

**Environmental problems of water resources of the Near-Caspian  
region connected with extraction and transportation of  
hydrocarbons**

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Water resources of the Caspian pool play an important role in formation of natural ecosystems and the steady economic development of the Near-Caspian states. The Caspian Sea is considered by many to be the largest lake on the planet. It is located on border of Europe and Asia. The Caspian Sea contains a large variety of flora and fauna, in particular sturgeon and inland seals. . The majority of northern and east coast of the sea borders the Kazakhstan sector. The sea is the basic source of water supply to the Mangistau region where 95 % of all potable and industrial freshwater are generated from (distillation?). The majority of industrial freshwater is used for cooling the process equipment of power stations and maintenance of stratum pressure on oil field.

Dynamics of use water resources for the period 1998-2002 is presented by the basic enterprises of Mangistau region in Table 1. The data indicate that the significant freshwater consumers are power stations and the oil-and-gas industry.

Table 1 - Dynamics of use of water on fields of activity on Мангистайской areas for the period 1998-2002

Parameters	Used water	1998	1999	2000	2001	2002
<b>Total</b>		720,716	700,178	600,395	673,91	652,3
<b>all including:</b>						
<b>Power station</b>	sea	693,895	674,715	573,503	618,31	623,0
«Oztenmunaigas»	sea	13,801	11,918	13,110	21,87	22,4
«Mangistaumunaigas»	sea	4,207	6,605	6,740	6,14	0,2
«KazTransOil»	river	8,813	6,940	7,020	8,84	6,7

In near-Caspian region the largest oil reserves are concentrated and extracted from more than 70 % of oil of the Republic of Kazakhstan. Now are intensively spent the geologist-prospecting of work on detection oil-gas deposits on a shelf of Caspian sea.

As a result of active oil exploration in the near-Caspian region the ecological load has increased considerably for the environment, especially, on its surface and underground water resources.

Pollution of surface waters of Caspian sea by harmful substances, basically, occurs from three sources ( E.T. Zhanburshin ,2005 ).

**Source 1**-pollution, introduced by river streams running into the sea, especially the river Volga. Almost all northern part of the sea is under influence of its fresh water, with not deep and distinct current from the north on the south. This current

brings the Volga pollution down into the main part of the sea. The Urals River also contributes to the pollution load.

Results of research on various fish types caught in the lower Urals River, between 2002-2003 indicate that approximately 50 % had livers with insignificant pathological changes. Compared with those in the Caspian sea, the Caspian Sea fish did show significant morphological anomalies. The Caspian sea fish had livers that were reduced in size and pale. Additionally the kidneys and branchiate petals are pale. Approximately at 30 % of the investigated fishes a surface of heart lumped had lumps on the heart. So a value index based on physical condition, show the Caspian sea fish to be higher (from 2 to 5 times higher) than those fish from the Urals River.

**Source 2.**-pollution of the sea environment by crude oil discharges from ships..

In Kazakhstan sector of the Caspian sea there is special concern in the port of Aktau. So, annually at loading oil in the tanker there are 5-7 floods of crude oil on water area of the sea. For example, in September 2003 there was an oil spill at a bulk mooring. Although the volume was estimated to be 24 litres, it resulted in a 1 mm thick film over an area of 40 meters, width - 0,6 m, thickness-1 mm. In the end of 2004 in area of a mooring # 4 on a water table 0,132 tons of oil are poured. Similar situations were observed as well in 2005.

For today an acute problem remains the flooded 29 courts in area of settlements Atash and Bautino , their long stay in sea water can lead destruction of fuel capacities and to a pouring out of the rests of mineral oil.

**Source-3** – Pollution as a result of oil extraction in the sea and coastal zones.

The current plans for offshore oil and gas development will increase stress on the environment. This development is planned for the northern parts of the Caspian Sea (offshore) as well as the Kazakhstan region.

Presence of a powerful salt layer with high abnormal of stratum pressure (from 86,126 to 121,59 MPa.) and the continual production of hydrogen sulphide from the oil bearing (up to 25%), complicate the technology of extraction, gathering, transportation and oil refining. Air quality is also impacted due to oil burning (approximately 1700 m<sup>3</sup>) and the venting of natural gas on the well platforms. Recycling of sulfur is not the answer. Besides it is not solved a question of recycling of sulfur. As, under the project of an early oil recovery on Kashagan after processing 2,9 billion m<sup>3</sup>/year of gas is allocated 900 thousand tons of elementary sulfur. Now, in the world market demand for sulfur is low.

Given all the listed impacts and potential causes of environmental degradation, by far the greatest threat is with accidental oil spills. Statistics have demonstrated that that the conditions on “Kashagan” result in the probability of 6 spills for 1000 wells. This is in spite of the fact that the new technology is being used there. There is a high probability of an uncontrolled well blow-out every year. During these accidental oil spills there can be emissions of NO<sub>x</sub> up to 15 mg/m<sup>3</sup>. This exceeds the maximum permissible concentration (maximum concentration limit) in 180 times. (E.T.Zhanburshin, A. Bigaliev, 2002, 2003, 2004)

Intensive oil exploration, oil transportation, and the creation of artificial islands for drilling threaten the ecosystem of the Caspian Sea. By results of analyses of the waters executed by laboratory of Atyrau region Management of Preservation of the

Environment, a degree of analyzed water samples for of sewage from drill rig installation # 257 "Sunkar" structures "East Kashagan" from January till November 2000. The results showed an excess of maximum concentration limits of ammonium salt from 55 up to 120 times, on anion surface-active substances up to 8 times. Such excess was observed and on western and east "Kashagan".

The researches ( S. Kobegenov,2005 ) lead within the limits of an estimation of influence on an environment on western and east "Kashagan" in 2000, have shown the same infringements in muscles practically at all investigated fishes. In spring of 2000 observed mass destruction of the Caspian seals, both on Kazakhstan, and on Russian coasts of sea.

By the end of May, 2000 quantity of the lost seals according to Caspian Scientific research institute of a fish facilities (Northern Caspian sea - the Russian coast) has come nearer to 11,000, and at the Kazakhstan coast the number of corpses cast ashore has reached 50,000. From northern border of Dagestan up to Derbent it has been counted 15,000 to 20,000 thousand lost seals besides at the Dagestan coast the significant amount of the lost fish - sturgeon was observed,

Underground water resources of region, in particular Mangistau region , as well as the freshened sea water, are the basic source for water supply of its population, an agriculture and the industry.

At the same time a unsystematic heavy use of underground sources of water, have led to change of structure of subsoil waters and their exhaustion.

Besides application on oil-and-gas deposits of a method given waters for maintenance of stratum pressure and chemical reagents: pollution of summit layers of

ground mineral oil, stratum and household waste to waters, are principal causes of technogenic pollution of underground waters in petrocrafts region.

Carried out researches of department of protection of bowels "NIPINEFTEGAS" on objects of the enterprises transporting mineral oil show environments, that the basic polluting substance, revealed in underground waters, mineral oil are on concentration of mineral oil oscillate from 44 up to 222 from permissible standard.

To reduce pollution to surface and ground waters, improve the ecological situation and improve the quality of life in the region the following steps need to be taken:

1. Create and provide a system of continuous monitoring on the Caspian sea and in areas of oil and gas development.

2. To replace morally and physically become outdated the equipment of the oil-and-gas companies with modern park of technologies.

3. Develop a rigorous system for determining compensation for natural resource damage.

4. To preserve economically inexpedient self-growing lazy artesian borehole.

5. To apply high technologies during drilling, extractions and transportations development of hydrocarbonic raw material on a shelf of Caspian sea.

6. To limit development of oil-and-gas deposits on ecologically vulnerable sites on Caspian Sea.

7. To create transboundary mechanisms of struggle against floods and compensation of all damages by a principle " pollution pays ", including through creation of the international fund of ecological insurance for Caspian sea.

