



The degree of pollution of water basin of the Neryungri district on the example of the Chulman river



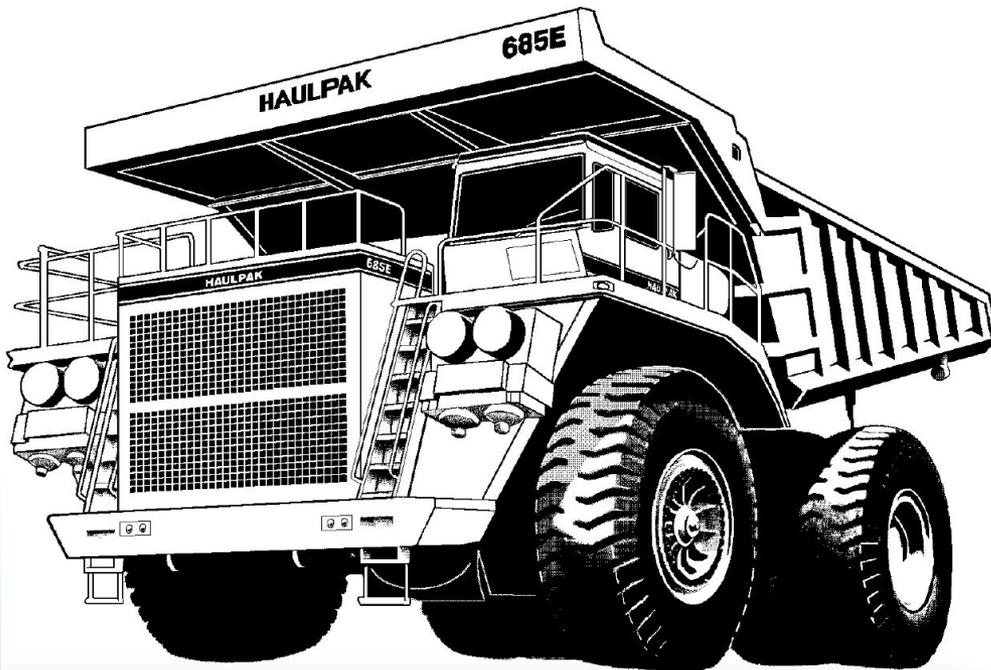
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Relevance: Water is the main resource which necessary to ensure the vital functions of the human body and all living things on the Earth, but the degree of pollution of natural reservoirs is growing every year. Today, 95% of all available water resources in the world, to one degree or another, are polluted, and the main reason for this is human activity.

Purpose: To study the degree of pollution and the chemical composition of water, water basins of the Neryungri district on the example of the Chulmanriver.

Hypothesis: The process of mining and enrichment of coal has a harmful effect in the Neryungri region, on water quality and the environment as a whole.



Tasks:

- ❑ To study the relevant literature on the chemical composition of water;
- ❑ To draw water in the channel of the Chulman River, before and after the alleged source of pollution
- ❑ Analyze a chemical analysis of water;
- ❑ To determine the degree of pollution of water bodies of the Neryungri district, using the example of the Chulman River;
- ❑ To study methods of water purification during coal preparation, at the place of possible pollution.

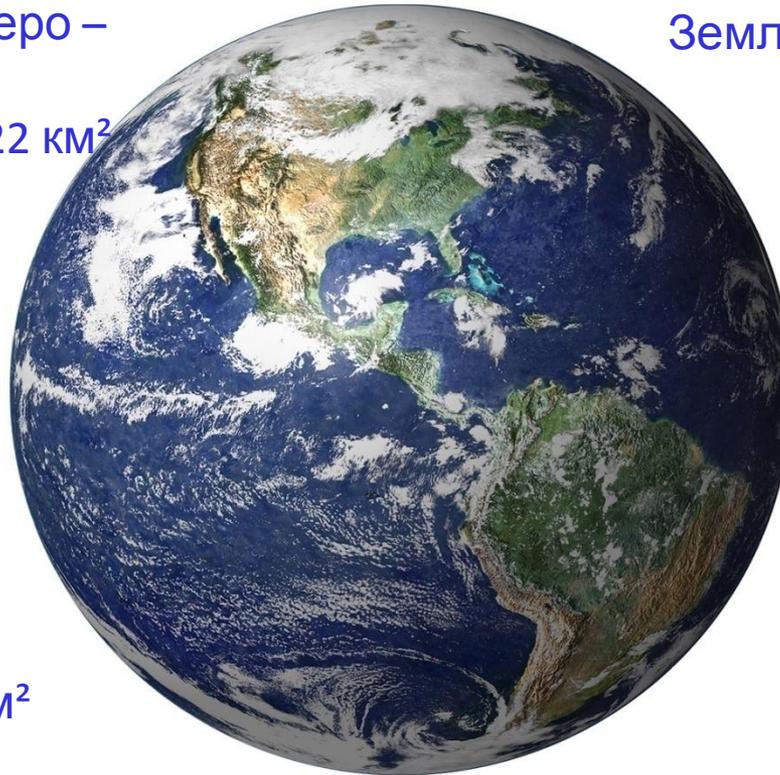


Water

Water is (hydrogen oxide) - a binary inorganic compound with the chemical formula **H₂O**. Under normal conditions, it is a clear liquid that does not have color, smell or taste.

✓ Самое большое озеро – Байкал.
Его площадь - 31 722 км²

✓ Самая большая река – Амазонка.
Её площадь-7180000км²



✓ Около 71% поверхности Земли покрыто водой.

✓ Площадь покрова воды - 361,13 млн.км.

✓ Марианская впадина - самая глубокая точка в мире - 10 994 м

Research

Purpose: To determine the content of pH (oxidizer) in water using an electrochemical water analyzer. SanPiN standards: Slightly acidic waters 5 – 6,5; Neutral waters 6,5 – 7,5; Slightly alkaline waters 7,5 – 8,5

№	Sample of water	Hydrogen indicator	
		Before	After
1	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2018)	7,23	7,65
2	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (winner 2019)	7,23	7,98
3	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (spring 2019)	7,35	8,05
4	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (summer 2019)	7,39	8,15
5	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2019)	7,42	8,27

Conclusion: during the study, it turned out that the content of the hydrogen index (oxidizing agent) in water samples taken to the alleged source of pollution is neutral. And in water samples taken after the alleged source - slightly alkaline. The increase in the hydrogen index is supposedly associated with the methods of water purification used in the enrichment of coal, namely the use of sedimentation technology.

Purpose: To determine the content of iron (Fe) in water using photometric analysis. According to the norms of SanPiN content of iron (Fe) in the water should be - 0.30 ± 0.10 mg / dm³

№	Sample of water	Iron (Fe)	
		Before	After
1	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2018)	0,30±0,07	0,31±0,07
2	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (winner 2019)	0,31±0,14	2±0,1
3	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (spring 2019)	0,31±0,14	9±0,19
4	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (summer 2019)	0,35±0,21	15±22
5	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2019)	0,36±0,24	17±0,24

Conclusion: the study revealed that the content of iron (Fe) in water samples taken along the Chulman river in the autumn of 2018 did not change significantly, further analysis of water samples taken in 2019 showed an increase in the content of iron in water samples. In this case, the indicator of iron content does not meet the norms of SanPiN and can harm the environment.

Purpose: To determine the content of petroleum products in water using capillary electrophoresis. According to SanPiN the norm of the content of oil products in water should not exceed - 0.1 mg / l.

№	Sample of water	Oil products	
		Before	After
1	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2018)	< 0,2	< 0,2
2	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (winner 2019)	< 0,2	0,3±0,01
3	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (spring 2019)	< 0,2	0,3±0,01
4	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (summer 2019)	< 0,2	0,5±0,01
5	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2019)	< 0,2	0,5±0,01

Conclusion: the study found that the content of petroleum products in the water samples taken along the Chulman river in the fall of 2018, is within the norm in contrast to the samples taken in 2019, in which there is a significant increase in the content of harmful impurities.

Purpose: To determine the chemical composition of water using capillary electrophoresis.

No	Chemical substance	Water is taken before the source of pollution	Water is taken after the source of pollution	The rate of harm	Norm (no more)	Unit of measurement
1	Chloride ions	$0,44 \pm 0,23$	$0,96 \pm 0,23$	on	350	mg / dm ³
2	Sulfate ions	$3,64 \pm 0,36$	$10,07 \pm 1$	on	500	mg / dm ³
3	Nitrate ions	$0,24 \pm 0,05$	$1,55 \pm 0,31$	sts	3,0	mg / dm ³
4	Natrium	$1,95 \pm 0,39$	$3,73 \pm 0,75$	sts	200	mg / dm ³
5	Magnesium	$0,99 \pm 0,25$	$3,61 \pm 0,51$	sts	65	mg / dm ³
6	Calcium	$4,65 \pm 1,54$	$15,44 \pm 1,54$	on	130	mg / dm ³

Sts - sanitary - toxicological standard

On - organoleptic norm

Conclusion: in the course of the study, it turned out that chemicals for humans weren't found in water samples which is taken along the Chulman riverbed.

Purpose: To determine the content of suspended solids and solids using the gravimetric method. According to SanPiN standards GOST 2874 and GOST 4979, the solids content should not exceed 1000 mg / dm³.

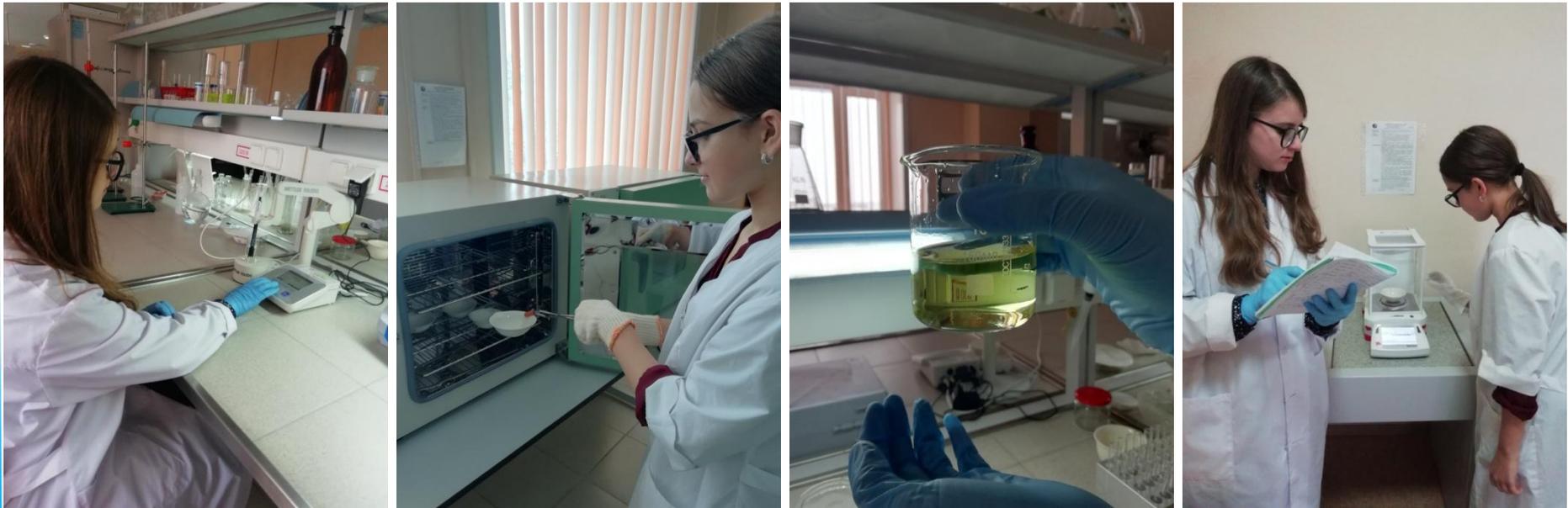
Formula:
$$x = \frac{(M_1 - M_2) * 1000}{V_{\text{проб.}}}$$

№	Sample of water	suspended solids		Solids
		Before	After	Before
1	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2018)	0,14±0,01	0,24 ±0,01	< 50
2	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (winner 2019)	0,2± 0,01	0,26 ±0,01	< 50
3	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (spring 2019)	0,2±0,01	0,26 ±0,01	<50
4	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (summer 2019)	0,22±0,01	0,27 ±0,01	<50
5	Samples is taken in the channel of the Chulman River, 500 meters before and after the alleged source of pollution (autumn 2019)	0,2±0,01	0,28 ±0,01	<50

Conclusion: in the course of the study, it turned out that in the water samples taken along the Chulman riverbed, the dry residue is within normal limits and is not harmful to humans.

Conclusion

The study revealed that the chemical composition of water samples to the alleged source of pollution meets The SanPiN standards, and the content of iron and petroleum products in water samples taken after the alleged place of pollution does not meet the SanPiN standards, that open-pit coal mining has a detrimental effect on the environment of the Neryungri district as evidenced by water samples taken in the Chulman river in the period from autumn 2018 to autumn 2019.



Consequently, the hypothesis put forward at the beginning of the study, about the detrimental effect of the coal mining and enrichment process on the water quality in the Neryungri district, on water quality and ecology in General, was confirmed. Further, to confirm the obtained research data, it is planned to re-take water samples before and after the alleged source of pollution in the winter of 2020.

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