

Global Environmental Problems in the Caspian Region

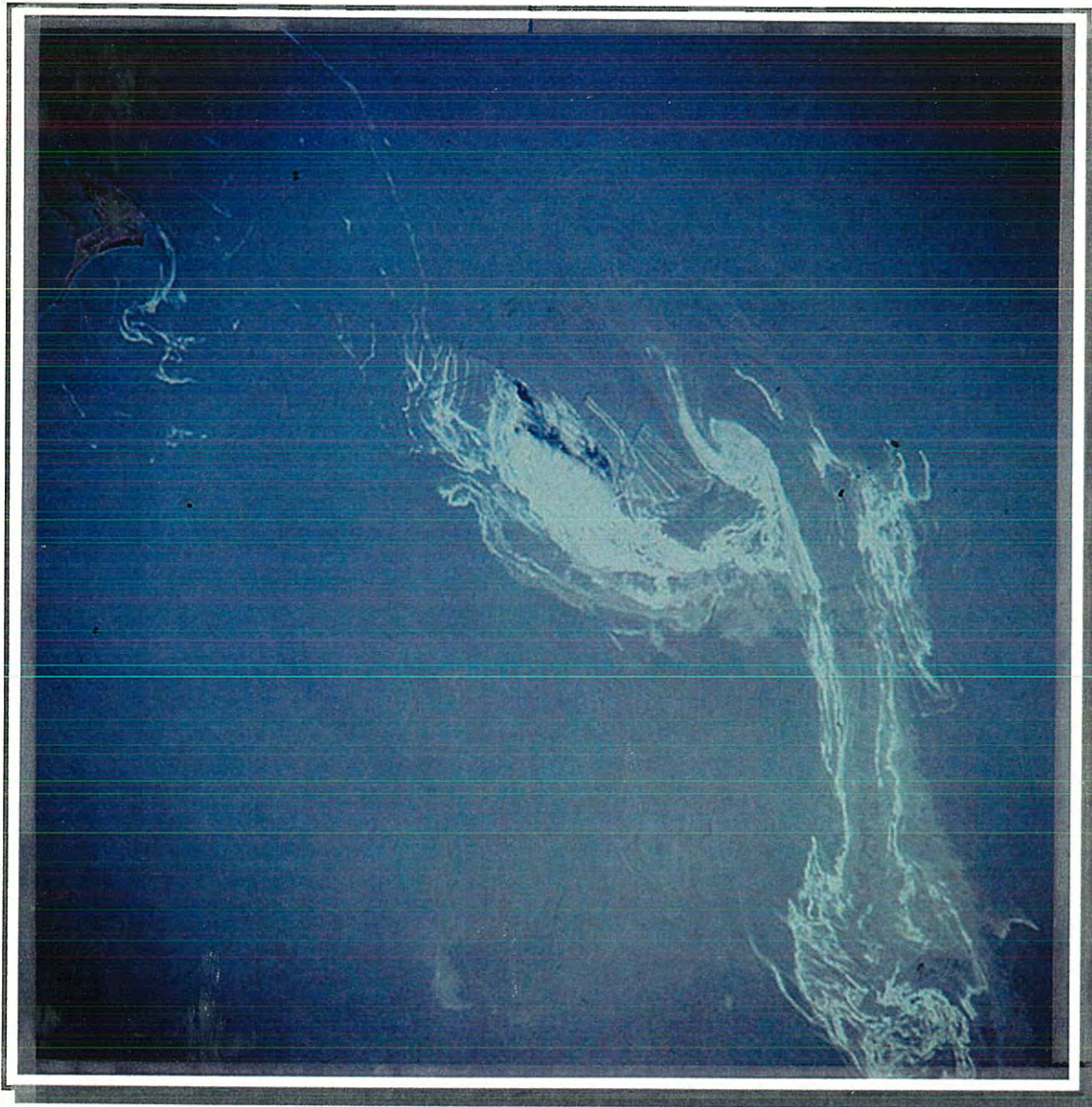
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Oil spill in the Caspian, courtesy of Office of Earth Sciences/NASA Johnson Space Center
(see inside front cover for more detail on the photograph)

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The Caspian region has large oil reserves, and development of those reserves is big business in Baku, Azerbaijan. This is a large oil slick in the western Caspian, off shore of Baku, near some offshore platforms. The small island near the top left edge of the image is Ostrov Zhiloy. The oil slick emanates from a huge offshore drilling complex (centered at 40.25N, 50.8E). The slick covers about 1000 km². There are adjacent images which show the oil being carried by currents to the north, wrapping around the Apsheron Peninsula. The slick is one of the largest ever photographed from space. Scale of image on the cover is 80 kilometers across its width. Image and text courtesy of the Office of Earth Sciences/NASA Johnson Space Center. Web site <http://eol.jsc.nasa.gov/> Date of image: mid-July 1996.

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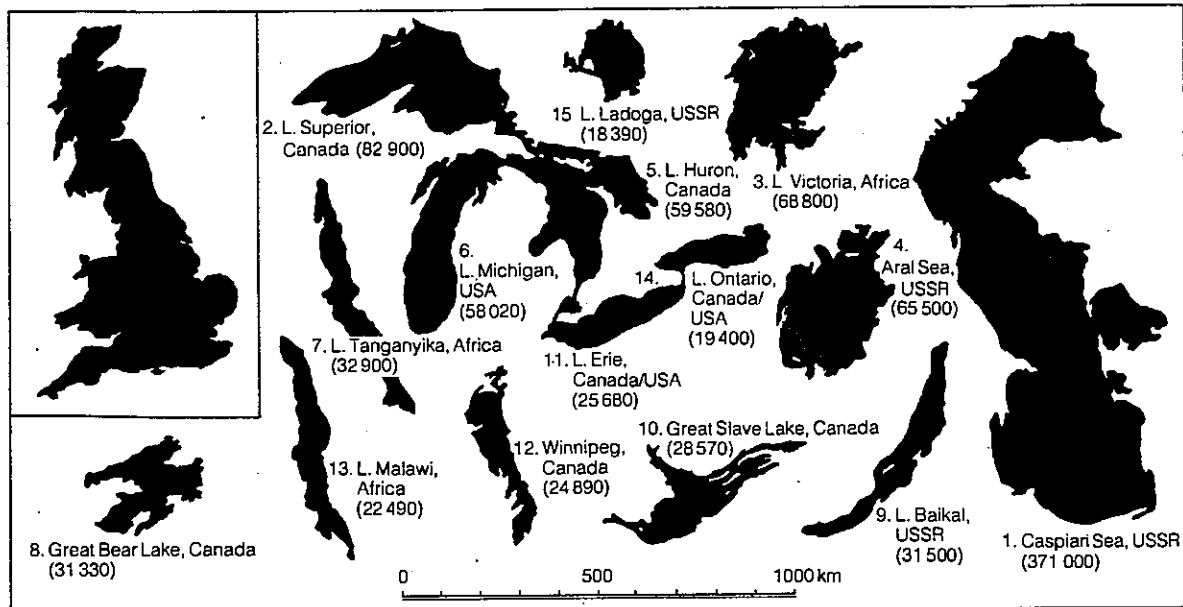
"If we do not change our direction,
we are likely to end up where we are going."
Chinese Proverb

"To know the road ahead, ask those coming back."
Chinese Proverb

This conference has many participants, both from the Caspian region and outside of it, who know the current Caspian situation very well. They are aware of the geopolitical situation that affects the region, as well as the region's economic, political, legal, biological, and environmental issues. Many of these issues are related to, if not dependent on, each other. As such, it is not possible to deal with one issue without it having some effect (positive or negative, direct or indirect) on the other issues.

The Caspian is the largest inland body of water on the planet, with a surface area of 384,400 km², a volume of 78,700 km³, and a coastline nearly 7,000 km long. It measures 1200 km from north to south and 200-450 km from east to west. The Sea is fed by numerous rivers, but it is the Russian Federation's Volga River which supplies about 82% of the Caspian's annual volume. The Volga is also one of the major (but not the only) conduits of pollutants to the Caspian, and its delta is among the major breeding grounds for sturgeon. The Caspian is considered to have three sections: north, middle, and south. The extreme northern end is relatively shallow (5.2 m average depth) when compared to the southern part (980 m average depth).

*The National Center for Atmospheric Research is sponsored by the National Science Foundation.



The 15 largest lakes in the world (insert is outline of Great Britain) all drawn to same scale. The numbers indicate the rank in area, while the figures in brackets denote surface area in square kilometers (after Ruttner, 1963; in Burgess and Morris, 1987; updated to 1996 by ESIG/NCAR).

For much of the twentieth century, the Caspian was politically shared by two countries — the Soviet Union and Iran — in accordance with the 1921 Treaty of Moscow. With the breakdown of communism in the 1980s and the breakup of the Soviet Union in December 1991, three newly independent republics were added to the list of Caspian littoral states.

Today, five countries border the Caspian: the Russian Federation, Azerbaijan, Iran, Turkmenistan and Kazakstan. The Russian Federation coastline on the Caspian is divided among three of its administrative units: the Republic of Kalmykia, the Republic of Dagestan, and the Astrakhan Oblast. Two other countries, Georgia and Armenia, in the surrounding (circum) region are also within the basin, although they are not on the Caspian's coastline. There are other politically disputed regions in the basin such as Nagorno-Karabakh, Osetia, and, of course, the Russian Federation's Republic of Chechnya.

Years ago, political scientist Robert Dahl (1982) wrote about domestic political issues in terms of their conflict potential. He noted that some issues generated cooperation, while others generated conflict. He discussed these issues in terms of "cleavages." Applying his logic to the international scene, one can take the Caspian as an example.

If each of the five governments which directly border the Caspian easily changes its alliances with or allegiances to some of the other Caspian states with respect to various political, economic, environmental, legal and social issues as they arise, then the likelihood increases that each would tend NOT to strongly oppose the various policies of the other four Caspian countries: At some point in the future each government might need the others as allies in support of a particular policy in which it has a keen interest. Dahl referred to these situations as *crosscutting cleavages* (with cleavages being viewed as political differences). Thus, given a set of politicized issues, members would shift their positions, sometimes cooperating with specific nations and, at other times, opposing those nations. In the long run, it pays to cooperate with these other nations, as there is a good chance that the nations in the region will be on the same side of a given issue at some point.

Dahl also referred to *reinforced cleavages* among groups (in this case, Caspian states, or even the more inclusive circum-Caspian states). These occur when sets of states tend to continually be on the same side of various controversies or issues or have formed an alliance that causes them to support each other's positions consistently. This means that the division between the opposing groups becomes more rigid, and higher levels of political or military conflict become more likely. In the case of reinforced cleavages, the chance for regional compromise is lowered.

The general points about political and other cleavages raised by Dahl (who was dealing with domestic politics and democracy) are as follows:

Do the characteristics of the allies and adversaries change in a significant way from one political conflict to another, or do they remain pretty much the same?

As a consequence, do the same actors tend always to be allies and adversaries, or are allies in one conflict often adversaries in another?

How strong or intense is the antagonism between the contestants? Do they see one another as enemies locked in a struggle for survival, or at the other extreme as friends, neighbors, or fellow citizens who have a temporary disagreement?

When conflicts reinforce one another, the composition of the adversaries remains essentially the same from one conflict to another: the individuals or the shared characteristics that form the cleavages do not change. One's allies today are one's allies tomorrow; one's opponents today are one's opponents tomorrow. With crosscutting cleavages, on the other hand, one's allies today will probably be one's opponents in the near future. It was supposed that whereas crosscutting cleavages would moderate the intensity of conflict and thereby encourage compromise, reinforcing cleavages would surely produce such intense conflicts as to make compromise difficult or impossible. Reinforcing conflicts would therefore lead to intense antagonisms and conflicts. . . . Crosscutting cleavages, on the other hand, would produce the moderation in political conflicts (Dahl, 1982).

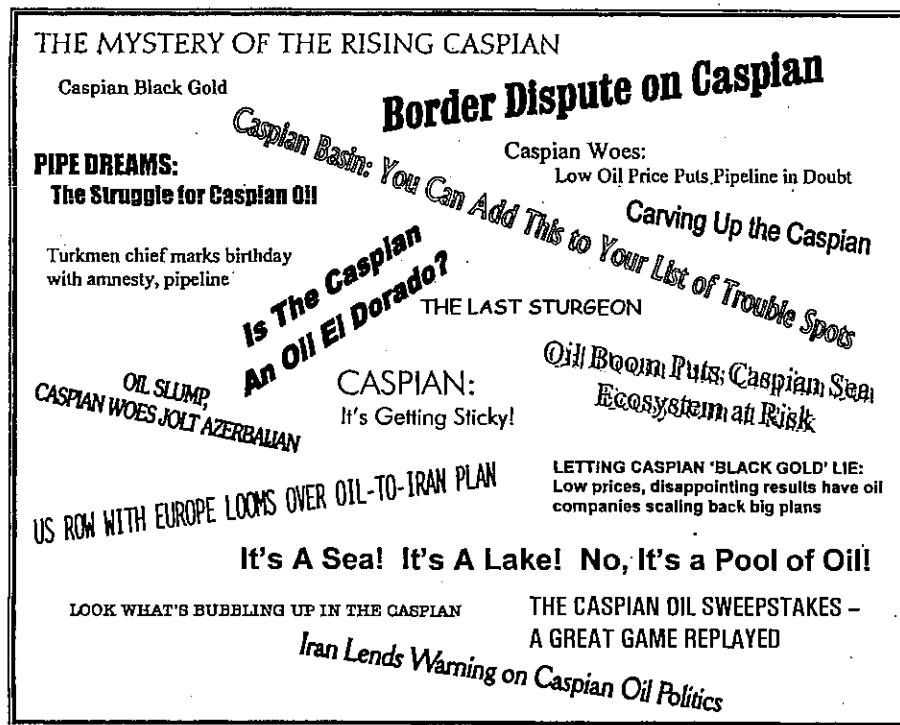
At first glance, it appears that at present there may be relatively few crosscutting cleavages in the region. Yet these are needed to foster coalition-building in the region and cooperation (as opposed to conflict) on a broad set of issues.

Global Environmental Issues

Interest in global environmental issues during the past two decades has grown considerably. Much of it has centered on the degree to which policymakers at the national level should be concerned about global environmental changes and their worldwide impacts on managed and unmanaged ecosystems and on societies. The most obvious *global* environmental issues include global warming and stratospheric ozone depletion. Such issues could be global in cause (the burning of fossil fuels) or they could be global in effect (again, fossil fuel burning, ozone depletion) or both. However, there are environmental problems that are called global, but are really regional, national, or sub-national. These include desertification, acid rain, water and air pollution, biodiversity loss, coral bleaching, and tropical deforestation. In fact, these can be considered global issues, because they result in widespread *interest* around the globe. The Caspian region is an area affected by several environmental changes, some of which are of local cause and local or regional in effect. Although some of those environmental changes are locally caused, they are clearly of global interest.

Setting

The Caspian is known globally for two key natural resources — oil and natural gas reserves, and a caviar-producing fish population (sturgeon). Both are highly valued export commodities, the sale of which can produce sorely-needed foreign exchange which, in theory at least, can be used for economic development purposes by the governments of the Caspian's littoral states. Hundreds of popular articles in international magazines and newspapers have been written about these resources from political, economic, biological, and environmental perspectives, as suggested by the headlines in the following graphic.



Oil exploration around the sea began in the mid-1870s in the Baku region of Azerbaijan. By the turn of the twentieth century, its contribution to the world's total oil supply was estimated at 10%. The USSR's Republic of Kazakhstan began in 1979 to exploit a major oil reserve along the Caspian. Since then, estimates of oil and natural gas reserves have grown sharply, with each of the littoral states keen on exploiting those reserves for export. Today, several foreign oil and gas companies have entered into various arrangements with the littoral states for exploration, production and transport of oil and gas resources with the hope of being able to export large quantities to markets around the globe.

Supplies of sturgeon and their eggs (caviar) have dwindled sharply in the 1980s and 1990s because of overfishing. The recent sharp decline has been blamed on the breakup of the Soviet Union and therefore the lack of management of this living marine resource, although the species showed signs of stress during communist rule as well. Taken for the export value of their highly valued roe, both by legal and illegal means around the Caspian, sturgeon numbers have been pushed to such low levels that conservationists and governments outside the Caspian region feared the possibility of extinction of the Caspian sturgeon populations, which make up 90% of the world's total of that species (De Meulenaar and Raymakers, 1996). While all of the sturgeon species are threatened, the three Caspian species are most endangered: Beluga, Russian sturgeon, and Stellate sturgeon.

It is not possible to address the region's environmental issues or issues related to natural resource abundance or availability in the Caspian basin without recognizing the importance of political, cultural, and legal issues. Separating political and economic considerations from environmental considerations in the Caspian is not necessarily helpful to an improved understanding of the problems that the governments along the Caspian shores face. To do so would be similar to Soviet Union decisions made for land use in the Aral Sea basin to push for all-out cotton production, decisions which were divorced from any serious consideration of the environmental implications of such an agricultural strategy. An over-focus on cotton production has had grave long-term economic, environmental and human health consequences for regional inhabitants (Glantz, 1999; Glantz and Zonn, 1991). Thus, as in all cases where resource exploitation has a possibility of adversely affecting the environment, policy makers must consider the setting in which those environmental issues are embedded.

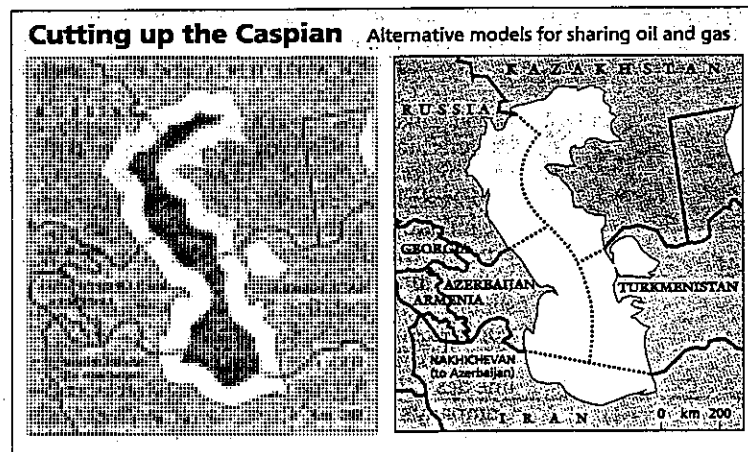
Legal Aspects

Inability to reach agreement on the legal status of the sea among the now five littoral countries is a major obstacle to intergovernmental cooperation on a variety of issues. As noted earlier, until 1991, the Caspian was an inland body of water shared by two sovereign countries: the Soviet Union and Iran. While some of the five littoral states view the inland body of water as a sea, others consider it to be a lake. To a person on the street there may be little importance attached

to this distinction. However, to international legal scholars and to those seeking to claim ownership of Caspian hydrocarbon resources, this distinction is crucial. From an environmental standpoint, it is also crucial to determine national responsibility for environmentally sound management and exploitation of the various natural resources in the Caspian.

If the Caspian were a sea, then the norms of international law of the sea would apply to its use and management. This means that countries could claim the territorial sea as well as establish other zones as national jurisdiction, e.g., an Exclusive Economic Zone and the continental shelf. Each country would then be responsible for the control and management of living and non-living natural resources in these areas.

If the Caspian is viewed as a lake (i.e., a body of water with no natural outlet to the global oceans), then the way its resources would be divided among the littoral states initially depends on the agreement of littoral states. One of the approaches could be like a slicing of a pie. The edges of the national borders on the coastline would serve as the points from which lines are drawn to a middle point or middle line in the center of the lake, with each country taking ownership of the sea and seabed within its "slice," as shown in the following maps.



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The importance of this legal determination relates to the management and exploitation of the Caspian's natural resources such as oil, natural gas, and the protection of living marine resources,

especially fish (and, more specifically, caviar-producing sturgeon). The Caspian states have changed or modified their position with respect to the possible legal status of the Caspian Sea over the last few years. Currently, Russia and Kazakhstan, having signed a bilateral agreement on the delimitation of the northern part of Caspian seabed, leaving the waters of the treaty area undelimited and in their common use. Azerbaijan, supported by Turkmenistan, continues to insist on the complete partition of the sea, both the seabed and the waters. Iran calls for a joint development of the sea by all coastal states. However, this status quo may change any day. The positions of the states involved, subject to both external factors and internal politics, are not fixed in perpetuity. The five countries are divided into two groups over the legal issue. Negotiations continue to be held for the purpose of developing a legal instrument for the Caspian that would be acceptable to the five states along the Caspian's shoreline.

With the breakup of the Soviet Union in late 1991, exploitation of the sea's resources has been undertaken at the national level with little concern for the interests of other states sharing the Caspian. For example, as noted by Turkmenistan's Deputy Foreign Minister Kepbanov (1998), Azerbaijan is seeking to explore and exploit the seabed's oil reserves in parts of the Caspian, the ownership of which other Caspian states consider still undetermined.

As for the fisheries, no single Caspian government is in a position to impose or enforce restrictions on when or where fishing can take place, or how many sturgeon their fishermen (or illegal poachers) should be allowed to take. In fact, national governments apparently have little control over the poaching of sturgeon by their own administrative units that border the Caspian (e.g., Dagestan). As a result, there has been an obvious over-exploitation of the various species of sturgeon, and their numbers have been decimated.

The high potential for the annihilation of the Caspian sturgeon population prompted various environmental groups worldwide to seek adding sturgeon to the endangered species list. In accordance with the CITES (Convention on International Trade in Endangered Species), this action should lead to a ban on the international trade of caviar, a highly valued, foreign-currency-earning commodity. This was clearly a unique (and last-ditch) effort to protect the remaining standing stock of sturgeon from legal and illegal fisheries. As a result, Caspian sturgeon have

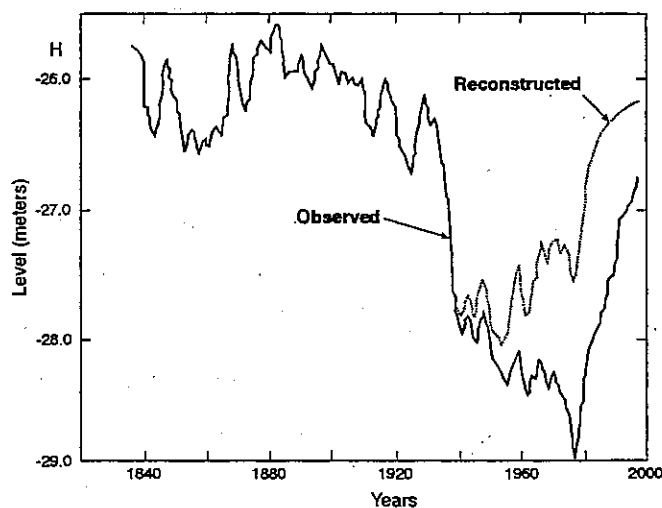
received protected species status (as of April 1998), and now the international trade in caviar is monitored by the international community (US Fish and Wildlife Service, 1998).

When the Caspian was a body of water shared between only two countries, certain controls were in place on various uses of the sea and its resources. There was some degree of monitoring of the sea — sea level, biological resources, water quality, contaminants — even if little was done to correct the various anthropogenically induced environmental problems that had been identified. Today, reliable information on environmental conditions is difficult to come by because of the abrupt end to sustained monitoring activities in the early 1990s.

Sea Level Changes

In the 1860s Cheleken was an island off the Caspian coast of Turkmenistan. The relatively high sea level at that time cut it off from the mainland. A regional map from 1860 suggests a Caspian level somewhat similar to what it was in the early 1990s when Cheleken was also an island. However, for most of the twentieth century Cheleken has been a peninsula because the Caspian's level dropped in the middle decades of the 20th century (Berkeliev, 1996).

It is a scientific and environmental fact that the level of the Caspian has been fluctuating on all time scales — seasons, years, decades, centuries, and millennia. In the past 160 years alone it has fluctuated within a range of 3.5 meters (see, for example, D. Ya. Ratkovich, 1993).



Mean annual values of observed and reconstructed sea level (Voropayev, 1997)

In the early 1930s, the Caspian Sea level, which had been considered relatively stable, suddenly began to drop precipitously. By the mid-1970s it had dropped about 3 meters. During this period, government officials were alarmed that the drop to this lower level was not only permanent but might also continue its downward trend. The decline in level would cause major problems for the sturgeon fisheries, in that the sturgeon's feeding grounds in the shallow northern part of the Caspian would disappear, replaced by exposed seabed. As the Caspian's level dropped over those few decades, policy makers, thinking the drop in level was permanent, allowed if not encouraged human activities to encroach on the newly exposed seabed and the receding shoreline.

The Soviet government sought to slow down, if not arrest, the drop in Caspian Sea level by planning in the early 1970s for diversions from Siberian rivers and for the construction of a dam across the Gara-Bogaz-Gol bay (Golitsyn, 1994; see also Feshbach and Friendly, 1992). This bay is at a lower level than the sea itself and withdrew about 20 km³ per year from the Caspian. Water in the bay would evaporate and residual salts and minerals were mined. However, by the time the dam was actually built in the early 1980s, the Caspian level had already reached an ebb and by 1978 had begun to rise.

Between 1978 and 1995, the Caspian's level rose rapidly by a total of about 2½ meters. As a result of the rise, settlements, agricultural lands, and infrastructure that had been developed on the exposed seabed since the 1930s were incrementally becoming inundated. Settlements and cultivated areas alike were abandoned to the encroaching sea all along the Caspian's coastline, with each of the littoral countries suffering differently from sea level fluctuations.

For example, the rise in the level of the Caspian in the past two decades by a few meters makes a bad environmental situation worse. Mekhtiev and Gul (1997, p. 83) wrote the following: "According to the data of Azerbaijan's Meteorology Committee, there has already been inundation of several petroleum deposits, 600 km of coastline with a loss of 20,000 ha of agricultural fields, 50 small cities and settlements, 250 industrial buildings and railways and highways. . . . Total damage at present is estimated to be more than \$2 billion US." The recent rise in level has led to the abandonment of coastal lands (oil fields, farms, pipelines, villages) and to human out-migration in all riparian countries. George (1994) reported that,

the worst flooding of all is in Kazakhstan where some 20,000 km² of land has disappeared beneath the encroaching water. Hundreds of villages are under water, as are more than 1400 oil wells. . . . As the level of the Caspian grows higher, this presents an enormous threat to the environment as more and more oil is washed into the sea (p. 24).

Thus, sea level rise and increased oil exploration and transportation could lead to an increase in environmental problems for the sea's ecosystems. An increase by yet another two meters in level is expected by some scientists to continue into the early decades of the twenty-first century. The cause of the sea level rise (like the decline) remains unknown, but the hypotheses about its cause are not lacking. Some argue that it is the result of tectonic movement; others suggest it has resulted from changes in management of water resources in the Volga basin; still others suggest that the sea level rise is the result of climate change (for a review of the competing views, see Voropayev, 1997). Understanding the dynamics behind sea level changes in the Caspian would create better management of the quantity and quality of this large inland body of water.

Climate Change and Variability

The fluctuation of the levels of the Caspian during past centuries have been attributed to natural factors. The leading cause has been climate-related (i.e., a natural cause). Since the middle of the 20th century, however, people have begun to consider human activities as being responsible for some part of the changes in Caspian levels. Today, some scientists suggest that 80 percent of the sea level rise is the result of natural climate variations.

The recent 2.5-meter increase in level (between 1978 and 1998) occurred during the same period as an increase in concern about the possibility of human-induced global warming of the atmosphere. Thus, some observers have suggested that the rise in sea level was the result of global warming. Although some Russian scientists studying the Caspian have forecast that the Caspian could continue to rise by as much as 5 meters into the early decades of the twenty-first century, others have speculated that the level will drop (e.g., Ratkovich, 1993).

Explanations for recent changes of the Caspian Sea level have centered primarily on either of two factors: global warming or human alterations of the flow of the Volga River system. If, for

example, as a result of global warming of a degree or two Celsius, the global hydrological cycle is enhanced by 15 percent (i.e., a result of enhanced evaporation due to higher temperatures), there would likely be an increase in precipitation over the Volga River basin. One could effectively argue in favor of the belief that the Caspian Sea level is likely to continue to rise.

Thus, the two contending (major) views about global warming are (a) that it is human-induced, the result of burning fossil fuels and tropical deforestation and (b) that it is natural variability in the climate system on the time scale of decades.

Another view about Caspian Sea level rise relates to human activities and Soviet political decisions. Some observers have suggested that the drop in the level of the Caspian after 1930 could be blamed on the Soviet Union's ambitious reservoir construction activities and the subsequent need to fill the various reservoirs along the Volga. It was suggested that the reservoirs along the Volga had been filled by the 1970s and water was once again allowed to pass directly into the Caspian. Hence, the level of the Caspian began to rise in 1978.

A recent study at the Russian Academy of Science Institute for Atmospheric Physics suggested, as a result of statistical correlations, that part of the recent rise in Caspian level could be attributed (statistically) to El Nino, an oceanic-atmospheric phenomenon that occurs every 3 to 7 years thousands of miles away in the central equatorial Pacific (Vaganov, 1998). This, however, is the only report that suggests such an El Nino "teleconnection." Climate modelers in Russia and elsewhere continue their research efforts to understand the causes of Caspian sea level fluctuations.

Geopolitics

It is imperative to acknowledge, however briefly, that the various geopolitical factors are integral parts of the setting in which regional and local environmental issues are generated, identified and (hopefully) dealt with.

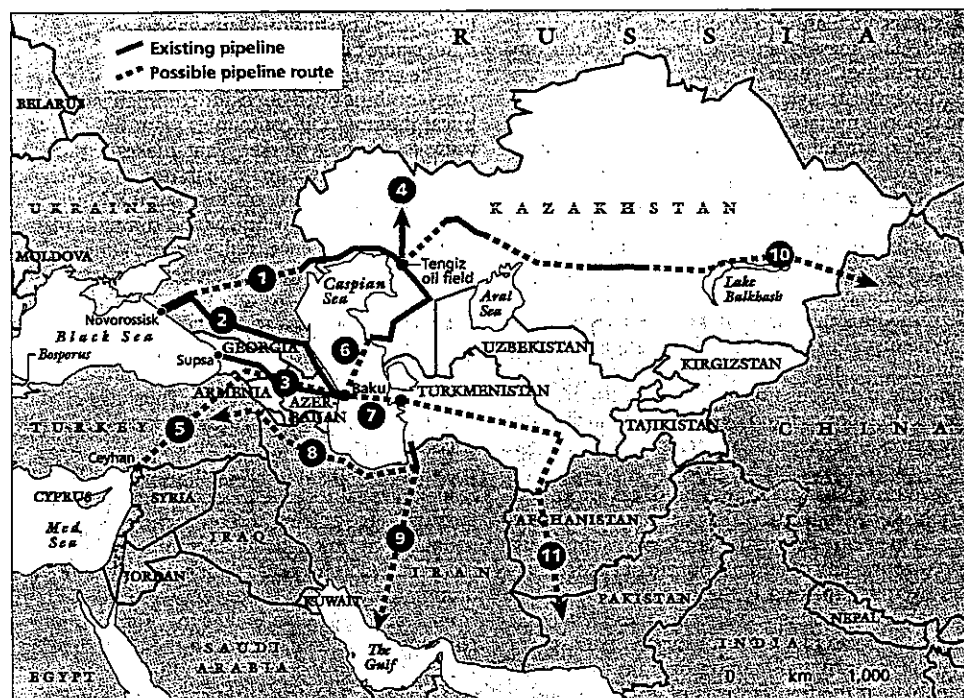
The current international political situation in the Caspian region has been likened, rightly or wrongly, to the "Great Game" that took place in the region in the 1800s between Russia and the British Empire (Hopkirk, 1994). At that time, the Great Game was one of imperialism and territorial conquest. At present, a *new* Great Game is taking place among several governments and ethnic groups within some of the circum-Caspian countries for control of the region's natural resources (oil and natural gas). Equally important is competition for control of the transport route(s) to carry those resources to foreign markets. An excellent review of the geopolitical and other interests in Central Asia and the Caucasus was provided by the *Economist* (7 February 1998, pp. 3-18). A special report on the region succinctly noted the Caspian's strategic importance:

The former Soviet republics of the Caucasus and Central Asia link Europe and Asia; Christianity and Islam. They are flanked to the east by a rising great power (China); to the north by their former hegemon (Russia); to the south by a country collapsed in violent chaos (Afghanistan), a fundamental Islamic republic (Iran), and a fragile secular state in search of a greater regional role (Turkey). Along with these, a distant superpower seeks influence, if not dominance (America).

This list of international political pressures on the Caspian region in this particular paragraph does not mention the various competing oil interests seeking to gain involvement of some sort in the region's oil and gas exploitation, the various countries outside the region in whose interest it might be to gain access to these Caspian resources, or the political pressures from international lending institutions and donor governments to reduce corruption, increase bureaucratic efficiency, and pursue democratic and economic development strategies. Nor does the paragraph mention the regional influence of local ethnic factors (e.g., the Chechens) that in some places play a dominant role in determining how some aspects (e.g., the pipelines) of the *new* Great Game might eventually play out (see Odum, 1998 for a view that challenges the "Great Game" analogy). As the *Economist* noted in its review of the Caspian region and Central Asia, it is "no wonder the Caspian has become a magnet for geopoliticians" (1998, p. 3).

Pipelines

A map, like a picture, can be worth a thousand words. In the case of the Caspian oil and gas pipeline issue, this adage holds true. The following figure illustrates most of the pipeline routes that have been proposed by various governments and oil consortia. The Caspian states have considerable potential wealth in their hydrocarbon reserves, both onshore and offshore. But, in order to realize that wealth, they must rely on neighboring countries for trans-shipment of their resources from the region by way of oil/gas pipelines and tankers. The *Economist* suggested that “the biggest single obstacle to fabulous wealth in the region is the lack of export pipelines” (1998, p. 7).



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Each of the existing or proposed routes has its economic, political, and geopolitical benefits and drawbacks. For example, one such route (#2) passes through the Republic of Chechnya. This route is not favored by Russia because it would give control over the flow of Caspian oil to leaders of this break away Russian republic. As another example, the route that passes from Turkmenistan across Iran to the Persian Gulf (#9) has been strongly opposed by the US government. A new pipeline from Russia to the Black Sea (#1) is opposed by Turkey on grounds of adding to the already excessive oil tanker traffic through the Bosphorus Straits. A pipeline route is proposed from Azerbaijan to the Georgian port of Supsa (#3). This route is of great

importance to Georgia as a new nation, giving it an international role in the world of oil. In February 1999, agreement was reached on the construction of an underwater oil and gas pipeline from Turkmenistan to Azerbaijan. While these governments and the companies that are to construct the pipeline believe they will take measures to protect the environment, those concerned with the possibility of oil pollution do not share their belief. And then there is the proposed controversial construction of a pipeline that goes across Turkmenistan through Afghanistan and Pakistan to the Indian Ocean (#11).



While oil companies might consider this to be one of the best routes economically, the US government would oppose it, given the ideological stance of Afghanistan's Taliban government. It is quite clear that economic cost-benefit analyses for purposes of ranking pipeline routes along economic lines will be overshadowed by geopolitical considerations. Without a doubt, consideration of regional animosities, ideological issues, and pipeline security will come into play when determining the "best" route(s) for oil and gas pipelines. As suggested by the *Economist* (1998, p. 7), "the real fight about pipelines is as much about geopolitical influence as about the oil business itself."

Pollution

There are numerous factually based accounts about the high levels of raw sewage and chemical contaminants that enter the Caspian as a result of a combination of one or more of the following processes: inundation by the rising Caspian of low-lying areas and oil processing facilities,

inundation of fertilized agricultural lands, and raw sewage from settlements along each of the several rivers that flow into the sea from the circum-Caspian states, including those states along the Caspian's coastline. As one example, I will mention briefly pollution related to Azerbaijan and assume that it represents to varying degrees pollution problems that, in terms of raw sewage volume, other countries are likely to face in the near future.

One writer (Robinson, 1996) noted that the air, water, and soils in Azerbaijan have become severely contaminated: "Long-term neglect of environmental concerns by the oil, gas, and chemical industries is a major cause of this situation: toxic agricultural pesticides, industrial air pollution, and the dumping of untreated sewage and industrial wastes into the Caspian and others." Robinson went on to note that "in the petroleum industry, obsolete equipment, inadequate storage techniques, the venting of natural gas, and deteriorating brine storage ponds contaminating the soil are just some of the problems generated at more than 50 onshore and offshore oil fields and nearly 12,000 wells."

Within Azerbaijan, it is well acknowledged that the coastal area of Baku is a "dead zone," especially in Baku bay. Raw sewage has flowed for decades, untreated, directly into the bay. Most recently, Azerbaijan's president called for the creation of a national park to include the bay. However, the official in charge of sewage management opposes this idea but has no alternative method for disposal (Panachov, 1999).

Soil pollution has come from "leakage from pipes transporting oil and oil-contaminated water and have left high concentrations of radiation and heavy metals in the soil" (Robinson, 1996). This particular article was written from the vantage point of business; with so many environmental cleanup needs, those industries that market cleanup technologies can do well in the region. And then there's the raw municipal sewage discharge into the Caspian. One report has suggested that, "Baku . . . pumps some 250 to 300 million cubic meters of sewage into the Caspian annually" (Leutwyler, 1998).

Analogues

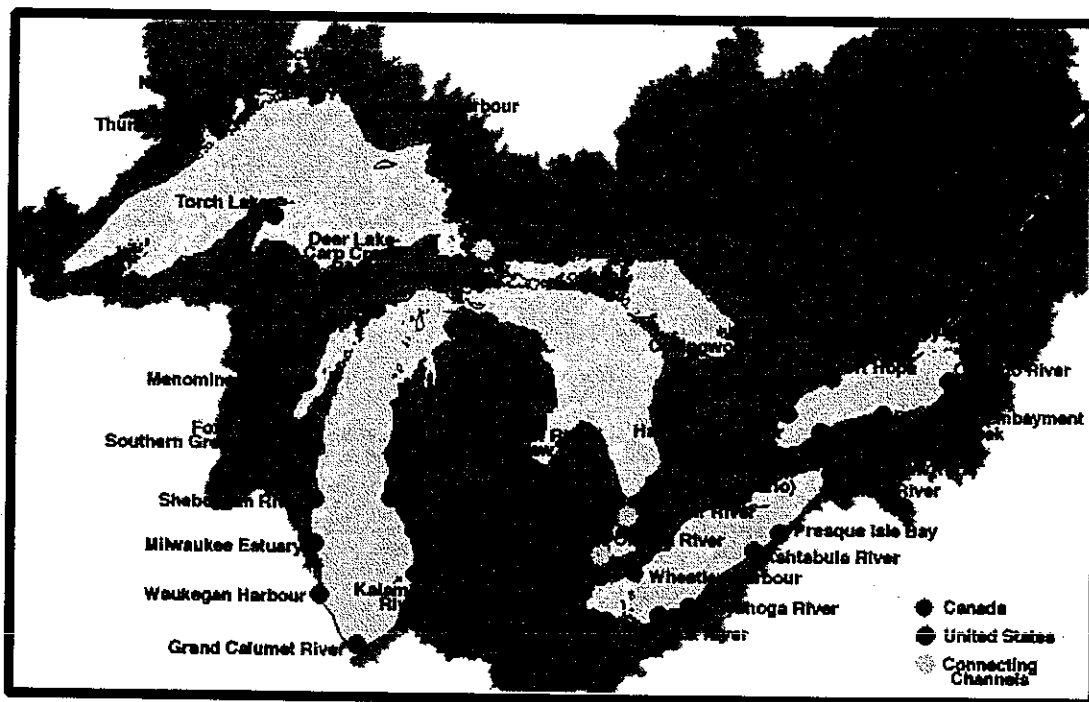
Clearly, no two situations are exactly alike, no matter how closely they may resemble each other. However, the use of analogies can provide some insights into dealing with new situations, if they are used with care. The North American Great Lakes, for example, could serve as a Caspian analogue because the level of the Great Lakes has also fluctuated on decadal time scales (as recently as the mid-1980s) and because these lakes have been the sink for pollution and toxic substances throughout the century (Ashworth, 1987, *passim*). The environmental history of the Great Lakes could provide some insights into what might be prudent environmental policy in the Caspian basin.

The Aral Sea situation might also serve in some ways as an analogue to the Caspian. The toxic chemical compounds added to the sea over a couple of decades, combined with unsustainable fishing activities, and a sea level drop of 17 meters in a couple of decades essentially wiped out the Aral Sea fisheries and the economic sector's activities based on them (Zholdasova, 1999).

Yet another analogue might be provided by the Gulf of Mexico, where fishing activities, oil extraction, and upstream pollution are in conflict.

The Great Lakes

The Great Lakes in North America might serve in some respects as an analogue to the Caspian situation. For more than 100 years the Great Lakes have been the repository for all kinds of effluents and emissions from industrial activities in their watersheds. In recent years there have been attempts to clean up these lakes, a response deemed imperative following the fires that appeared on the Cayuhoga River and Lake Erie in the late 1960s as a result of high levels of industrial pollution (EPA, 1997). That eye-opening incident sparked the realization that pollution of the lakes could no longer be ignored by the numerous levels of littoral governments, from local to international.



North American Great Lakes Basin, shared by US and Canada. Lakes left to right:
Superior, Michigan, Huron, Erie, and Ontario

As a direct result of increased awareness of the environmental problems in the basin, a basin-wide assessment was organized under the International Joint Commission (IJC) of the United States and Canada. In 1987 the IJC designated 43 “hot spots” of pollution (called areas of concern) in the basin that required immediate attention. Much of the attention was centered on the contamination of the lake beds with PCBs (polychlorinated biphenyls) and other chemicals dangerous to human and ecosystem health. The IJC worked with national, state and local governmental and non-governmental organizations to develop Remedial Action Plans for each of the 43 “hot spots” (Environment Canada, 1995).

A key difference in responses to pollution between these regions is that the level of cooperation among the riparian countries, provinces, states, and municipalities is quite high in the Great Lakes basin and quite low in the Caspian region. Industries are involved, along with governmental and non-governmental organizations, in cleaning up the pollution in the lakes.

However, one could argue that industrialization and its associated environmental pollution in the Great Lakes region preceded by a century or more the present-day interest in cleaning up the environment that had been sullied by "industrial metabolism" (a neutral term for processes that pollute the environment). Thus, Caspian states could (and on occasion have) used this same argument for their region as an excuse to pollute first and clean up later. In addition, to some, pollution has even been equated to economic development: the more polluted a region, the more developed it must be (e.g., Enloe, 1975).

Another similarity is that both inland bodies of water have fluctuated over time, causing problems to coastal inhabitants and settlements. In the early 1960s the Great Lakes were at their lowest level in the past century (as was the Great Salt Lake in Utah). By the mid-1980s, however, the lakes were at their highest level in recent times (as was also the case for the Great Salt Lake) (Morrisette, 1988). As we now know, the Caspian Sea level dropped a few meters between 1930 and 1977, and rose from 1978 to 1995. In all three cases, human activities encroached on the receding shorelines. Assuming that the lowering of lake levels would be a permanent feature, governments allowed people to develop, cultivate, or build on the newly exposed lake beds. Decades later, when the lake levels began to rise again in each of these three basins (Great Lakes, Great Salt Lake, and the Caspian), those who had been encouraged to move onto the exposed lake bed had to abandon their settlements and retreat inland and away from the rising lakes.

Gulf of Mexico

The Gulf of Mexico, especially the inner continental shelf of Louisiana, can serve as an analogue to the Caspian in a couple of ways. First of all, there is considerable oil exploration along the Gulf coast, and the oil rigs are subject to storms and hurricanes in the Gulf and are therefore potential sources of oil pollution. There is a thriving fishing industry in the Gulf, and the oil interests are sometimes in conflict with the fishing interests. There is yet another similarity between these two bodies of water: they are both fed by major river systems, with the Mississippi River feeding the Gulf of Mexico (approximately 600 km³ water per year). At the same time,

this river, like the Volga in the Russian Federation, feeds pollutants into the Gulf's marine environment.



Much of the runoff from agricultural fields in the US Great Plains (its agricultural heartland) makes its way into the Gulf. After decades of dumping certain substances into the Gulf, it appears that it has led to the creation of what scientists refer to as a "Dead Zone" (St. Germain, 1995). The "Dead Zone" presently covers 7,000 square miles, whereas in 1993 it was only half that size. According to one report, "the trouble with the Dead Zone is that it lacks oxygen . . . apparently because of pollution in the form of excess nutrients flowing into the Gulf from the Mississippi River" (Yoon, 1998). Scientists also noted that the problem of rising nutrient loads, especially nitrogen, and related decreases in oxygen led to the situation known as "hypoxia" (i.e., the absence of oxygen reaching living tissues). In coastal waters, it is characterized by low levels of dissolved oxygen, so that not enough oxygen is available to support fish and other aquatic species (EPA web site). Other problems are caused by phosphorus from municipal waste water and fertilizers. Apparently, each summer brings a new load of nutrients into the Gulf by way of the Mississippi and a new Dead Zone is created. Interestingly, support for this view is found in the fact that during the major drought in the US Midwest in 1988, the hypoxic zone was almost absent (Yoon, 1998). The US Senate passed legislation (S. 1480) entitled "The Harmful Algal Bloom and Hypoxia Research and Control Act of 1998" to establish a federal task force to clean up the Dead Zone (Senator John Breaux of Louisiana press release 9 July 1998). Hypoxia zones

are also found near Denmark, Norway, Sweden, and in the Baltic Sea, Chesapeake Bay and Long Island Sound.

Aral Sea

The Aral Sea region provides an example of an area where explicit calculations were made by scientists who compared the value of one natural resource to the relative value of another. In the late 1970s, a determination was made to value cotton production over the fishing sector. Borovsky (1979) suggested that a unit of Aral Sea water was 100 times more valuable when put on the desert sands to grow cotton than it was when kept in the sea in order to keep a few fish alive or to evaporate into the atmosphere unused. As a result of this long-standing belief, government decisions were made to divert increasing amounts of water from the two major rivers that feed the sea. Within a couple of decades of 1960, that tradeoff proved to be catastrophic. The fishing industry collapsed, and fish were imported from the Baltic for processing in the Aral region. Other factors were not considered in the calculation: the drying out of the deltas, the desiccation of the Aral Sea, the loss of the fishing industry, the exposure of toxic seabed soils to wind action, deterioration of human health in the region, the loss of wetland flora and fauna, and so on. None of this was put into the equation for determining the tradeoffs between cotton and fish. Blum (1998) has recently discussed the issue of the tradeoffs between environmental protection and resource exploitation in the Caspian region.

On the use of analogues

The reason for suggesting these situations as potential analogies with respect to the present conditions in the Caspian region is that, given a "business as usual" scenario for future decades, one can gain a good idea of the Caspian's likely environmental future. The sturgeon population has already been put at high risk of extinction, as a result of officially tolerated catch levels and illegal poaching. The environment in the region's oldest oil-producing area (Azerbaijan) has been greatly (i.e., adversely) affected by exploration, extraction, storage, and shipment of oil. In the absence of any meaningful efforts (as opposed to official platitudes) to protect the various aspects of the environment in the Caspian region — fish, seals, water quality — one could

reasonably surmise that the future for the environment of all the parts of the Caspian countries bordering the sea is that of Azerbaijan's environment at present.

The kinds of environment-related changes that one might find in the Caspian fall into the category of what I have referred to as "creeping environmental change." Creeping changes include global warming, sea level rise, ozone depletion, acid rain, air pollution, soil erosion, desertification — an incremental change that appears to leave the environment quite like it was yesterday. And tomorrow's environmental change will not alter the environment much from what it is today. However, over several years, these incremental changes will have added up and, one day, when we look at what that creeping environmental problem has become, we will have an environmental crisis to deal with (Glantz, 1994). This is often the result of putting short-term economic benefits ahead of long-term environmental stability.

Another environmental problem, an oil spill, is a quick-onset disaster. Considerable attention was focused on America's worst oil spill, the Exxon Valdez oil spill, in Alaska on March 24, 1989 (Burger, 1997). Ten years later, a US government report noted that the affected wildlife and ecosystems were still in various stages of recovery. There have been ten oil spills around the globe since 1989 that have been larger than the 11 million gallon Exxon Valdez spill. Few people today remember the Amoco Cadiz oil spill along the French coast of Brittany on March 17, 1978. This remains as one of the biggest ever oil spills in the marine environment, but it and its lessons are already being forgotten. The Amoco Cadiz spill was eight times the size of that of the Exxon Valdez (Burger, 1997) (<http://earthbase.org/home/timeline>). Oil spills can be expected to occur, regardless of verbal assurances of safeguards, such as rapid containment and cleanup. Thus, sensitive ecosystems in the Caspian will be at risk as oil transport increases.

Taking the relevant parts of the various analogies suggested above (among other analogies of various environmental aspects of the Caspian, such as those that might be provided by a review of the environmental situations in the Black Sea or the Baltic Sea), a plausible environmental scenario for the future can be constructed. That future is bleak from an environmental perspective, unless governments in the region truly seek to balance economic development with an acceptable level of environmental protection.

Circum-Caspian ARW (Advanced Research Workshop) Findings

This section presents a brief review of key points from the 1996 NATO-supported workshop on the Caspian (Glantz and Zonn, 1997). This summary is based on the discussions at the workshop in plenary and working group sessions. The list of recommendations centers on the need to identify the mutual environmental interests of the coastal governments.

- Focus at first on the functional issues in need of regional cooperation. Deal later with the structural considerations for the region. This suggests that there is a need to develop regional cooperation but not necessarily a regional organization. Also, focus on a problem (or problems) that is (are) the least political but which are most important and tractable from an environmental perspective; one from which all can benefit (preferably, at first, this problem should not be directly linked to oil issues).
- The urgent need to protect sturgeon and other Caspian living marine species must be presented in terms of the need to protect biological diversity as opposed to presenting it in terms of sustainable development. In a traditional cost-benefit assessment, the biological resources (as typified by sturgeon) will always lose out to oil interests.
- Since 1992 and the breakup of the USSR, routine, sustained data collection in some of the littoral countries has sharply declined because of the lack of financial and human resources. Yet, environmental monitoring and data collection must be maintained for the various environment-related processes in the region (e.g., for sea level changes, for changes in the health of fish populations and land-based resources such as desertification processes, raw sewage pollution of rivers and the Caspian).
- At the very least, there should be national cooperation to enforce existing national environmental standards.

- Scientists must identify the range of uncertainty regarding Caspian level fluctuations so that policymakers can develop plans for at-risk populations, resources, and ecosystems. Nevertheless, policymakers in the region must accept the fact that there will be uncertainties associated with sea level rise (but not with its potential impacts) and can devise a circum-Caspian plan to minimize risk of developing for agricultural or industrial purposes to these relatively low-lying areas that would be affected by a 2 m or so sea level rise. Yet, there is no agreement around the basin on how to respond to decadal-scale fluctuations in sea level.
- The Caspian Sea must be seen for what it really is, an holistic ecosystem made up of several subsystems. Most participants at the 1996 ARW considered the notion of ecosystem health as useful for the Caspian region.
- There is a proverbial “window of opportunity” in the Caspian region, given the recent emergence of newly independent states, to address environmental problems in the region early in their development, and well before they become a crisis (although the condition of the sturgeon fishery is already acknowledged to be in a crisis stage).
- Governments should not wait for the legal international issues (e.g. lake or sea status) to be resolved before they address pressing environmental issues. Coordination effort could begin with specific scientific issues (climatic change, sea level fluctuations, pollution content and sources, desertification, sturgeon decline, etc.). For example, a reliable forecast for Caspian Sea level trends in the next few decades is not expected to be developed in the near future. This activity requires research support if such a capability is to be developed in a reliable and timely way. Littoral countries can share their experiences (successes, failures and plans) for developing responses to decadal-scale sea level fluctuations: Focus on how to use scientific research output. This includes translating it into user-friendly terminology for policymakers.
- It was proposed at the 1996 ARW that the Caspian countries should request from UNEP that a diagnostic study be undertaken for the sea, as it had for Lake Chad and the Aral Sea, among others. Its purpose would be to provide baseline environmental data on the current status of the Caspian and its coastal areas. The results of such a study would be highly visible to the

international community and would draw attention to and political support for the humanitarian and sustainable development aspects and to some extent away from the high politics of oil. It would also reinforce the view that littoral countries must not pursue economic development without ecological protection.

- As with the climate change issue, there is a need to address activities in the circum-Caspian region based on the “precautionary principle,” that is, as a primary consideration, “do no harm.”
- Educational activities in the circum-Caspian countries are very important. The idea of a “Caspian University,” a university without walls, was proposed to be carried out at first as “roving seminars” in order to generate public awareness among citizens and policymakers.

Concluding Comments

While the current geopolitical situation in the Caspian region has been likened to the “Great Game” of the nineteenth century, in the *new* Great Game there are many more actors, and there is much more potential for a greater number of conflicts. While most attention has been focused on the oil and gas reserves and how to exploit them with the fewest number of resulting political repercussions (ranging from political opposition to military conflict), the environment is most likely to suffer, at least into the mid-term (a few decades). A Pacific Environment and Resources Center (PERC) report on the Caspian noted that, “If the Great Game of the Caspian is to benefit societies at large, it would be wise to put environmental concerns before geopolitics” (Hydrocarbon Online, 1999).

Examples from other countries and regions can be used (as analogies to gain a glimpse of the future) to provide an early warning to the Caspian countries about the risks associated with a chronic lack of environmental concern. These analogies might convince the Caspian governments that the sustainable use of the environment can produce long-term benefits not only to their economies but also to the environment and the inhabitants of the region. It is most likely less costly to prevent the degradation that is sure to follow unmonitored resource exploitation

than to attempt to clean up the mess once it has occurred. There are some signs of hope that governments and international donors realize this, at least on a theoretical level. One example of this glimmer of hope is a recent regional attempt to produce a management plan.

The Caspian Sea Environment Program

In 1995, the World Bank, the United Nations Development Programme, and the United Nations Environment Programme in conjunction with the Caspian governments developed the concept of a Caspian Sea Environment Program (CSEP). The program's outline (CSEP, 1997) was based on similar plans for other regional seas programs. In May 1997, a concept paper was prepared for the CSEP identifying the overall goal as promoting sustainable development and management of the Caspian environment over the next twenty years. The report noted the following additional environmental goals for a Caspian Sea Environment Program:

- Understanding and learning to live with the Caspian water level fluctuations;
- Abatement and prevention of new types of pollution and deterioration of the Caspian environment and its bio-resources;
- Recovery and rehabilitation of these elements of the Caspian environment (including biological diversity) that are degraded and still have the potential for recovery;
- Long-term sustainability of environmental quality and bio-resources as assets for the present and future human populations of the region.

Caspian governments have witnessed what has happened to the sturgeon fish population in the absence of an effective intergovernmental response to a creeping problem of which they were all aware. They have a strong incentive to put this plan into action as soon as possible because of the persistent creeping (incremental) and cumulative nature of the various threats to the Caspian environment. One can only hope that there will not be a need for the next generation to ask why solutions to the Caspian's environmental problems were known in the 1990s but were not applied.

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