
*ENVIRONMENTAL SENSITIVITY AND PROTECTION
FOR THE NORTHEAST CASPIAN SEA*

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An environmental sensitivity and impact analysis was performed for the largest ever two-dimensional marine geophysical survey to be conducted in the Kazakhstan sector of the Caspian Sea. A total of 35,000 km of seismic lines are to be shot covering an offshore area of 100,000 km². The purpose of the environmental studies is to identify critical environmental sensitivities and to develop operating rules for the seismic work to protect the environment.

The Caspian Sea is an area of particular environmental and socioeconomic sensitivity. Ecologically, it supports major populations of sturgeon and other anadromous fish (80 percent of the world's sturgeon catch is from the Caspian). The Caspian is also a principal flyway for waterfowl and shorebirds migrating from Africa and the Middle East to northern Russia and Siberia. And, the Caspian is home to the Caspian seal, the only marine mammal in the area. The northeast Caspian is extremely

shallow and salinity regimes range from fresh to marine water. As oil field development is common throughout much of the region, the government of Kazakhstan recently enabled seismic exploration activities to be considered based on the results of a thorough environmental sensitivity and impact analysis. This analysis and the outcome are described below.

Methodology

The environmental sensitivity and impact analysis was performed to identify critical environmental sensitivities and habitats in the area of the northeast Caspian for which the seismic survey was planned. Based on these sensitivities, operating standards were then developed to enable seismic operations with a maximum of environmental protection. Key habitats and natural resources were identified from literature review, interviews with experts in Kazakhstan and Russia, Landsat thematic mapper imagery, and extensive fieldwork. Actual environmental effects from different seismic methods and operations were monitored and evaluated during a two-month field program. An interdisciplinary team of scientists from the United States, Europe, Kazakhstan, and Russia, under the leadership of Arthur D. Little, Inc., performed the analysis during a twelve-month period.

The sensitivity analysis has found complex and fragile reed-dominated habitats; fish spawning and nursery grounds and migration passageways into the Volga and Ural rivers; bird breeding, nesting, and moulting areas; areas of very large bird concentration during migration; and seal breeding areas and rookeries. These areas are primarily along the coastline, in the river deltas, and on and around islands and sand bars. The protection of these areas is of major importance during critical periods, that is, during periods of faunal reproduction and migration. Based on the extensive ecological data collected, a series of detailed sensitivity maps were developed indicating biologically important areas, biotopes (both terrestrial and aquatic habitats), major infrastructure and existing sources of pollution and marine environmental impact, and geologically and geomorphologically based subdivisions. Both Landsat image analysis (1:200,000 scale) and ground truthing fieldwork were used to delineate land and coastal habitats.

A classification system was developed for faunal and regional sensitivity, differentiating low, moderate, high, and critical sensitivities. Areas of similar characteristics in the northeast Caspian were grouped into regions with like sensitivities. For these regions, seasonal windows of differential sensitivities were then derived and color coded on the sensitivity maps. Next, for areas and windows of high and critical sensitivity, operating standards were developed to guide the seismic crews and to allow them to schedule their activities around these windows, to maximize environmental protection while achieving their geophysical objectives.

In order to develop reasonable and practicable, yet environmentally effective, operating standards, a seismic testing program was conducted and environmental effects were carefully monitored and recorded. Different seismic methods and techniques were evaluated for geophysical performance and environmental impact. Methods included airguns and buried explosives, hydrophones and geophones, airboats and buggies. Samples of air, water, and sediment, and biota and noise

measurements, were taken before, during, and after seismic test operations. Physiological and behavioral effects on fish, as well as disturbance effects on seals and seabirds, were monitored, recorded, and evaluated, so as to select the environmentally most protective methods that meet geophysical objectives. Also, based on these test results and knowledge of the regional environmental sensitivities, operating rules were developed jointly with the geophysical staff.

Results

The operating rules developed for environmentally protective seismic data acquisition in the northeast Caspian Sea provide for operational prohibitions and restrictions during periods of high and critical environmental sensitivities. Airgun and buried explosives work is permitted only at safe distances from sensitive areas, and wildlife monitors are to accompany the operations for added protection of the resources at risk. The environmental sensitivity and impact analysis work was presented to the general public in a series of public meetings, and the final report with the operating recommendations was submitted to the Kazakhstan Ministry of Ecology and Bioresources. Final approval of the seismic operations was expected the spring of 1995.

Author

Bernhard Metzger is an environmental planner and manager of the Arthur D. Little environmental impact and risk assessment consulting practice.