

# Objective and subjective factors in the environmental safety concept of industrial territories of the Ural district

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**Abstract.** The objective and subjective factors in the environmental safety concept are considered. The idea of environmental safety in an industrial area includes the following: to breathe clean air, drink clean water, and consume safely grown products. The ways (methods) of forming environmental safety are proposed.

## 1 Introduction

The concept (SES, 1984, p.624) is a certain way of understanding and interpreting the environmental safety. There are two ideas relating to the environmental safety concept [1]:

- a set of actions in the case of which the natural basis for the society development is not disturbed,

- a set of conditions and phenomena that ensures the ecological balance, for which the society is ready at the physical, economical, technological and political levels.

The basic specifications of environmental safety are the society ideas about the non-interference with the natural environment and the readiness to ensure the ecological balance. Therefore, the need is occurred to consider the objective and subjective factors.

## 2 Objective factor

The objective factor is the deteriorating environmental condition (according to the vivid expression of V.P. Oldak, economist [2], “it is dangerous to breathe air, it is prohibited to drink water, the products require disinfection”). The Ural and West Siberian regions are specified by the following features that determine the need to ensure the environmental safety of the area:

The first feature. Over a long period of industrial development (more than 300 years), the environment has suffered the enormous accumulated environmental damage.

Table 1 represents data on the areas of wooded lands in the Middle Urals (Sverdlovsk region) polluted to varying degrees (areas of environmental risks, crises, disasters) due to the anthropogenic emissions.

Table 2 shows data on the contaminated lands (including disturbed) of natural landscapes in Western Siberia, where the area of such lands reaches almost 2% of the area of licensed oil fields (399,200 ha).

**Table 1.** Wooded lands of the Sverdlovsk region in accordance with the environmental condition (due to the technogenic pollution)

Environmental condition	Forest cadaster area	Forestry section	Area, hectares
Territory of environmental risk	Yekaterinburgskiy	Bilimbaevskoye	19,925
		Rezhnevskoye	102,853
		Nevianskoye	20,277
		Berezovskoye	55,396
		Verkh-Isetskoye	127,800
		Sysertsckoye	138,864
		Nizhnetagilskoye	38,603
	Krasnoufimsko-Shalinskiy	Shalinskoye	189,054
		Nizhne-Serginskoye	103,884
Alapaevskoye		40,706	
Territory of environmental crisis	Yekaterinburgskiy	Sukholozhskoye	61,178
		Berezovskoye	10,329
		Verkh-Isetskoye	4,637
		Sverdlovskoye	38,809
		Egorshinskoye	19,713
Territory of environmental disaster	Nizhnetagilskiy	Kushvinskoye	33,393
		Nizhnetagilskoye	82,242
		Krasnouralskoye	55,814
	Yekaterinburgskiy	Nevianskoye	98,123
		Bilimbaevskoye	147,672
		Sukholozhskoye	8,950
	Krasnoufimsko-Shalinskiy	Nizhne-Serginskoye	49,450
	Pripyshminskiy	Kamyshlovskoye	43,137

The volume of industrial waste in the Sverdlovsk region amounted to 8596 million tons [3, 4]; only 143 among the 450 household waste facilities are identified as the business entities. At present, 432 thousand people live in the sanitary protection zones of industrial enterprises.

The second feature. Increased vulnerability to the man-made burden of the mountain and northern ecosystems of the Urals [5, 6, 7, 8]. Thus, the self-organized vegetation of disturbed wooded areas in the mountainous regions of the Urals can be expected only 50 years later or more. Disturbance of the wooded lands in the territory with perpetually frozen grounds leads to the irreversible consequences. Figures 1, 2 show the fragments of land plots in Western Siberia (Khanty-Mansiisk Autonomous District - Yugra) damaged (destroyed) after an oil spill [9].

**Table 2.** Condition of the designated forest lands (including the wooded lands) in Western Siberia

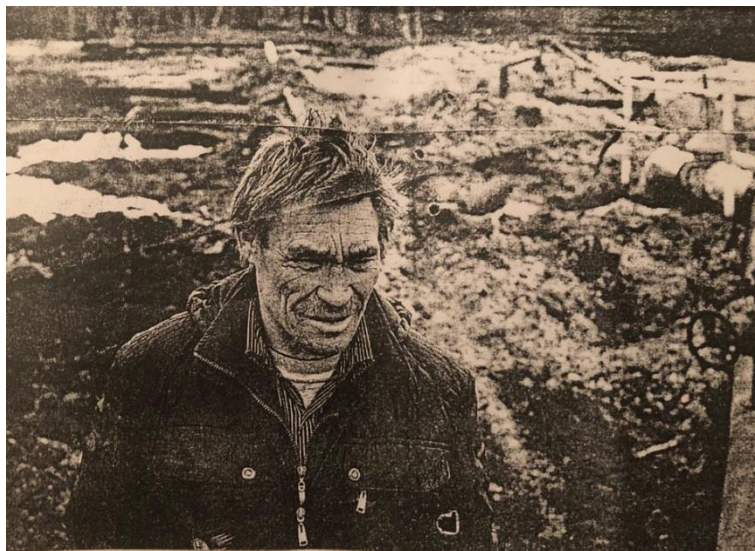
Indicators	Forest reserve lands			
	Forest earth	Overflow lands	Swamps	Total
Total field area on the forest reserve lands, square km	13802	3565, 5	16547	33915
Area of oil contaminated	0, 45	0, 87	1, 85	-

soils of the forest reserve, in %				
Area of contaminated forest reserve lands, square km	62 1	31, 0	306, 1	399, 2
Average percent of lands in need of reclamation, %	87, 4	62, 3	97, 1	-
Area of forest reserve lands in need of reclamation, square km	54, 3	25, 5	297, 2	377, 0



**Fig.1.**Oil spills on the wooded lands in Western Siberia (consequences of pollution)

*The third feature.* In the Ural region there is a large number of nuclear fuel complex facilities (Fig. 3) - uranium and thorium deposits (7 deposits), nuclear reactors (3 reactors), nuclear material processing facilities (3 centers), radioactive waste storage (5 storage facilities), locations nuclear underground bursts (13 bursts); consequences of man-made disasters (accident at the Mayak enterprise, 1958).



**Fig. 2.** Area of the destroyed communal family land (Pravda, 2017, No. 29).

*The fourth feature.* The forest fires occur annually in the Urals and Western Siberia. The frequency and intensity of forest fires is largely determined by the regional climate specifics. Most often, the fires occur in the lichen pine forests (after 30–60 years), in the green moss pine forests (after 50–80 years) and even less often (after 80–120 years or more) in the bog moss pine forests. In the primary lichen pine forests on the islands in the lakes and swamps of Western Siberia, the cycle of lightning fires (on average after 63 years) is 2-3 times longer than in the anthropogenic lichen forests. Table 3 shows the data relating to the fires in the Middle Urals for the period in 1996–2018.

**Table 3.** Forest fires in the Middle Urals during the period in 1996–2018.

Year	Number of fires	Area of fires, hectares	Average area of fires, hectares	Area of fires by types			Expenses for firefighting, thousand rubles	
				Creeping fires	Crown fires	Ground fires	Total	Per 1 hectare
1996	728	3786	5.20	3 633	150	3	1600	0.423
2003	718	1655	2.27	1 645	4	6	975	0.587
2018	576	1970	3.42	1 887	83	0	-	-

Many nuclear fuel cycle enterprises in the Urals region (where the forest lands occupy 45-70% of the area) are located near major cities: Orenburg, Ishimbay, Solikamsk, etc.

For the year the forest reserves of the Sverdlovsk region (12.6 million hectares) suffered from 576-728 fires on an area from 1665 hectares to 3786 hectares.

*The fifth feature.* Despite a slight increase in the average human life length, the region demonstrates an increase in diseases of the nervous system, circulatory system, respiratory system, and digestion system. The deterioration of environmental situation in the industrial regions, the growing stratification of society in terms of the income levels lead to a high incidence of the substance dependence and psychogenic disorders (Tables 4 and 5).

An alarming aspect in the industrial regions is a steady increase in psychogenic disorders in children and adolescents (Table 6).

**Table 4.** Incidence of psychogenic disorders in the industrial areas of the Sverdlovsk region

District (territory)	Total incidence, by years			Primary incidence, by years		
	2008	2009	2010	2008	2009	2010
Yekaterinburg (1386.5 thousand persons) - mechanical engineering	1974	2670	2129	287	360	299
Nizhniy Tagil (361.4 thousand persons) - metallurgical production	1202	2593	2353	87	400	691
Kamensk-Uralskiy (176.5 thousand persons) - nonferrous industry	1541	1995	2884	137	229	329
Pervouralsk (149 thousand persons)	1580	3659	4478	65	773	773
Serov (101.2 thousand persons) - metallurgical production	3312	2435	-	67	679	-
Asbest (98.7 thousand persons) - asbestos extraction and processing	1884	3254	-	335	347	-
Kachkanar (38 thousand persons) - iron ore extraction	1477	1782	1898	72	477	393
Kushva (27 thousand persons) - iron ore extraction and processing	2801	1777	1873	331	411	524
Rezh (37 thousand persons) - nonferrous metal ore extraction and processing	3986	3271	2601	469	416	461

Note: Data from the Regional State Healthcare Institution “Sverdlovsk Regional Clinical Psychiatric Hospital” (Form 10, 2010).

**Table 5.** Incidence of substance dependence disorders (2009) in the industrial areas of the Sverdlovsk region.

District (territory)	Total incidence per 100,000 persons		Primary incidence per 100,000 persons	
	Alcohol use disorder	Drug dependence	Alcohol use disorder	Drug dependence
Yekaterinburg (1386.5 thousand persons)	530	366	102	75
Nizhniy Tagil (361.4 thousand persons)	553	399	75	33
Kamensk-Uralskiy (176.5 thousand persons)	2723	511	79	18
Pervouralsk (149 thousand persons)	812	386	63	14
Serov (101.2 thousand persons)	975	214	82	51
Asbest (98.7 thousand persons)	1385	459	66	36
Municipal unit Alapaevskoye	581	8.3	5.5	0

(excl. Alapaevsk)				
Bisertskiy urban district	361	47.5	9.5	0

Note: Data from the narcological department of the Sverdlovsk region (2010)

**Table 6.** The number of registered patients (general incidence of psychiatric disorders in the Sverdlovsk region in 2006-2010, percent)

Year	Absolute number (persons)			Percent of the relevant category		
	total	Children	Adolescents	total	Children	Adolescents
2006	115530	20482	7381	2.6	3.17	3.36
2007	112058	19374	6462	2.6	3.13	3.31
2008	107454	18158	5682	2.5	3	3.2
2009	107750	18178	5619	2.5	2.9	4.1
2010	109307	17784	5525	2.6	2.8	4.3

This is the objective basis, a factor for substantiating the environmental safety concept of the Ural Federal District. The subjective factor of environmental safety is generated on the basis of an objective factor.

### 3 Subjective factor

The subjective factor is as follows:

- firstly, the development by the scientific (Institutes of the Ural Branch of the Russian Academy of Sciences) and educational spheres (universities of the Ural Federal District) of the environmental safety concept that is strict, understandable and attractive (such as the idea of social development proposed in Russia in 1917 - “Land to the peasants, factories to the workers”). The current situation shows that the society mainly develops an economic understanding of the world and does not develop the ecological thinking.

Ignoring the environmentally friendly way of thinking by the civil society creates the habituation effect in relation to the existence of negative environmental consequences (that is already happening); and the future correction of this “environmental addiction” will bring the society to the serious social and economic troubles;

- secondly, the introduction of a strict, understandable and attractive environmental safety concept developed by the scientific and educational spheres into the society (state governance structures, business community and non-governmental organizations). To rephrase the famous classical scholars, the environmental safety concept that has taken hold of society, is becoming a material strength. Thus, the idea of unlimited global consumption, presented to the society in Russia as a market one in the 80-90s of the 20th century, having become a material strength, blown the second global powerhouse (USSR) to bits;

- and, thirdly, leading the social movement for changes in management in accordance with the developed environmental safety concept.

At present, there are various environmental safety ideas:

- the ideas of sustainable development of the area [10], conservation of biological diversity [11], the fight against global warming [12], green economy [13], green energy [14], etc. are spreading in the scientific sphere;

- holding the conferences, symposia, summits and congresses, arrangement of the green offices and universities are the methods used in the educational sphere [15];

- the management environment mainly uses the idea of managing within the declared standards of maximum allowable concentrations (MAC) of environmental pollution and the idea of increasing the cost of environmental protection measures.

It can be assumed that such ideas of environmental safety do not currently take over society, does not become a material force, although on the whole they correspond to the environmental safety of the territory.

During the work process, an idea of environmental safety, understandable and really attractive to the society has been formulated - the desire to provide the environmental condition when people can:

- breathe the pleasant ambient air (as in a coniferous forest after a thunderstorm), when the pollution level is close to the background one, saturated with ionized oxygen [16], and contains phytoncides [17];

- drink water from the natural sources with pleasure that is currently possible in the Urals only in the upper reaches of mountain streams and rivers, in the springs and wells from the underground sources that are not yet polluted. Such a component of the environmental safety idea was transformed in 2019 into the material strength of population in the villages in the southern part of Lake Baikal (Listvyanka, Kultuk, Slyudyanka) that led to a ban on the construction of the Baikal water filling plant;

- safely consume the grown products that do not include any elements hazardous to health (consequences of changes in the growth-promoting substances, numerous chemicals) and that naturally produces seeds.

At present, the ideology of restoring and maintaining clean ambient air, water, food products is occasionally implemented into the material strength of society in Western Siberia in the territories of indigenous minorities of the North. The following is a part of the appeal of the indigenous residents of the Surgut region of the Khanty-Mansiisk Autonomous District - Yugra to the President of the Russian Federation.

## 4 Conclusion

In order for the society to master the proposed idea of environmental safety, it shall:

- know everything about the environmental capabilities (not only visible increases in the MAC in relation to the pollution, but also invisible increases at the level of interaction between the environmental components [18]);

- discuss everything, in particular, the climate changes on Earth [11], the role of green energy in the management system [19], the essence of genetically modified organisms [19];

- do everything consciously (not just protest against the functioning of mining and technological production, against the development of pulp and paper mills, but also participate in the generation of acceptable functioning corridors.

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