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ENVIRONMENTAL PROBLEMS OF THE CASPIAN REGION, CAUSES AND WAYS OF SOLUTION

Abstract. This paper examines the environmental problems of the Caspian region, the causes of their occurrence and the necessary solutions. The Caspian Sea has been suffering for a long time from oil pollution, radioactive waste from nuclear power plants, as well as large volumes of untreated industrial waste. Accordingly, there is also a depletion of the biological resources of the sea – namely, a huge number of rare species of fish – sturgeon and many others are dying.

Pollution of the Caspian Sea is an urgent and large-scale problem, because the negative impacts are increasing every day.

There is an urgent need to develop and adopt scientifically ways to solve the environmental problems of the Caspian region.

Keywords: Caspian region, environmental problems, negative impacts, environment, solutions.

Майя Урузғалиева, Ерболат Серғазин, Гаухар Абдрахманова КАСПИЙ ӨңІРІНІҢ ЭКОЛОГИЯЛЫҚ МӘСЕЛЕЛЕРІ, СЕБЕПТЕРІ МЕН ШЕШІМДЕРІ

Андатпа. Бұл жұмыста Каспий өңірінің экологиялық проблемалары, олардың пайда болу себептері және шешу жолдары қарастырылған. Каспий теңізі ұзақ уақыт бойы мұнайдың ластануынан, атом электр станцияларының радиоактивті қалдықтарынан, сондай-ақ өнеркәсіптің тазартылмаған қалдықтарының үлкен көлемінен зардап шегіп келеді. Тиісінше, теңіздің биологиялық ресурстарының сарқылуы да орын алады – атап айтқанда, сирек кездесетін балық түрлерінің - бекіре тұқымдас балықтардың және басқа да көптеген түрлерінің жойылуы.

Каспий теңізінің ластануы ауқымды және өзекті проблема болып табылады, өйткені теріс әсерлер күн сайын артып келеді.

Каспий өңірінің экологиялық проблемаларын шешудің ғылыми негізделген жолдарын әзірлеу мен қабылдаудың шұғыл қажеттілігі бар.

Түйін сөздер: Каспий өңірі, экологиялық мәселелері, теріс әсерлері, қоршаған орта, шешімдер.

Майя Урузғалиева, Ерболат Сергазин, Гаухар Абдрахманова
ЭКОЛОГИЧЕСКИЕ ПРОБЛЕМЫ КАСПИЙСКОГО РЕГИОНА,
ПРИЧИНЫ ВОЗНИКНОВЕНИЯ И ПУТИ РЕШЕНИЯ

Аннотация. ВВ данной работе рассмотрены экологические проблемы Каспийского региона, причины их возникновения и необходимые пути решения. Каспийское море длительное время страдает от нефтяных загрязнений, радиоактивных отходов атомных электростанций, а также больших объемов неочищенных отходов промышленности. Соответственно, также происходит истощение биологических ресурсов моря – а именно гибнет огромное количество редких видов рыб – осетровых и многих других.

Загрязнение Каспийского моря является актуальной и масштабной проблемой, ведь негативные воздействия увеличиваются с каждым днём.

Существует острая необходимость разработки и принятия научно обоснованных путей решения экологических проблем Каспийского региона.


Ключевые слова: Каспийский регион, экологические проблемы, негативные воздействия, окружающая среда, пути решения.

Introduction

The Caspian Sea is a common ecological object of the Caspian region. The crisis in one part of the region will certainly affect others. If the Caspian Sea is not saved right now, it will turn into a shallow, polluted with oil and household chemicals, a shallow reservoir in which there will be no fish and other marine life.

Hazards and risks are primarily associated with the intensive development of the resources of the sea and the coastal zone. In order to understand what environmental hazards the inhabitants of the coastal strip are exposed to, it is necessary to find out first of all what impacts (natural and anthropogenic) these hazards and risks create for people. Firstly, it is the natural conditions of the Caspian Sea, which is a unique ecosystem and has its own laws of development. It combines the character and features of not only a lake, but also a large marine basin. That is why the Caspian has a dual nature - from the sea it took all the hydrophysical properties (atmospheric phenomena, organic world, geographical location), from the lake - the closeness of the reservoir and the lack of communication with the sea.

Since the Caspian Sea is a space between mountain peaks and all air masses that move from west to east and from north to south pass through it (and this is a



very narrow strip), it is in this region that atmospheric phenomena increase - winds, hurricanes, snowstorms, etc. This is the uniqueness of the sea: there is no second such basin that is not connected with the ocean, but has patterns in common with it [1].

The second feature is that the geological structure of the seabed is characteristic of the oceanic basin, which determines all geological and hydrogeological processes. For example, frequent earthquakes, which are typical for most of the mainland areas. Scientists explain this by the fact that the current Caspian Sea was formed from the Tethys Ocean, which stretched here tens of millions of years ago and disappeared as a result of the clash of lithospheric plates. They call it the Remnant Sea. Thus, the geographical position of the Caspian Sea itself creates danger and risks associated with atmospheric phenomena and being in the zone of active development of the Earth's crust.

Due to all the circumstances, the situation in the Caspian Sea continues to deteriorate. Industrial and oil pollution of the Caspian Sea has reached a "critical level". The development of oil fields and the movement of large tankers annually leads to the release of more than 122 thousand tons of potentially hazardous oil pollutants into the largest closed reservoir in the world. Also, the sea is poisoned by a large amount of heavy metals, which pose a huge danger to human health. Thus, it is known that the source of 95% of pollution is the Caspian countries in the north and northwest - Russia, Kazakhstan and Azerbaijan, which account for most of the offshore oil production.

According to experts of UNEP (United Nations Environment Programme), active exploration of oil and gas resources, growing networks of pipelines and transport routes, industrial pollution from the inflow of rivers and groundwater, climate change and coastal desertification, as well as loss of biodiversity due to excessive use of fish stocks and the emergence of aggressive introduced species - these are just a few of the environmental challenges that threaten the Caspian Sea [2].

More than 15 million people live in the Caspian region, who are heavily dependent on the natural resources of the sea. In this regard, the protection of the environment of the region is not only a matter of ecology, but also obligatory for reducing risks to the health of the coastal population and sustainable economic development. Since most of the problems are cross-border in nature, these challenges require closer and more active cooperation between the Caspian countries.

Research methods

The author used public sources of information; information from regional and international statistical data; ratios and indicators related to environmental safety specified in official sources, reports, government programs, Internet resources, etc. To achieve the goal, methods of analysis and comparison are used. In addition, as a modern form of research, the author resorted to the inductive method of research. This method is the formation of conclusions about the phenomenon based on the study of private signs (a large number of private environmental disasters and accidents at various enterprises, which resulted in a set of environmental problems in the whole region).

Literature review

Currently, much attention is paid to the comprehensive study of the Caspian Sea, which is associated not only with the intensive development of oil and gas production, significant changes in the regional climate, but also with rapidly developing environmental problems against this background. Modern researchers publish many scientific papers on the future fate of the Caspian region.

Thus, it is necessary to note the works of N.A. Sarsenbay «The concept of a comprehensive program of scientific and applied research of the Caspian Sea and the coast within the Atyrau and Mangistau regions» [3], F. Akiyanova «On the implementation of the scientific and applied program of the «Astana» MNC on the topic: «Comprehensive studies of the ecosystems of the Kazakh sector of the shelf and the Caspian Sea coast with an assessment of the impact of the oil and gas industry in 2021-2026» [4].

On the Internet resource asianecology.kz the article «Assessment of the current state of the Caspian Sea and analysis of the habitat of the Caspian Seal» has been published, the authors of this study are the Central Asian Institute for Ecological Research LLP, Almaty, Kazakhstan, Independent Center for investigation and Appraisal in organic Chemistry, Cuers, France.

It is necessary to note the scientific works of K.A. Byakishev: «The new international legal regime of the Caspian Sea» [5], «International legal problems of fisheries management» [6], «Safety at sea» [7], «The international legal status of the Caspian Sea».


A considerable contribution to the study of this topic was made by L. V. Dorofeeva «Prospects for the development of trade relations in the Caspian region for the Russian Federation» [8], S.A. Lebedev, A.G. Kostyanoy, A.I. Ginzburg «Dynamics of the Caspian Sea according to instrumental measurements, modeling results and remote sensing data» [9] and others.

The main part

The unique natural object – the Caspian Sea – in recent years is in the zone of ecological catastrophe, the preservation of its hydrocarbon resources and biological riches is a common environmental task of the countries of the Caspian region (Russia, Kazakhstan, Azerbaijan, Iran, Turkmenistan).

There are several environmental problems in the Caspian region, the main polluter of the Caspian Sea, of course, is oil. Oil pollution suppresses the development of phytobenthos and phytoplankton, which are represented by blue-green and diatoms, and also reduces oxygen production. Oil creates a film on the water surface that prevents phytoplankton from developing. This, in turn, leads to a decrease in the level of oxygen in the water and the death of marine inhabitants. The number of sturgeon fish is decreasing, followed by waterfowl. The increase in pollution, respectively, negatively affects the heat, gas, and moisture exchange between the water surface and the atmosphere. Due to the spread of the oil film over large areas, the evaporation rate decreases several times [10].

Also, pollution of the Caspian Sea is caused by phenols - hydroxyl derivatives



of aromatic hydrocarbons (volatile and non-volatile), they are common pollutants entering natural waters with wastewater from oil refineries and other enterprises. Usually, under natural conditions, phenols are formed during the metabolism of aquatic organisms, during the biochemical oxidation of organic substances. The maximum permissible concentration of phenols in drinking water and water of fishery reservoirs is 1 mcg/l. From the results of the analysis, we found that the content of phenols in water in shallow areas of the sea reached 8 mcg/l, and the average content of phenols in water of the Caspian Sea reaches 60 mcg/l, and the average value characteristic of the waters of this area is 3 mcg/l, that is, the average concentration of phenols in the water has recently increased to 6 MPC (0.006 mg/l) [11].

The next pollutant is wastewater. The Volga and all other rivers that carry their waters to the Caspian Sea bring with them tons of human waste products, as well as household solid garbage. Many coastal cities do not have sewage treatment plants and drain sewage – both from homes and businesses – directly into the sea. Dirty waters create dangerous oxygen-free zones - they have already appeared in the south of the region. These are parts of the sea where due to the high level of pollution, all marine vegetation that produces oxygen dies, and after algae, all marine life dies [12].

The next problem is overfishing and poaching leads to a reduction in the number of sturgeons. So, poaching, according to unofficial data of local residents, accounts for up to 80% of the catch. In recent years, poaching has been actively combated, which has led to a slight recovery of the sturgeon population.

Another serious problem is the decline in sea level. In some regions, the coastline recedes by a meter per year. This is due to the active construction of dams and power plants on the rivers feeding the Caspian Sea, as well as due to excessive water intake from rivers for irrigation of fields. Geothermal power plants are a great alternative to traditional methods of energy production. The Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan recalled that the downward trend in the level of the Caspian Sea began in 2006, and by 2016 amounted to 27.99 m. According to the long-term forecast, by 2040 the sea will become shallow by 2.04 m.

The real problem for the Caspian Sea is the active reproduction of alien organisms - mnemiopsis ctenophore. Ctenophore practically devastated the Azov and Black Seas in the 80s, now it destroys the food base of Caspian fish, consuming a huge amount of plankton. The ctenophore also eats sturgeon caviar, reducing the already meager population.

Based on the above, the environmental problems of the Caspian Sea and its coast are a consequence of the entire history of extensive economic development in the countries of the region. This is superimposed both by long-term natural changes (secular fluctuations in sea level, climate change) and acute socio-economic problems of today (transition period, economic crisis, conflicts, introduction of transnational corporations, etc.).

The problems that have arisen regarding the condition and pollution of the Caspian Sea require the adoption of active measures to protect the environment in the region and, accordingly, control by the five coastal states.

It should be recalled that in 2003, the Caspian countries signed the Framework

Convention for the Protection of the Marine Environment of the Caspian Sea in Tehran. It was approved on August 12, 2006. Since then, five Caspian littoral states have been jointly solving the problems of the marine environment in the Caspian Sea.

The above environmental problems of the Caspian continue to exist in full, in connection with which, we believe it is necessary, first of all, in the development and operation of hydrocarbon resources in the Caspian Sea basin, to carry out environmental protection measures on an ongoing basis. And also, in our opinion, it is necessary to update common regulatory, methodological and legal documents for the development of hydrocarbon raw materials, which would exclude or reduce the anthropogenic impact on the ecosystem of the Caspian Sea. If the coastal countries jointly and rationally use natural resources, carry out work to increase the number of plants and animals, environmental protection measures, then in this case the Caspian Sea will live.

International emergency services in case of accidents in the Caspian Sea are also very important. We also need the Caspian Environmental Fund. Ensuring environmental safety, the development of environmental monitoring is a priority problem of each state. The possibility of restoring the ecosystems of the Caspian Sea largely depends on the coordinated actions of the Caspian states.

It should be noted that from June 1 to July 1, 2022, major repairs are expected at the field of the Kazakh side, during which production will not be carried out.

Based on the above, we can see that the Caspian Sea is a common ecological object of the Caspian region, and the crisis in one of its parts will result in a common, inseparable ecological catastrophe, which, ultimately, will affect the personal plans of each state and its development prospects. Effective environmental control over oil operations and the general situation in the Caspian Sea is possible only with the joint control of the Caspian littoral states. In turn, such control can be carried out through the creation of an interstate environmental authority, and the granting of appropriate powers, in particular, the right to preliminary environmental expertise of oil projects, to suspend or terminate the implementation of these projects in the event of an environmental hazard or increased risk, as well as the development and implementation of joint environmental programs.

Conclusion

Summing up, it should be noted that ensuring the stability of the environmental situation in the Caspian region largely depends on active interstate cooperation. Measures to save the region should be supported by all coastal States, and should include mandatory:

- development of emergency response systems for emergency oil emissions;
- cleaning and proper storage of waste from processing enterprises;
- stopping poaching;
- creation of nature conservation areas;
- creation of sturgeon and other fish breeding enterprises;
- allocation of funds from the budget for the study of environmental problems of the region.

Based on the above, we believe that the possibility of restoring the ecosystems of the Caspian Sea largely depends on ensuring and coordinating the actions of the Caspian states on the above points (proposals).

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