

COMPARATIVE ANALYSIS OF OIL AND GAS EXPLORATION IN AZERBAIJAN AND IN THE STATE OF CALIFORNIA, USA

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Authors of this report describe similar characteristics of oil and gas industries of the Azerbaijan Republic and the State of California, USA. Ecological and environmental problems on the territories of exploration are presented as well.

Keywords: oil and gas industry, exploration, ecological and environmental problems, comparison of oil and gas exploration, pollution.

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Natural environmental conditions in California, basically climatic ones, have similar features with those of Azerbaijan, as middle and southern part California and Azerbaijan are situated on the same parallels. This region is characterized subtropical climate. In addition to this, there is a whole range of other particularly similar features in flora and fauna, peculiarities of relief, as well as the set of similar ecological problems in both territories. Oil pollution of coastal zones plays on of the most significant roles among ecological problems. Caspian Sea, as well at the sea shore of California can be characterized by pollution by various substances. The most widely spread among which are oil and oil products. The natural sources of petroleum on the surface of USA territory have been found and exploited already since the year 1629. Several of them even now still pollute the coast of Southern California. The Coil-Oil cape is well-known in this regard. With the purpose of protecting the nature of the California lands and its riches long time ago territories on the Californian sea shore have been offered for rent - for drilling oil wells here.

After the incident in the Santa-Barbara channel more rigid and detailed rules for drilling oil wells stated by Scott (Scott 1969) were introduced.

Film produced by the blowout out of petroleum because of crashes in the channel of Santa-Barbara has shown that the massive sludge settlement of oil on weighted substances has moved and reached the middle of the channel's depth after half of the year (Kolpack 1974). Half of the population of "Balanus glandula" inhabiting the coastal zone close to Santa-Barbara has been exposed to rather strong adverse influence of spilled petroleum. Only a few worms known able to pull through in conditions oil pollution (McCouley 1966). McCouley has informed that oligochaeta "Tubifex" can pull through well in the bottom mud saturated with petroleum (Reisth 1964, 1970). Reisth discovered quality indicators of presence of polychaeta "Capitella capitata" in the zones of strong pollution caused by wastes discharge from oil refinery factories in the Los Angeles port. Large population of brown algae living in the temperate zone was covered by a dangerous mucous film moisten by fresh liquid oil.

When damp of the oil has reached coasts of the channel of Santa-Barbara upper layer of big brown alageae "Macrocystis pyriera" has been protecting plants and animals located below the water level up until the moment when the flow covered them. After

dumping of petroleum in the channel of Santa-Barbara heavy oil film has been discovered covering the islands inhabited by the colonies of sea lions "Zalophus californianus". Over 100 whelps of sea elephants "Mirounga angustirostris" on the island of San-Mishel were affected by petroleum pollution. Incident in Santa-Barbara has taken place in the period of seasonal migration of gray whales "Eschrichtius gloucus". Moving through strongly polluted sites of the channel animals tried to avoid contact with petroleum. Sea anemone "Amthopleura xanthogrammia" has also suffered a lot from direct contact with the petroleum in lagoons and coastal zones. But only these animals have pulled through in the closed zones situated on sea shore of California, in water bodies to which the great drains from oil refinery factory have been dumped. Usually fish is able to find optimum safe places, and in most cases environmental areas characterized by conditions of powerful pollution are avoided. So, when the "Tampico Maru" has crashed close to California (North, W.J., M. Neushul & K.A. Clendenning, 1964), the majority of fish species were able to leave the region of the petroleum blowout. Commercial fishing has considerably decreased as the result of pollution of the channel of Santa-Barbara in this region. As rule, birds and

mammals live on the land and contact with sea, therefore they are consequently affected by influence of pollutants of water only in short periods of searching for some food or stern close to the shore. A huge number of these birds became victims of petroleum pollution. In this connection from chronic pollution more birds have probably been killed annually than during separate catastrophic blowouts. When diving into polluted waters they imperceptibly for themselves get into in the layer of petroleum which then covers their heads, backs and wings. Apart from that, having swallowed some quantity of petroleum, birds lose their appetite. It is known, but rather essential is the fact that it influences the population of birds and changes viability of fledglings and eggs.

Most of such kinds of problems connected with the pollution are observed in the Caspian Sea as well.

The main sources of pollution in the Caspian Sea are rivers outflows, exploration and operations in the sea oil fields, transportation of petroleum and oil-based products by sea, discharge off polluting sewage waters from ventures, blowouts from the municipal oil and petrochemical industrial sector of cities and discharge of polluted waters from agricultural lands. We shall pay our attention to one of these aspects.

Azerbaijan began to extract petroleum for with the purpose of exporting it in the year of 1871. During the last 120 years Azerbaijan has extracted 1.325 billion of tons of petroleum. The production of petroleum in Caspian Sea leads to its strong pollution, especially in the region Apsheron peninsula, islands of Baku and Apsheron archipelagoes. Oil has highly toxic effect for the sea flora and fauna. At the beginning large damage was caused by primitive engineering and underdeveloped technology of petroleum production. And later on the extraction has rapidly increased. The pressure was based on economic interests. Dangerous situations in the Caspian Sea have arisen due to the influence petroleum pollution, which leads to changes in thermal and gas exchange between lakes and the atmosphere, downturn of biological resources and degeneration of separate bioseneses. In the initial period of pollution Caspian Sea water organisms,

as well as organisms and algae on the sea shore of California were able to liquidate separate centers of pollution, but later on because of intensification of pollution they could not completely clear lakes and waters from pollution by substances. Under the effect of pollution, sea organisms show such changes as the gradual reduction of size and number and up to complete pause in reproduction and extinction of species. Before 1930 the coastal zone of Apsheron peninsula was greatly inhabited by crawfish (*"Astacus pachypus"*) – a significantly valuable type for producers. However after the oil pollution the Caspian Sea population of crawfish has rapidly decreased and in present days only individual specimens can be found. In the past the areas to the South from the Apsheron and to the South from Baku on the distance of 30-35 kilometers were inhabited by extensive population of brush woods zoster (Vereshagin, 1946). By 1940 brush woods zoster has completely disappeared due to the oil pollution.

In general the Caspian Sea is rich with 449 kinds of algae (table 5), 566 kinds of microbentos, foraminiferida of 18 kinds (table 18) and 306 kinds of microbentos (table 20) in deep-water zones. Caspian Sea is inhabited by 35 species and forms (table 32) also drastically influenced by incidents of oil pollution. Apart from that coastal areas of the Caspian Sea have great significance for migrations and dwelling of birds. Information about birds observed in the coasts in December, 1995 is shown in the table 3.2.3-1. Data shows that every year 12000 birds fly across the sea shore of Caspian Sea from Europe, Asia and the Middle East. Therefore coastal the zone of Azerbaijan is known as the habitat of birds and has national and international significance. Also Caspian Sea is inhabited by the Caspian seal (*"Phoca caspica"*). Seal inhabit all the territory of the Caspian Sea, and during the last 10 years their population has been intensively decreasing because of the pollution.

At the result of strong pollution by petroleum and other substances, the bay of Baku and the waters of the coastal city of Sumgait are turning into the dead zones.

An industrial settlement of Neft Daşları 100 miles off the coast of Baku, Azerbaijan, is a complete town on the sea. The first oil platform in Azerbaijan, Neft Daşları was also the first operating offshore oil platform in the world. What began as a single path out over the water in 1959 slowly grew into a full city over the years, as paths and platforms were built on the back of ships that were submerged into the sea to serve as a foundation for the expanding structure. After two years of construction, in 1951, Neft Daşları was ready for production. Oil tanks were installed and drilling platforms erected, and the city's first oil was tanked out that same year. The city expanded so quickly in the first decade of operation that nine-story hotels, cultural palaces, bakeries, and other sites were built up by 1958. Two decades later another boom (1976-1978) saw the construction of a five-story dormitory and two oil-gas compressor stations. Those years also brought residents a drinking water facility, two underwater pipelines, and a flyover for vehicular traffic.

The Los Angeles City Oil Field was discovered in 1890, and made famous by Edward L. Doheny's successful well in 1892. The field became the top producing oil field in California, accounting for more than half of the state's oil in 1895. Doheny became one of the richest men in California. The peak year was 1901, with 200 separate oil companies active on the field. In 2011 only one small well remained in production.

The historical roots of Azerbaijani oil goes back to the ancient period. Since 1847, the first phase of production of drilled oil wells begins with the mechanical method. It continued up to 1920. Bibi, for the first time in 1847-1848, and then mechanically processed fields of Balakhani drilled oil wells enriched the Azerbaijan's oil industry since thee same year. In the early nineteenth century, the world's first hand-dug wells in the sea 30 kilometers away from the shore (Bibi) produced oil. In 1859, the first oil refinery (unit) is being built. Javad Malikov kerosene plant was built in 1863. For the first time the cooler was used in the oil refining. In 1867, there were 15 oil rigs. With the development of well drilling technologies

a number of new oil fields were found (Binagadi, Pirallahi, Surakhani, etc.). Oil production has increased and the oil industry began to develop its infrastructure related to oil refining and oil production. Oil was refined and sold by hundreds of established companies. National bourgeoisie has formed and Baku became one of the world's industrial centers. For the first time in 1871 Balakhani-Sabunchu-Ramani in Absheron fields was developed industrially.

History of oil in California. The story of oil production in California began in the late 19th century. In 1903, California became the leading oil-producing state in the US, and traded the number one position back and forth with Oklahoma up till the year 1930. As of 2012, California was the nation's third most prolific oil-producing state, leaving behind only Texas and North Dakota. In the past century, California's oil industry grew to become the state's number one GDP export and one of the most profitable industries in the region. The history of oil in the state of California, however, dates back much earlier than the 19th century. For thousands of years prior to European settlement in America, Native Americans in the California territory excavated oil seeps. By the mid-19th century, American geologists discovered the vast oil reserves in California and began mass drilling in the Western Territory. While California's production of the excavated oil has increased significantly during the early 20th century, the accelerated drilling resulted in the overproduction of the commodity, and the federal government unsuccessfully made several attempts to regulate the oil market.

Oil in pre-America California. Native Americans were keenly aware of oil reserves in California, and they relied on its utility for thousands of years, albeit not for energy sources. The most abundant oil seep in the ancient California territory was the La Brea tar pits, in present-day Los Angeles. Native Americans used oil from La Brea and other seeps primarily as a lubricant, but they also used it as a sealant to waterproof canoes. When Spanish explorers arrived in California in the 1500s, they also used oil to seal cracks in their ships and the

roofs of their homes. World crude oil production from wells (excludes surface-mined oil, such as from Canadian heavy oil sands) has started in 1930 and goes on in the today's world.

Phase II starts after the nationalization of the oil industry in Azerbaijan in 1920 and in 1949 in the open sea, "Neft Daşları" is within the examined period. On November 7, 1949 a well in Oil Rocks №1, 942 meters in depth, was commissioned to produce 100 tons per day and laid the foundation for offshore oil production. Agha Gurban Aliyev was the first geologist there. The third stage "Neft Daşları" started in 1950 with the commissioning of the offshore oil industry, and this continued up to 1969. Since 1969, the fourth stage of the national economy of the oil and gas industry has been characterized by the rapid development. During this period, especially in the offshore oil production in the oil and gas industry a new stage of development begins. In 1970, "Xazar Daniz Neft" Production Union (PU) was established and the USSR Ministry of Oil Industry sent oil workers to work in the sea (Caspian Sea, Azerbaijan), taking into account the experience of all sectors of the Caspian Sea (the Caspian Sea was divided into sectors). Exploration, drilling, development, maintenance and other works were implemented by the Azerbaijani oilmen. Oil and gas production in 1975 amounted 27.1 million t-a (conventional fuel). The number of drilling rigs in the 80s has reached 11. Most of the main part of Azerbaijani oil extracted from the sea territories, is taken from layers at depths of 80-350 meters. The layers rich in oil deposits have been discovered (Guneshli, Chirag, Azeri).

The fifth stage of the USSR, the new history of Azerbaijan, covering the period of independence is characterized by the establishment of "the new oil strategy". At present, 24 thousands of tons of oil are produced per day. According to forecasts, throughout 20 years, the total income from the export of oil and gas production is around US \$ 200 billion.

In 1900, the state has produced 4 million barrels. In 1903, California became the leading oil-producing state

in the US, and traded the number one position back and forth with Oklahoma up till the year 1930. Production at the various oil fields increased to about 34 million barrels by 1904. By 1910 production has reached 78 million barrels.

The development of California oil also presented challenges to the geologist that had been seen in no other oil field. As a result, the complexities of the geology of Southern California led to a significantly increased knowledge of petroleum geology and exploration. By the end of 1938, the Long Beach Field had produced 614.5 million barrels of crude oil, 750 million barrels by 1950, and over 900 million barrels by 1980. This made Signal Hill one of the most productive fields per acre the world has ever known. In the early 1930s the Texas Company developed the first mobile steel barges for drilling in the brackish coastal areas of the Gulf of Mexico. In 1937 Pure Oil Company (now part of Chevron Corporation) and its partner Superior Oil Company (now part of Exxon Mobil Corporation) used a fixed platform to develop a field in 14 feet (4.3 m) of water, one mile (1.6 km) offshore of Calcasieu Parish, Louisiana. In early 1947 Superior Oil erected a drilling/production oil platform in 20 ft (6.1 m) of water some 18 miles [vague] off Vermilion Parish, Louisiana. It was Kerr-McGee Oil Industries (now Anadarko Petroleum Corporation), as operator for partners Phillips Petroleum (Conoco Phillips) and Stanolind Oil & Gas (BP), that completed its historic Ship Shoal Block 32 well in October 1947, months before Superior actually drilled a discovery from their Vermilion platform farther offshore. In any case, that made Kerr-McGee's well the first oil discovery drilled out of sight of land.

On June 8, in the South Caspian basin of Baku archipelago, located 80 km away from the capital, the second well of the "Hope" drilling platform was perforated and launched. No. 10 well of the Balakhani layer in the range of 6340-6356 meters along the horizon was launched at the bottom of the seventh one. The well's daily output was 1.2 million cubic meters of gas and 150 tons of condensate. The information that the well from "Umid" field had

large reserves of hydrocarbons has been proved by a more visual way. In order to transport the gas to the shore from the field "Hope" (platform "Bulla-Deniz", No. 82 well) pipeline, 18 kilometers long and 8.6 inch wide, was laid on the pitch. Natural gas was to be produced from "Hope", "Bulla-Deniz" field, No. 82, and then to be transported to the shore.

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Results

Remote locations bring forward the issue of using tanker technology. Because of California's remote location in relation to the industrial centers of the east, California oil companies were at the forefront of tanker technologies. Thanks to the efforts of Azerbaijan President's initiative in 70s-80s 75 types of cranes lifting heavy loads and more than 400 vessels, pipe-smoking vessels, seismic, passenger and other kinds of ships were brought. The "Azerbaijan" crane ship began to work in the Caspian Sea with the capacity of 2500 tons. In addition, for the first time at a depth of 70 meters, in order to carry out exploration works in the areas of "Khazar", and later operations at the depth of 200 meters the "Shelf" semi-submersible drilling rigs were used and this resulted in the acquisition of oil and gas in deeper waters. There was an opportunity for the discovery of new deposits. As a result, comparing to the end of the 60s, 8 new oil and gas fields were discovered. Oil resources and gas reserves have increased by three times. Oil and gas production of 27.1 million t (conventional fuel) was reached in 1975. On September 18, 2002 in the Sangachal terminal in Baku, Azerbaijan, with participation of the presidents of the Baku-Tbilisi-Ceyhan (Azerbaijan, Turkey and Georgia) the foundation stone of the oil pipeline construction has been laid. Merger of the Azerbaijani and Georgian sections of BTC took place in October 2004. On July 13, 2006 the opening ceremony for the Baku-Tbilisi-Ceyhan main export oil pipeline, the largest energy project

in Ceyhan, Turkey in the twenty-first century was held. Thus, over the years between 2001-2011, 56.5 billion US dollars have been invested. 30.4 billion US dollars, or 53.8 percent of these funds and the accumulation of capital of 491.5 million US dollars in 2001 Oil Fund has increased by 62 times over 10 years. In 2012 California was the 13th largest state in terms of natural gas production, with a total annual production of 248 billion cubic feet of gas. Today natural gas is the second most widely used energy source in California. Depending on yearly weather conditions, about 45% of the total natural gas used is now burned in gas-fired electric generator plants for electricity generation as coal burning plants are phased out. Most of these plants are cogeneration plants that use high temperature burning gas to run gas turbines driven generators and use the captured turbine exhaust heat as power for a steam turbine driven generator set. Funded by the State Oil Fund, the Republic of Azerbaijan government approved the "State Program on education of Azerbaijani youth abroad for the years of 2007-2015. Its aim is the realization of human potential to create a modern country, to increase the level of education of the young generation and the international level that will facilitate reaching these goals. The program is financed by the State Oil Fund and the "black gold into human capital" is a strategic step towards the realization of the idea. In October 2010, "Revenue Watch" Institute and the "Transparency International" organization published a report on the index of transparency in the management of natural resources. Azerbaijan ranks 9 among 41 countries. Funds section of this report and the Extractive Industries Transparency Initiative, Natural Resources section of the implementation are at the maximum, i.e., 100 points.

As a result of the success of the national oil strategy founded by the leader of the region, as well as regional and global economic condition "Contract of the Century" has been recognized as one of the leading players among other projects.

We would like geographers of the corresponding faculties of California universities to assist in organization of

students' conferences with participation of our students. After such an event we could find necessary information about Californian sea shore and several most painful problems of coastal of zones in both territories, as well as the ways to solve them.

On the final stage all geo-information has been included into the geo-information Data Bank "GEOLAND" using MAPINFO geographical information system. All works are marketed in Scientific and Information Centre "GEOINFORMATICS AND COMPUTER GEOGRAPHY" at the Baku State University (www.ali-nabiyev.narod.ru).

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- Promotion of international consolidation and cooperation of business structures
- Promotion of development of commercial businesses of various kinds
- Assistance in settlement of relations between businessmen with each other and with social partners in business environment
- Assistance in development of optimal industrial, financial, commercial and scientific policies in different countries
- Promotion of favorable conditions for business in various countries
- Assistance in every kind of development of all types of commercial, scientific and technical ties of businessmen of different countries with foreign colleagues
- Promotion of international trade turnover widening
- Initiation and development of scientific researches, which support the effective development of businesses and satisfy the economic needs of the society
- Expert evaluation of activities in the field of settlement of commercial disputes, establishment of quality standards and defining of factual qualitative parameters of goods and services
- Legal and consulting promotion of business
- Establishment and development of activities of the international commercial arbitration
- Exhibition activities
- Holding of business and economic forums