

Evaluation of Contemporary Environmental Condition of River Basins in Southern Pre-Caspian Areas of Azerbaijan

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Abstract

Southern Pre-Caspian areas of the Republic of Azerbaijan have favorable geographical position as well as natural and climatic condition for dwelling, development of settlements, and industrial activity. Most areas have fertile soils and attractive landscapes. These factors facilitate human distribution in the researched area and therefore, the area is highly populated. Population are engaged mainly in areas such as farming, namely production of tea, vine, cereals, vegetable, different fruits, including citrus plants, production of foods, and also cattle- and sheep-breeding. As a result, the coastal zone and rivers experience high anthropogenic influence. This article deals with the study of anthropogenic pollution of highly-settled river basins and valleys as well as evaluation of changes going by quality of river waters in southern Pre-Caspian areas of Azerbaijan.

Key words: hydrochemical regime, soluble mineral substances, contamination, sewage pipe, fecal water, solid waste.

Introduction

The main rivers in southern part of Pre-Caspian areas of Azerbaijan are Vilashchay, Lankaranchay, Astarachay, Tangarud, and other less ones. Many settlements are situated on the banks of these rivers and their branches in the researched area. This territory has higher population density compared to other regions of Azerbaijan. Rural settlements are distinguishing in the country for their larger population number which even may exceed 10 thousand people. As a result, solid wastes are being shaped near rural and small urban settlements, damaging surface- and underground water reserves as well as fertile lands. Pollution of river basins with domestic garbage and waste water is particularly disturbing situation.

Many enterprises, especially smaller ones near southern coasts of the Caspian Sea are seasonally or continually functioning without keeping environmental norms. In the meantime, impacts on the nature, including valleys' landscapes by a number of industrial enterprises and communal buildings have been increased. The influence and its character is different both quantitatively and qualitatively by territories of the administrative regions, namely Masalli, Lankaran and Astara, economic bases are composed of various industrial activities.

Monitoring

According to perennial studies and observations conducted by special monitoring center attached to the Ministry of Ecology and Natural Resources of Azerbaijan Republic on rivers of the country, water of the rivers of Istisu, Tangarud, Lankaranchay, and Vilashchay is included mainly to 'class of pure water' in accordance with Water Pollution Index (WPI). The studies carried have shown that among the rivers of the researched area, Tangarud and Vilashchay have been polluted at least extent. However, in these rivers, yearly amounts of copper compounds and phenols in average exceed the allowed limit of concentration (ALC) by 2 times as much. The corresponding indicators by the rivers of Istisu (near point of Alasha) and Lankaranchay nearly equate the ALC. According to WPI, water of the last belongs to 'second-class purity'.

Analysis of processes

The researched area is situated in the territory of the economic region of Lankaran-Astara which is not industrially high-developed. Many areas of heavy industry or so-called 'dirty manufacturing' such as primary sector of industry, including oil industry, chemistry, metallurgy do not exist or less developed in the region.

However, many medium and small enterprises of brick production, light industry, daily food products, canning, fish farm, and some others are responsible for arising sewages thrown away from enterprises to rivers. Service areas also should be mentioned. Environmental situation related to contamination of river basins and beds and quality of water as well as sources responsible for pollution is regarded and evaluated by each three regions – Masalli, Lankaran and Astara separately.

Administrative region of *Masalli* is located on the environmentally sensible. The demand of population of Masalli for pure drinking water is being provided at the expense of artesian wells drilled in areas called Arkivan and Onjegala. The 6 natural and man-made outlet lines are registered in the territory of the region which provide flow of water and wastewater to the Caspian Sea. These include the rivers of Vilashchay, Gumbashichay and Takhtachay as well as channels bored for discharging wastes from settlements. The river of Vilashchay used with the purpose of irrigation experiences anthropogenic influence more compared to other natural flows in Masalli. Clustering of solid wastes near settlements has shaped few hills of sweepings along the right and left banks of Vilashchay. Wastes are not being purified because there are not cleaner settings in Masalli. Little ponds have been arising in places where wastewater is thrown away, and this caused ecological problems to take place year-round. As the small enterprises are not situated in the coastal strip but near it, wastewater is being poured to the Caspian Sea through collectors, channels, and rivers. By the researched rivers' waters, over 90% of total mass of soluble mineral substances are composed of ion salts. Food items also share considerable role in shaping hydrochemical composition of waters of rivers. In general, hydrochemical regimes of rivers have been shaped by influence of complex interconnected factors. Chemical indicators are different by hydrometric points as composition of water changes during flowing process. Perennial indicators in average by chemical composition of rivers were calculated for defining corresponding changes (see the table 1).

Among rivers of the region, Vilashchay and Astarachay have mainly chloride in their composition of water. In general, by the rivers of the region, concentration of hydrocarbonate per liter of water hesitates between 139 and 199 milligrams, whereas the same indicators by ammonium sulphate are from 61,9 to 150 milligrams. Chlorides fluctuates between 13,3 and 818 milligrams/l. The carried researches show that anion of hydrocarbonate has significantly changed, and sulfuric ion has been increased in composition of water of Istisu.

Table 1: Perennial indicators of chemical substances in water in 1989-2010 (mg/l in average)

Names of river and point	Volume of water (km ³)	HCO ₃	SO ₄ ²⁻	Cl	Soluble oxygen	Mineralization	Roughness
Vilashchay/Shikhlar	0,14	189,1	150	144	10,1	662	5,53
Lankaranchay/Sifidor	0,28	201,9	82,3	13,3	8,86	427	3,92
Tangaru/Vago	0,10	137,3	61,9	44,4	8,83	451	3,12
Istisuchay/Alasha	0,04	172,2	73,3	818	8,68	1565	11,0

In *Lankaran region*, demand for drinking water is being supplied due to the water storage of Khanbulanchay, water pipeline of Luvasur-Dashdatuk, and wells located in the same area. Water provision here is regulated by the Office of Rural Drinking Water Supply. 15 flow lines accessing to the Caspian Sea are registered in the researched area. Arat waters (used in irrigation for increasing humidity of soils in period of water deficiency) are being flowed to the sea via 7 drainage collectors (Abduyev, 2008). There are also other 8 functioning collectors of mixed origin in the area.

It should be noted that some measures on reconstruction of part of sewage system, namely replacement of pipelines being in balance of Water and Sewage Office of Lankaran city, have been carried in recent years. However, pollution problem mainly relates to the river of Lankaranchay.

81 km long Lankaranchay is the second largest river in the researched area behind Vilashchay. Water of this river is intensively being used in agriculture. For this purpose, many channels have been laid from it. Lankaranchay is influenced by human activity more among other researched rivers. Sewage of buildings and small enterprises as well as fecal waters discharged from military units located near the river contaminates Lankaranchay which in its turn transports different chemical substances and pollutants to the sea. Annually, 71300 tons of chemical compounds, 28600 tons of depending substances, 250 tons of organic substances, 5 ton of metals and 0,5 tons of phenols are being transported by Lankaranchay to the Caspian Sea (Hajiyev, 2004).

The dumps formed near the country of Sutamurdov are located almost on the bank of Lankaranchay. Dumps seriously damage the area's environment. Functioning of cheese producing enterprise located in Sutamurdov is responsible for arising sewage thrown away to the coastal zone without purification as a result of which a few wastewater ponds as well as marshes exist near the coast. Girdani channel is also being polluted in the territory of Lankaran region. Enterprises of canning production operating seasonally still raft their wastes into the channel in contrast with bottom cleaning works carried in its valley. The river of Girdani crosses territory of the dump of Lankaran-city, and this increase contamination as the river's water mingles with domestic and fecal water in northern part of the city reaching then the Caspian Sea. The table 2 reflects analysis of quality of water rafted from enterprises located in Lankaran region.

Kanar Mesha area located on the right bank of Lankaranchay includes a number of sources of arising domestic and fecal water discharged without purification and filtration by 3 outlet lines, polluting the Caspian Sea.

The other factor responsible for change of quality and pollution of water of Lankaranchay is related to functioning of quarries in its bed, namely extraction and production of gravel as well as transportation of clay from valley and bank of the river (Malikov, 2009). Deforestation also is a process going in the valley of Lankaranchay. Many dwelling houses illicitly have been constructed on the bank of this river. It is notable that Lankaranchay is a place of reproduction for many kinds of valuable fishes such as omul, gold fish, garasol, etc. Contamination of this river is dangerous for fishes living in its water.

Table 2: Evaluation of quality of sewage discharged from enterprises to the Caspian Sea in Lankaran region

Indicators	Unit of measurement	The allowed limit of concentration	Outlets by:			
			Enterprise of dairy products in settlement of Sutamurdov	Biological cleaning setting in Lankaran city	Canning plant in Lankaran city	Company of "Gilan"
pH		6,5-8,5	6,24	6,90	7,40	7,45
Share of salts	‰		1,0	0,7	0,2	0,1
NH ₄	mg/l	0,5	20,0	25,0	3,8	0,58
NO ₂	mg/l	0,08	0,05	0,14	0,084	0,08
OBT ₅	mg/l	3,0	410,0	520,0	250,0	60,0
SSAM	mg/l	0,5	1,1	3,2	0,5	0,5

Ecological condition of river basins in *Astara region* is not satisfactory (see the table 3). Solid wastes shaped in the rural settlement of Shahagaj and other clusters of the coastal zone have entailed large dumps. In the territory of Astara, there are three natural and man-made flows reaching the Caspian Sea, including the rivers of Astarachay and Pensarchay, and collector of Kaladahna. The last flow is polluted more.

The Kaladahna collector is connected with natural flows of Archivanchay and Gezendashchay. It clusters wastewater discharged in larger and small settlements located along these rivers as well as sewage shaped in Astara city, rafting them to the Caspian Sea. Functioning of the Department of Water Sanitation and Municipal Services in Astara is not effective. Reconstruction works are needed in the place where the sewage pipe crosses Kaladahna collector as wastewater is being spilled into the collector because of bad condition of the pipe.

Table 3: Evaluation of quality of sewage discharged from enterprises to the Caspian Sea in Astara region

Indicators	Unit of measurement	The allowed limit of concentration	Outlets by:	
			“Azerjanub’ Ltd (fecal waters)	Where sewer pipe accesses Kaladahna collector
pH		6,5-8,5	7,65	7,17
Duzluluq	‰		0,3	0,6
NH ₄	mg/l	0,5	4,8	18,0
NO ₂	mg/l	0,08	0,036	0,29
OBT ₅	mg/l	3,0	275,0	320,0
SSAM	mg/l	0,5	1,1	1,5
Depending substances	mg/l	4,25	48,0	18,0
Oil products	mg/l	0,05	–	
Ecotoxicology			Acute toxic	
Microbiology				Dirty 311000 number/liter

No any measure has been conducted concerning management of wastes shaped in newly-created cargo terminal that was constructed in coastal zone of Astara region. Transportation of wastes shaped in special storehouses arranged for clustering sewage and solid wastes is not being carried as any obliging contract in this connection does not exist. Solid wastes have shaped large dump (square of which reaches approximately 0,3 hectares) in waterlogged territory near the coastal strip and about 500 meters away from terminal.

Picture 1: Ecological condition of Pre-Caspian coastal strip in Astara region

1.1.The waterlogged territory



1.2.Pollution of Pre-Caspian coastal strip with household waste



1.3. Illicit dump near the cargo terminal



1.4. Sewage discharged from the enterprise of dairy products, settlement of Sutamurdov

Conclusion

So, in recent years, definite changes by quality of water of rivers have taken place in Pre-Caspian areas of Azerbaijan due to various industrial activities and increasing dwelling houses. This process goes more intensively in lower part of river basins. For preventing contamination, it is advisable to increase number and quality of water-cleansing devices in the researched area. Prevention of illegal invasion to the river's bed as well as transition of environmentally safe production and technology is necessary. Functioning of water-cleansing installations should be under strict control as well. Local climatic and hydrometeorological condition as well as attractive landscapes and environmental condition of river valleys should be taken into account when creating new industries and services in the area.

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