands are salinized according to various estimates. Shortcomings in design and construction, and the exploitation of irrigation systems led to a situation in which, out of 5 million hectares of irrigated lands in Russia, 739 thousand hectares (or 15%) are in an unsatisfactory condition.

About 15 cubic km of water are used annually for agricultural needs, mainly for irrigation.

The most important problem in dry and arid regions is the preservation of biodiversity since there occur up to 1,900 species of vascular plants, 300 bird species and 70 mammal species in one area. The proportion of rare species in the total flora composition is 12.5 % and the number of rare animal species included in the Red Books varies from 30 to 130 according to the region.

Soil and territory degradation takes place as a result of military action, mainly nowadays in the Caucasus. It is manifested in the physical destruction and contamination of the soil layer and the temporary withdrawal of mined territories from rotation.

There are five areas with a particularly high sensitivity to climatic factors of desertification in the territory of Russia. They are Kalmykia, the eastern part of the Volgograd area, the extreme south of Omsk oblast', and the Kulunda and Tuva basins.

As the review of historical data shows, droughts of significance to all main regions of the CIS were observed regularly in the past -- every 3-6 years.

Region	Period	In succession				
		1 year	2 years	3 years	4 years	5 years
Ukraine	1861-1980	220	7	3	0	1
Volga area	1861-1980	15	8	1	3	0
Central Chernozem area	1871-1980	13	3	0	0	0
North Caucasus	1891-1980	12	4	0	0	0
West Siberia	1915-1980	18	7	8	1	1
Kazakhstan	1885-1980	15	7	2	1	0

Table 3: Groups of arid years of different duration by the main grain regions of the USSR (Rauner, 1982)

In certain regions in the Ukraine and West Siberia there were cases when droughts were observed 5 years in succession (in 1920-1924). Droughts are observed many years in the Volga area and in West Siberia.

Much more rarely, droughts occur simultaneously in different regions over several years.

Regions	Period	In succession
		2 years 3 years

Ukraine- Volga area	1861-1980	2	1
Ukraine CChO*	1871-1980	1	0
Volga area-North Caucasus	1891-1980	4	0
Volga area-CChO	1871-1980	3	0
Ukraine-North Caucasus	1891-1980	1	0
CChO-North Caucasus	1891-1980	2	0
Minimum two regions of ETU** in any combination	1861-1980	6	1
West Siberia-Kazakhstan	1885-1980	3	2
Volga area-West Siberia-Kazakhstan	1885-1980	3	0
Ukraine-Volga area-Kazakhstan	1885-1980	2	0
ETU (two regions minimum)-West Siberia	1815-1980	2	0
Major part of the grain zone		2	0

\*- Central Chernozem Oblast'

\*\* - European territory of the USSR

Table 4: Simultaneous droughts in various combinations of the main grain regions (Rauner, 1982)

Thus, the coincidence of droughts is observed most often in the European part of the country.

Droughts cover significant territories. According to the data of L.G. Polozova and A. A. Grigoryeva (1984), from 25 to 100% of the ETU territory was subjected to drought in arid years.

Year	Area	Year	Area	Year	Area	Year	Area
1891	80	1917	65	1938	85	1962	25
1892	90	1920	95	1939	65	1963	95
1897	80	1921	95	1946	100	1965	50
1901	95	1924	95	1950	85	1967	25
1905	60	1827	60	1951	75	1968	25
1906	75	1930	50	1954	60	1972	100
1907	50	1931	75	1957	75		
1911	65	1934	70	1959	60		
1914	75	1936	90	1961	50		

Table 5: Area of ETU regions within 45-55 ° N and 30-50 ° E affected by drought (as % of the total area of this territory)

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### **Biographical Sketch**

Prof. GLAZOVSKY Nikita Fedorovich was born on August 17, 1946 in Alma-Ata (Kazakhstan). He is a citizen of Russia, a corresponding member of the Russian Academy of Sciences (RAS), and Deputy Director of the Institute of RAS.

N. F. Glazovsky is one of the leading Russian geographers, a world famous scientist, a specialist on environment protection, sustainable development, use of natural resources and geochemistry of landscapes. He is the author of over 200 published works, including monographs.

N. F. Glazovsky was a Deputy Minister of Ecology, Russian Federation, a Chairman of Council of Ecological Foundation of Russian Federation, a member of the Higher Ecological Council, and a member of the Advisory Committee, Institute of World Resources (Washington). He is also a Regional Director of the International Program “Leadership for Environment and Development”.

In 2000 he was elected the Vice-President, International Geographical Union World.