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Caspian Sea Region: Environmental Issues

GENERAL BACKGROUND

The landlocked Caspian Sea is the largest inland body of water on earth. Surrounded by Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan, the Caspian Sea is home to myriad ecosystems. At the meeting point of the Middle East, Europe, and Asia, the Caspian region includes steppe land in the north, cold, continental deserts and semi-deserts in the northeast and east, and warmer mountain and highland systems in the south and southwest. The coastal wetlands of the Caspian basin include many shallow, saline pools, which attract a variety of bird life and biodiversity; over 400 species are unique to the Caspian. In addition, the sea's native sturgeon is famous the world around for the roe it produces: sturgeon from the Caspian Sea accounts for approximately 90% of the world's caviar industry.

Although oil has been produced in what is present-day Azerbaijan for more than 100 years, the dissolution of the Soviet Union in 1991 led to heightened interest in the region, especially among

Western energy companies that previously were shut out of the area. The Caspian Sea's energy potential already was well-known, and the confirmation of that potential with the discovery of significant hydrocarbon deposits in the mid-1990s brought an influx of foreign investment in energy development in the region, particularly in Azerbaijan and Kazakhstan.

ENVIRONMENTAL PROBLEMS

The spotlight on the Caspian region's oil and gas reserves also highlighted the appalling state of the environment in and around the sea. Years of neglect have left the sea and the surrounding region in a precarious position environmentally. Petrochemical and refining complexes on the Absheron peninsula in Azerbaijan are major sources of land-based pollution, and discharges and spills from oil and gas drilling--both onshore and in the sea itself--have had serious impacts on the environment. Untreated waste from the Volga River--into which half the population of Russia and most of its heavy industry drains its sewage--empties directly into the Caspian Sea, while pesticides and chemicals from agricultural run-off are threats to the sea's flora and fauna. Thousands of seals that live in the Caspian Sea have died since 2000 due to pollution that weakened their immune systems, and overfishing, especially of the prized sturgeon, has caused a dramatic decline in fish stocks.

In addition to the existing problems, several other issues could compound the Caspian region's environmental difficulties. Oil and gas production in the sea inevitably will result in the construction of pipelines and infrastructure to export these resources to consumers, raising the possibility of loss of habitats for marine life as well as the specter of accidental spills. The mysterious rise of the Caspian Sea could flood oil wells, rigs, and earth-walled reservoirs on the coastline, spilling into water tables and contaminating drinking water supplies. A lack of regional cooperation, highlighted by the still unresolved legal status of the Caspian Sea, as well as weak environmental laws and regulations and the inability to enforce them, already is affecting efforts to protect the Caspian's environment.

The economic decline that accompanied the breakup of the Soviet Union reduced industrial production in the region (and thus the flow of contaminants into the Caspian) in the early and mid-1990s. However, as economic growth in the region has rebounded, so have pollution levels. Polluted beaches and coastlines means that swimming in most areas of the sea is hazardous, and toxic waste threatens to contaminate drinking water supplies for people living in the region. The impact of the environmental degradation on human health has been measurable, with higher rates of cancer recorded in the area, and the precipitous decline in the Caspian's (official) sturgeon catch is threatening the survival of the region's caviar industry.

Thus, there is an urgent need to protect the Caspian environment in order to maintain it for future generations. Continued economic development, improved regional cooperation, and the implementation of modern technology will be required in order to improve the state of the environment in and around the Caspian Sea in coming years.

Oil- and Gas-Related Pollution

The collapse of the Soviet Union in 1991 exposed to the world the regime's poor environmental record in the Caspian. Rusty derricks, poisoned soil and water, pools of oil scum, and uncontrolled well fires were byproducts of the Soviets' oil exploitation in the Caspian region. Despite the influx of billions of dollars in foreign investment, many Soviet-era wells remain in place. The long history of contamination, combined with short-term economic pressures to exploit the sea's potential, will mean that threats to the Caspian environment from oil and gas production will continue to loom large.

Oil and gas extraction, along with transportation and industrial production, has been the source of severe air, water, and soil pollution in the Caspian region. Systematic water sampling in different parts of the Caspian basin shows contamination from phenols, oil products, and other sources. Mineral deposit exploration, particularly oil extraction and pipeline construction, have contributed to the pollution of about 30,000 hectares of land.

Pollution from oil fields and refineries continues at a high rate due to the use of outdated technology, malfunctioning equipment, and/or simple human disregard. However, even normal processes for oil and gas extraction have environmental side effects. Loud sounds used in seismic surveys in oil and gas exploration can have a range of negative effects on living creatures, particularly fish. The drilling of offshore exploratory wells involves the introduction of various materials into the marine environment, including such non-toxic materials as water-based drilling mud and rock cuttings but also potentially toxic drilling fluids. Discharges from drilling rigs--accidental or otherwise--can include sewage and wastewater from crew facilities as well as deck wash, which can include lubricants such as greases, hydraulic fluids, cement slurry, drill testing fluids, and incidental fuels.

In addition, there is always the chance of an accidental spill from an oil derrick, where a blowout results in an uncontrolled release of hydrocarbons for hours, weeks or even months until the well can be controlled. Although blowouts are rare in offshore exploration, the likelihood is slightly higher than for production wells. Approximately 1% of exploratory wells worldwide have had blowouts and the resulting releases are normally relatively small. Heavy crude oils tend to stay in the marine environment longer than lighter API gravity oils. Furthermore, the purposeful flaring of associated gas from oil wells releases carbon emissions into the atmosphere.

The effects of oil and gas exploration and production in the Caspian region have been felt most strongly in Azerbaijan, where a century's worth of oil production has resulted in acute soil degradation and contamination problems, particularly on the Absheron peninsula. Scant environmental consideration was given to industrial and energy development in Azerbaijan, with disastrous consequences: oil production has left behind vast areas of wasteland, with

standing oil ponds and severely contaminated soil, a shore along Baku Bay that is black with oil residue, and high levels of pollution in the Caspian Sea.

While Azerbaijan has been hardest hit by pollution from oil exploitation, other littoral and neighboring states also have been adversely affected. In Kazakhstan, environmental tests have noted that cases of blood disease, tuberculosis, and other diseases are four times more common in the Caspian area than the rest of the country's average. Although the tests showed that the environmental contamination in the northeast Caspian is less than what has been recorded previously, water which has been contaminated by oil products in Kazakhstan is still used for drinking water. This contamination is cited as a main reason for intestinal infections in Kazakhstan's coastal areas.

Oil and Gas Transport Issues

In addition to the health and environmental threats due to oil and gas production in the Caspian, the sea's geographic location is another factor complicating efforts to protect the regional environment. Since the sea is landlocked and the littoral states are not major energy consumers (with the exception of Russia, which is a major consumer but also a net energy exporter), in order for the oil and gas produced in the Caspian region to reach intended customers it must be transported via pipeline. A number of Caspian region oil pipelines have been built or are under construction, and several regional gas pipelines have been proposed as well.

Environmental issues have played an important part in the selection of export routes for Caspian oil and gas. As proposed east-west routes have predominated, the environmental health of the Black Sea in general and the Bosporus Straits in particular has become an important factor influencing the selection of final routes, especially for oil. With the launch of the Caspian Pipeline Consortium's Tengiz-Novorossiisk pipeline in 2001, tanker traffic leaving the Black Sea port of Novorossiisk and exiting the Bosporus en route to the Mediterranean Sea has increased.

The Bosporus is already a major chokepoint for oil tanker shipments, and and traffic is projected to increase substantially as the CPC pipeline reaches its eventual 1.34-million-barrel-per-day-capacity. Thus, Turkey has argued against export routes that utilize the Black Sea, noting that the projected increase in large oil tankers will pose serious navigational, safety, and environmental threats to the Bosporus. Several "Bosporus bypass" pipelines have been proposed to avert the threat of an oil spill or gas explosion on a tanker navigating the Bosporus through the heart of Istanbul.

Construction of new pipelines, such as the Baku-Tbilisi-Ceyhan (BTC) oil export pipeline (under construction) and the planned Baku-Tbilisi-Erzurum gas pipeline, will necessitate the construction of new roads and infrastructure, which could lead to habitat loss. The Georgian government has expressed worries that the BTC's planned route traverses the country's Borjomi Valley, home of Georgia's famed mineral water. However, BP, which is the operator of the consortium constructing the BTC pipeline, has conducted a thorough environmental impact assessment for the underground pipeline, and built-in precautions, such as automatic shut-off valves in the event of a leak, are geared to mitigate any negative environmental effects. The results of the environmental impact assessment seem to have alleviated the Georgian government's concerns, although there remains opposition to the pipeline among Georgian environmentalists.

Several proposed export routes for Caspian oil and gas entail the construction of trans-Caspian pipelines or tanker deliveries to from oil terminals to export pipelines. A trans-Caspian gas pipeline from Turkmenistan to Azerbaijan has been proposed, as has a possible pipeline link across the Caspian to transport

oil from the Kazakh port of Aqtau to Baku. Tanker traffic, mostly from Aqtau and the Turkmen port of Turkmenbashy to Baku and the Russian port of Makhachkala, could impact fish migration routes. The northern Caspian Sea, which is characterized by relatively shallow waters and the lack of currents, is home to more the 80% of the sea's netted fish, making it more difficult to regenerate its natural resources in the event of an environmental problem. The laying of pipelines on the Caspian seabed could have a negative effect on marine life as well, and both Russia and Iran have opposed trans-Caspian pipelines on environmental grounds.

Transporting oil and gas via pipeline has inherent risks, with the possibility of leakage and spills, but in the Caspian region these risks are heightened due to the possibility of sabotage. A number of conflicts in the Caspian region remain unresolved, and the difficulty in securing pipelines over long distances, as well as the economic dependence on states such as Azerbaijan on export revenues, could make Caspian oil and gas pipelines prime targets for sabotage. Separatist groups targeting an oil or gas pipeline could cause an environmental catastrophe in the event that an explosion on the pipeline results in a major leak. Illegal tapping, rather than sabotage, of both the Baku-Novorossiisk pipeline in Chechnya and the Baku-Supsa pipeline in Georgia already has caused major leakage problems.

Agricultural, Industrial, and Municipal Waste Discharges

Although environmental damage from oil and gas production in the Caspian Sea and surrounding areas is considerable, oil-related pollution is less serious than it sometimes seems because most hydrocarbons deteriorate in seawater. Far more serious, however, are the agricultural, industrial, and municipal wastes--mostly untreated--that pour into the sea. Although the decline in the region's industrial and agricultural output during the 1990s reduced air pollution and industrial and agricultural discharges into the Caspian, Azerbaijan's Ecology Minister, Gusein Bagirov, has estimated that pollution from rivers that feed into the sea still accounts for 85% to 90% of the pollution.

Approximately 130 large and small rivers flow into the Caspian Sea, nearly all of which flow into the north or west coast. The Volga River, the sea's largest single source, splits into a thousand smaller streams as it flows through a largely uninhabited delta feeding into the Caspian Sea. This marsh serves as a filter, cleansing the river of some of the upstream pollution, which comes mainly from Russian factories in the Ural Mountains, but sufficient amounts still reach the Caspian to cause major imbalances, especially in the shallow north basin which has limited absorption capacity.

The Caspian still has miles of undeveloped coastline, especially along the eastern shore in Kazakhstan and Turkmenistan where there are no permanent inflows. Yet the south end of the sea is deep, dark gray and polluted by discharges from sewer pipes and factory drains from the five littoral states. Air pollution from Tehran, due largely to the abundance of old cars that lack catalytic converters, falls out in the Caspian when the wind blows the smog north from Iran, contributing to the sea's environmental problem. However, waste discharges account for the lion's share of pollution in the Caspian. The World Bank has estimated that perhaps one million cubic meters of untreated industrial wastewater is discharged into the Caspian annually.

A major culprit is the Azeri coastal city of Sumgayit. During the Soviet era, the city was planned as a model center for petrochemical industries, but in an effort to keep up with the continually increasing production quotas, the environment was subjugated to industrial goals. Hundreds of thousands of tons of toxic wastes each year were released into the atmosphere or dumped into a creek that fed into the Caspian.

The result was predictable: pollution overwhelmed the sea around Sumgayit and Baku, creating a virtual dead zone, and the area witnessed a dramatic rise in stillbirths and miscarriages. The legacy lives on, as untreated sewage is still dumped into the Caspian, and mercury-contaminated sludge wastes (from the use of mercury in chlor-alkali production) are accumulating. Since the wastes often are stored inadequately, ground water contamination and leakage into the Caspian Sea is likely. Discharges of processed water already have

contaminated sea bottom sediments in the Caspian severely.

Overfishing and Poaching

The Caspian Sea is the source of about 90% of the world's caviar. However, the lack of an international agreement safeguarding the Sea's environment has led to overfishing and poaching of sturgeon, the fish whose roe is used to make the delicacy, resulting in dwindling fish stocks. Environmentalists have warned that poaching of beluga, the largest and rarest of the sturgeon, is threatening to push the species into extinction. Iranian officials have reported a steady drop in caviar production, one of their major non-oil exports, blaming poaching and oil prospecting.

Legal trade in the black fish eggs from the Caspian is estimated to be worth $100 million per year, but the illegal catch in the four former Soviet republics is believed to be 10 to 12 times higher. In the spring of 2001, the United Nations' Convention on International Trade in Endangered Species (CITES) banned exports of caviar from Azerbaijan, Kazakhstan, Russia, and Turkmenistan. The ban led to a higher price for beluga caviar, which in turn gave further incentive to poachers. Despite opposition from environmentalists, in March 2002 CITES lifted the export ban on the former Soviet republics, citing improved management of their sturgeon stocks.

Fluctuating Sea Level

In addition to the man-made environmental problems that have affected the Caspian adversely, the sea has exhibited a curious natural variation in its water level that has created additional problems and has wrought havoc on coastal infrastructure. Since 1978, the sea level has risen almost 7.5 feet. Flooding in coastal zones has inundated residential areas, transport, telecommunications and energy infrastructure, chemical and petrochemical industries, croplands and hatcheries, forcing thousands of residents to be evacuated from flooded homes. In Turkmenistan, the town of Dervish, which is detached from the western part of the mainland, is turning into an island due to the rise in sea level, and Cheleken and Karakul are sinking into the water as well.

Given the problems involved in drilling, large amounts of oil keep spilling over onto the surface in the Caspian, polluting the water. Earth walls are being built to enclose the polluted zones, so polluted water will not mix with clean water, but the rising sea level is resulting in the mixing of polluted and clean waters. Gradual flooding has precipitated abrasive erosion of sea shelves, endangering oil infrastructure, and the rising seawater threatens to flood oil wells along the coast and cause spills directly into the sea. At the onshore Tengiz oil field in Kazakhstan, more than 100 wells have been flooded, and about 1,200 wells and refinery installations on the shallow northeast coastline are at risk.

In addition to the danger posed to oil fields in Kazakhstan and Azerbaijan, the sea-level rise results in changes in water regime, hydrochemical regime of river mouths, dynamics and chemical composition of groundwater, structure and productivity of biological communities in the littoral and in river mouths, sediment deposition patterns, pollution by heavy metals, petroleum products, synthetic substances, radioactive isotopes, and other substances. A 6-mile sewage pipeline in the Azeri coastal district of Azizbayov has been partially submerged by the rising water level, causing the pump station there to malfunction and allowing sewage from the area to be discharged directly into the sea. Up to 100,000 people in coastal cities and towns in Azerbaijan alone have been affected by the spread of toxic wastes, contamination of water supplies, and the loss of infrastructure due to the rising sea level.

The sea's rise has confounded scientists and engineers who have monitored the sea level. From 1933-1941, experts recorded that the Caspian's water level consistently *decreased*, by a total of 5.5 feet. The pattern of sea level increase since 1978 has played havoc with engineers who have attempted to deal with the natural water variation. For example, at the beginning of the 20th century,

the strait between the Garabogazkol Gulf in Turkmenistan and the Caspian allowed for significant water flow to the smaller basin. As the sea level fell in the mid-20th century, the flow consistently decreased. In March 1980, Soviet engineers constructed a solid dam across the Strait to stem any further drop in sea level.

However, the average sea level had already begun to increase in 1978, and by September 1984 planners were forced to open a spillway in the dam to permit some discharge of water in the Gulf. The dam also created other environmental problems: in addition to barring sturgeon from their spawning grounds, the dam dried up what had been a stable salt lagoon. The result was salt-laden dust storms that turned surrounding towns and villages into ghost towns. Desertification and other environmental damage accelerated until the dam was finally demolished in June 1992. This example highlights the difficulty in anticipating natural variations in the hydrologic cycle and creating engineering works to counter this natural variability effectively.

Environmental Legislation and Regulation

An additional issue compounding the region's environmental problems and adding to the difficulty in finding solutions is the weak state of existing environmental legislation and regulation in the littoral states. Environmental law was virtually nonexistent during the Soviet era, and post-Soviet environmental legislation and environmentalism is still in its infancy in Azerbaijan, Kazakhstan, Russia, and Turkmenistan.

Although environmental legislation has been passed in the four Soviet states, as in Iran, the application and enforcement of these new laws is often suspect. Poverty in the Caspian region means that corruption is rampant, and since oil and gas production are the driving forces behind the growth of the region's economies, the enforcement of environmental laws sometimes has been subjugated to economic development goals. In the early and mid-1990s, strong environmental laws were viewed by governments in the region as a threat to the continued influx of foreign investment that was pouring into the region, in particular into Azerbaijan and Kazakhstan. As a result,

governments were reluctant to issue regulations endorsing more rigorous environmental standards.

For their part, energy companies involved in exploration and drilling in the Caspian shelf have complained of overlapping environmental authorities, conflicting regulation between local and national authorities, and the lack of specific environmental regulations that are required in environmental laws. In Azerbaijan, for example, the country's Energy Law appears to be in direct contradiction to its Subsoil Law. Several layers of bureaucracy, as well as constant changes to legislation and regulations, complicate business operations and the ability to comply with environmental standards, according to Western investors in the Caspian region.

However, as economic growth continues and environmental awareness in the Caspian improves, the region's governments increasingly are taking a stronger stand on environmental issues. Both Azerbaijan and Kazakhstan have passed legislation requiring energy companies to utilize associated gas that is produced during oil extraction where previously the gas typically was flared. Environmental impact assessments (EIAs) have become mandatory for regional oil and gas export pipelines, and new development projects are required to carry environmental insurance as well as to conduct EIAs. Whereas previously the governments were not always very diligent in enforcing environmental regulations, several high-profile incidents have demonstrated that the Caspian region governments are becoming stricter in enforcing environmental standards.

In August 2001, Tengizchevroil, the ChevronTexaco-led international consortium developing the giant Tengiz oil field in western Kazakhstan, was fined around $75 million for ecological damage. In addition, Kazakhstan

forced Agip KCO, the consortium developing the offshore Kashagan field in shallow water, to halt operations temporarily and pay a hefty fine after several oil spills from exploratory wells operated by the consortium. The Kazakh government, in particular, has become more aggressive in its environmental stewardship: in the past, the country only fined polluters, but now it is prepared to make sure that criminal charges are brought against the management of the enterprises which break the country's environmental protection legislation.

The Caspian Environmental Outlook

The current oil bonanza has focused more attention on the plight of the Caspian environment, highlighting the need to take action. However, environmental remediation of existing hotspots has not been a priority for the region's governments, and their desire to develop the Caspian's oil and gas resources as a driver for economic development means that environmental protection measures are likely to take a back seat in the near-term.

Nevertheless, the involvement of Western energy companies using more modern technology actually should result in an improvement in the way oil and gas is extracted in the Caspian basin. For example, gas flares can be contained with Western technology, and drilling discharges can be mitigated by following proper techniques. In addition, pressure from shareholders will make publicly-traded energy companies carry out their operations in the Caspian region in an environmentally-responsible fashion.

While the countries of the region have begun to take added measures to prevent pollution, including conducting oil spill response exercises and increasing state funds for enforcement of environmental regulations, the lack of regional cooperation among the Caspian littoral states continues to undermine individual state efforts to protect the sea and the surrounding region. The absence of a multilateral agreement on the legal status of the Caspian Sea has hampered efforts to craft and to implement an overall regional strategy to safeguard the sea's flora and fauna, as well as human health. The overfishing that threatens the Caspian's sturgeon population is a

direct result of the inability to reach a new agreement to divide the sea.

Although a final multilateral solution still eludes the Caspian littoral states, an encouraging sign has been a move towards greater cooperation. Several initiatives have boosted regional cooperation in protecting the environment, including the establishment of the Caspian Environment Programme (CEP) in conjunction with the World Bank's Global Environmental Facility. The aim of the CEP is defined as "environmentally sustainable development and management of the Caspian environment, including living resources and water quality, so as to obtain the utmost long-term benefits for the human populations of the region, while protecting human health, ecological integrity, and the region's sustainability for future generations."

Implementation of these goals will be extremely difficult, especially in light of the region's economic situation, but it is hoped that bilateral agreements between several of the Caspian states will help lead to an overall multilateral agreement. Azerbaijan, Kazakhstan, and Russia have signed bilateral agreements with each other to divide the Caspian seabed into national sectors, a move could facilitate bilateral environmental agreements. As oil and gas extraction in the region continues at a brisk pace, the challenge of protecting the Caspian's environment will become more difficult. Without increased cooperation by the littoral states, the state of the environment in the Caspian Sea and surrounding areas will remain threatened.

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