Chapter Five

NATURAL RESOURCES AND POTENTIAL CONFLICT IN THE CASPIAN SEA REGION

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INTRODUCTION

Since the collapse of the Soviet Union, the petroleum-endowed states of Central Asia and South Caucasus have sought, with varying degrees of success, to attract foreign direct investment in their respective energy sectors, with the hope of securing a steady stream of revenues and bolstering their political legitimacy. Hamstrung by their landlocked geographic position, decaying infrastructure, and non-cash-paying neighbors, the Caspian Sea littoral states have struggled with the issue of how to profit from their remote fossil fuel reserves in a practical and timely manner. As petroleum revenues increase in the next 10–20 years, each of these states will be faced with increasing expectations for improved standards of living from their populations and internal competition over the distribution of this wealth, with potential long-term social dislocations resulting from natural resource-based economic growth. The energy picture is further complicated by divergent claims to the scarce water resources in the region, which are a critical element in both regional energy trade and long-term agricultural plans for many states.

The potential contribution of natural resources to armed conflict in the Caspian Sea region must be placed in the context of existing grievances and aspirations of the former Soviet states, as developed in the other chapters of this report. History has shown that a heavy reliance on extractive industries can lead to severe political and eco-

nomic pathologies that can be precursors to civil conflict. At the same time, the development of oil and gas resources provides a unique window of opportunity for the Caspian energy producers to modernize their economies and gain political clout. Whether the Caspian leaders have the political will and ability to husband their indigenous resources for the long-term benefit and stability of their societies is unclear.

FOSSIL FUEL PRODUCTION IN THE CASPIAN SEA REGION[1]

Crude Oil

Today, the combined crude oil production in the Caspian Sea region is recovering from a period of stagnation in the early 1990s. At peak output, the Caspian Sea region is forecasted to contribute approximately 3 to 4.5 percent of total world crude oil production, and 6 to 9 percent of non-OPEC crude oil production, as illustrated in Figures 5.1 and 5.2, respectively.[2] These forecasts do not include Russian or Iranian sectors of the Caspian Sea, which are not expected to contribute substantially to total Caspian production.

Six projects—Kashagan, Tengiz, Karachaganak, Azeri-Chirag-Guneshli, Shah-Daniz, and the Severnyi block—contain approximately 68 percent of the region's 39.4 billion barrels of liquid reserves. According to forecasts based on *existing* discoveries, oil production in the region will be dominated by Kazakhstan and Azerbaijan, and it will likely plateau in the 2010–2015 time frame, as illustrated in Figure 5.3. Future exploration successes could push the eventual decline in production beyond 2020. Azerbaijan, once thought to be the linchpin of future Caspian oil exports, is increasingly seen by energy analysts as a natural gas producer, following a

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[1]For this chapter, Caspian Sea fossil fuel *production* forecasts are based on analysis by the Wood Mackenzie consulting agency: Hilary McCutcheon and Richard Osbon, "Discoveries Alter Caspian Regional Energy Potential," *Oil & Gas Journal*, December 17, 2001. Domestic Caspian fossil fuel *consumption* forecasts are from: Robert Smith, "Politics, Production Levels to Determine Caspian Area Energy Export Options," *Oil & Gas Journal*, May 28, 2001.

[2]World and non-OPEC production forecasts are from Energy Information Administration's *International Energy Outlook 2001*, March 2001, p. 42. Caspian state-level production scenarios are from Robert Smith, "Politics, Production Levels. . . ."

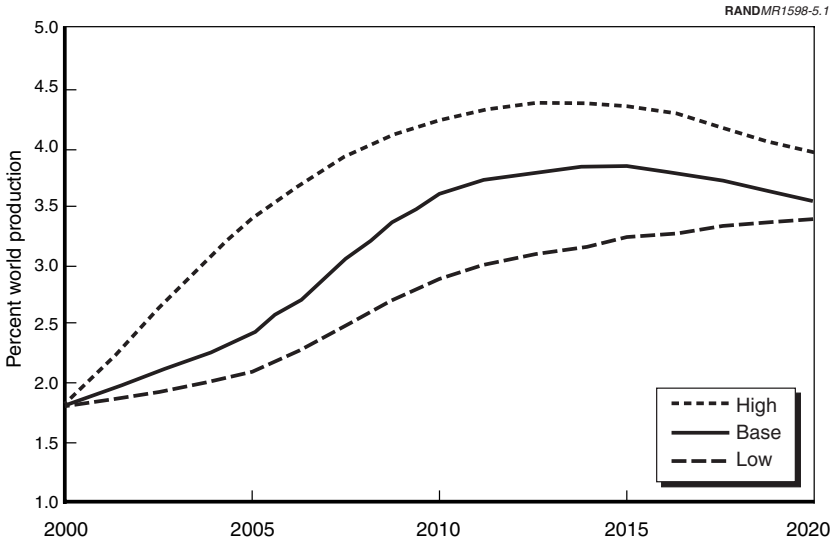

Figure 5.1—Caspian Contribution to World Crude Oil Production

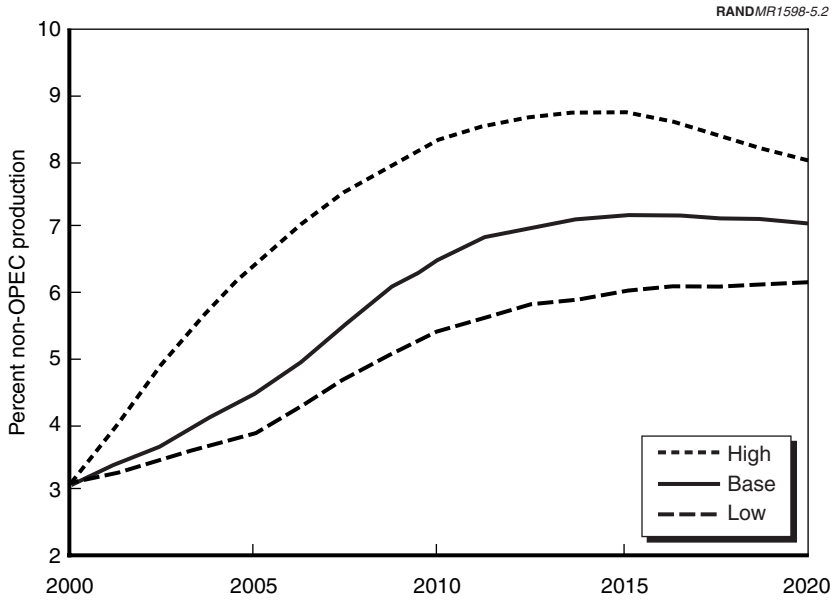

Figure 5.2—Caspian Contribution to Non-OPEC Crude Oil Production

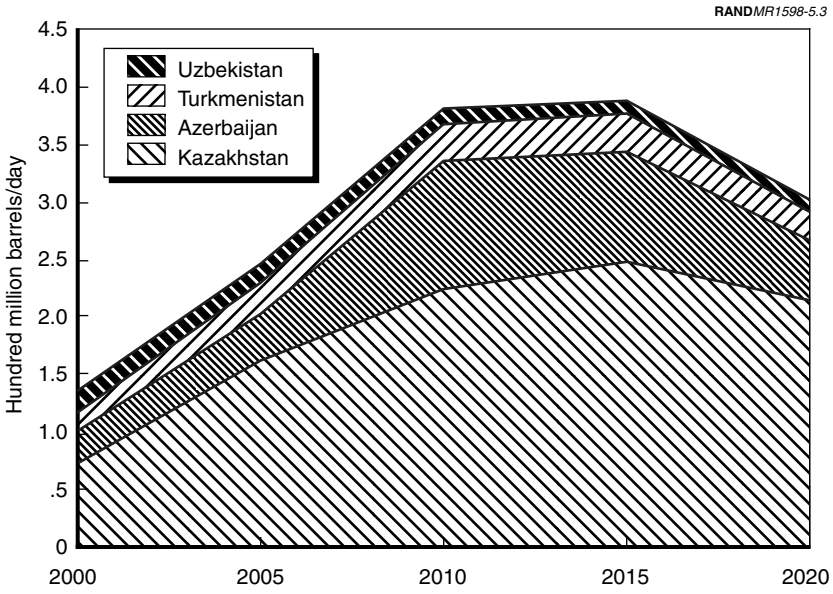

Figure 5.3—Caspian Crude Oil Production Forecasts

string of disappointments in exploratory drilling in 2000 and 2001. In light of successful exploration efforts in the Kashagan field since 2000, Kazakhstan is forecasted to be the dominant regional producer and exporter of crude oil over the next two decades.

Macroeconomic and demographic developments in the region will affect export potential primarily through the growth in domestic consumption. For example, Turkmenistan's share of Caspian (non-Russian and Iranian) export potential, as shown in Figure 5.4, will steadily decrease from 7 percent to approximately 4 percent in 2020. By 2005, Uzbekistan is expected to become a net importer of crude oil, importing almost 150,000 barrels per day (b/d) by 2020.

NATURAL GAS

Caspian gas production, based on existing discoveries, will also reach a peak in the 2010–2015 time frame, driven by projects in Kazakhstan's Karachaganak, Tengiz, and Kashagan projects, as illustrated

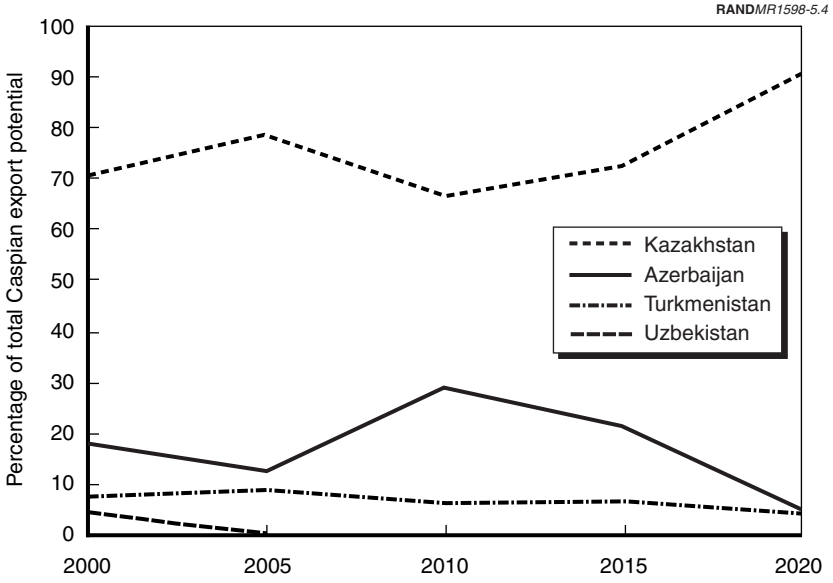

Figure 5.4—Caspian Crude Oil Export Potential Forecasts

in Figure 5.5. In the near term, the lion's share of Caspian natural gas export potential will come from Turkmenistan, with Uzbekistan's production share declining rapidly in the next decade, as shown in Figure 5.6. Although Uzbekistan will still be a major regional producer of natural gas for some time, its export potential will become insignificant by 2005 because of its high levels of domestic consumption, as the most populous state in the region. Azerbaijan's export potential will depend greatly on successes in the Shah Daniz project.

One important caveat in this analysis is that these figures represent production forecasts, which are highly dependent on assumptions about producers' actions in matching supply and demand. This is particularly relevant for both Turkmen and Uzbek estimates, where great uncertainty remains in the viability of export options. For example, Uzbek gas production will probably reflect domestic demand more than theoretical production capability, while Turkmen gas production will depend on securing Turkish and Far Eastern markets.

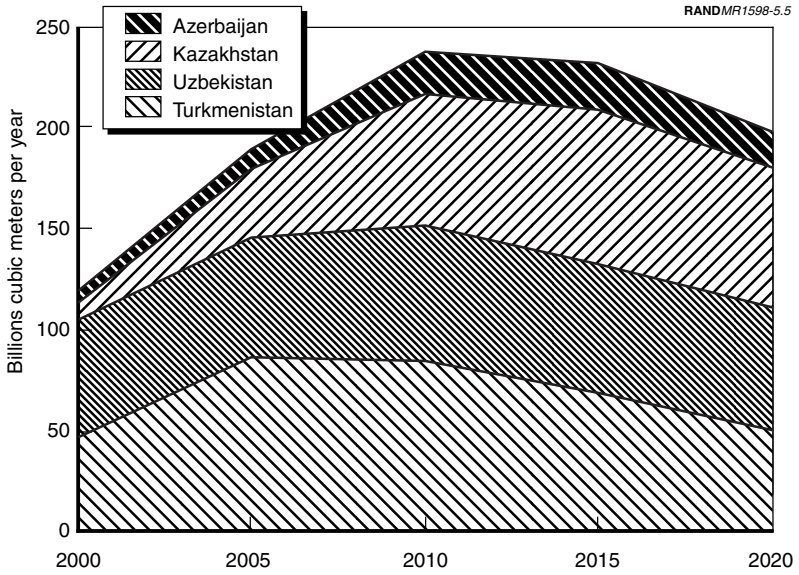

Figure 5.5—Caspian Natural Gas Production Forecasts

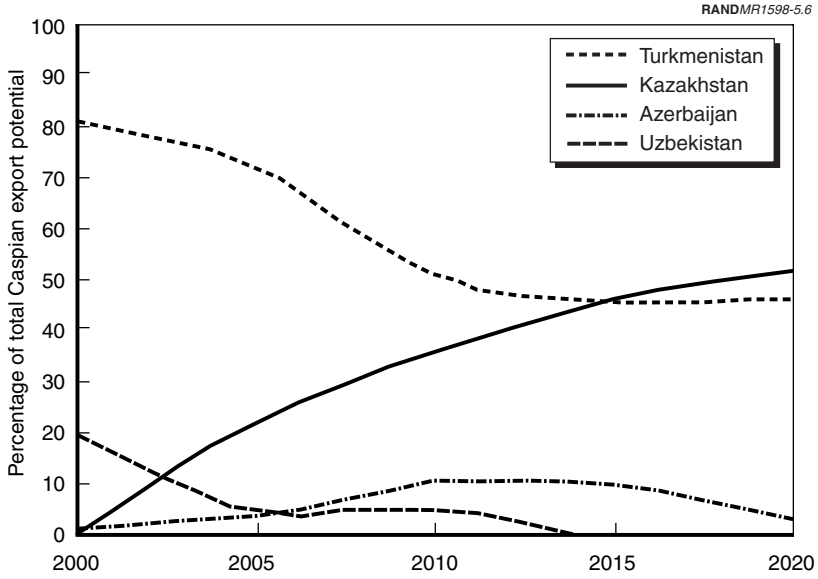

Figure 5.6—Caspian Natural Gas Export Potential Forecasts

FOSSIL FUEL TRANSPORT TO MARKETS

Although they face similar obstacles, such as low domestic demand and high transportation costs to foreign markets, crude oil and natural gas producers must consider fundamentally different transportation options. With the exception of large markets with overland routes, such as China, potential crude oil pipeline expansions would likely terminate at high-capacity ports with access to international waterways in the Black Sea, Persian Gulf, Mediterranean Sea, and possibly the Indian Ocean. In contrast, natural gas pipelines would lead directly to regional hubs near demand centers, since large-scale maritime transport is impossible without capital-intensive liquefaction plants. Existing and proposed oil and gas pipelines are illustrated in Figure 5.7.

CRUDE OIL

Current Transport Options

Today, the existing transport options for Caspian oil are dominated by Russian-European pipelines, seaborne exports from Black Sea terminals, and low-volume swaps with Iran. The Black Sea terminals include the Russian ports of Novorossiysk (with a maximum capacity of 680,000 b/d) and Tuapse (200,000 b/d), the Ukranian port of Odessa (200,000 b/d), and the Georgian ports of Supsa (200,000 b/d) and Batumi (70,000 b/d). To reach the Mediterranean Sea and beyond, tankers must pass through the increasingly congested straits of the Bosphorus, posing a potential environmental threat to Turkey and the Black Sea littoral states. Kazakhstan exports have relied on an existing pipeline to Samara, Russia (200,000 b/d), where Kazakh crude is blended with West Siberian crudes, ultimately arriving at Russian terminals on the Black Sea, or to European markets via the Druzhba pipeline. Kazakhstan has also engaged in low-volume oil swaps with Iran, whereby Kazakhstan transports oil via barge to northern Iranian terminals and refineries, while Iran sells an equivalent[3] amount of oil from its Persian Gulf terminals to world markets. With the recent construction of the Caspian Pipeline Consortium

[3]This is modified somewhat by Iranian markups for lower Kazakh crude oil quality.

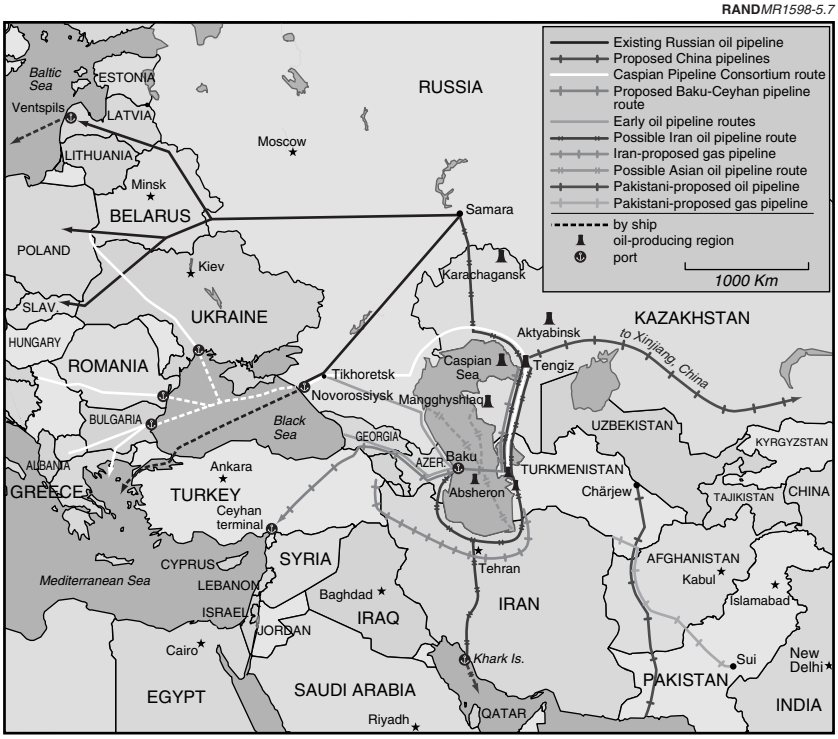

Figure 5.7—Oil and Natural Gas Existing and Proposed Pipelines (EIA)

(CPC) pipeline from Tengiz to Novorossiysk, Kazakhstan will enjoy the most diversified export options among Caspian nations. Azeri oil relies on a "western route" from Baku to Supsa, and a "northern route" from Baku to Novorossisyk, for which a bypass was recently built to avoid the risks associated with transit through Chechnya.

Medium Term (until 2005)

The most pivotal decision regarding Caspian liquids transport over the next several years concerns the construction of a "main export pipeline" to accommodate the bulk of increased production capacity from Kazakhstan and Azerbaijan over the next two decades. Azerbaijan, Georgia, Turkey, and the United States have supported the con-

struction of the Baku-Tbisli-Ceyhan (BTC) pipeline, a transportation option that would bypass Russian and Iranian territory altogether. As originally envisioned, it would begin in Baku, Azerbaijan, pass through Georgia and eastern Turkey, and terminate at the Mediterranean port of Ceyhan, Turkey. This route would offer Azerbaijan more export flexibility, generate transit revenues for Turkey and Georgia, stem tanker traffic through the Bosphorus and Dardanelles, and prevent Russia and Iran from exerting added influence in the Caspian crude oil market. Russia, Iran, Armenia, and some energy analysts in the United States and elsewhere have criticized the BTC plan for being a politically inspired and economically unviable route.

Recent disappointments with dry wells in the Azerbaijani sector have made Kazakhstan's participation potentially critical to the future success of the project. Kazakh crude, transported by tanker or pipeline from Tengiz to Baku to supplement Azeri crude, would help ensure the economic viability of the project by reducing the risks from potential Azeri production shortfalls.[4] It is expected that the BP-led Azerbaijan International Operating Company (AIOC)[5] will make a decision after it reviews the results of a twelve-month detailed engineering study to be completed by June 2002, determines the extent of Kazakhstan's commitment in crude oil shipments to Baku, and secures assistance from U.S. government lending agencies such as the Export-Import Bank and the Overseas Private Investment Corp. Recent comments by U.S. Deputy Secretary of State Richard Armitage[6] and President Bush's waiver of economic sanctions[7] against Azerbaijan certainly bode well for the project.

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[4]The BTC project will hereafter be referred to as the TBTC project.

[5]AIOC is a consortium of 10 major oil companies and the State Oil Company of Azerbaijan (SOCAR).

[6]Although he has not explicitly stated that the United States would play any financial role in the development of the BTC pipeline, Armitage said at a U.S.-Azerbiajan Chamber of Commerce meeting on March 7, 2002, that he expects the pipeline to be completed by 2005 and on budget. Maureen Lorenzetti, "Iran Should Not Interfere with Caspian Interests, Top U.S. Official Says," *Oil & Gas Journal Online*, March 8, 2002.

[7]On January 25, 2002, President Bush signed a waiver of Section 907 of the Freedom Support Act to end restrictions on U.S. economic assistance to Azerbaijan, which was approved by Congress in October 1992 during the Nagorno-Karabakh conflict with Armenia. Although the waiver was initiated most directly to enlist Azeri support for U.S. efforts to fight international terrorism, energy analysts view it as a prelude to U.S.

Technical analyses performed by AIOC and its contractors concerning the TBTC pipeline are not available in the public domain. However, several consulting agencies, under the auspices of the European Union's Tacis INOGATE program,[8] have published a comparison of nine different export options for Caspian oil to the European market.[9] The clear winner, in terms of lowest total transportation costs (20.2 euro/ton), would involve transporting Tengiz crude via a trans-Caspian pipeline to Baku, where Azeri crude would be added, followed by a pipeline route to Supsa on the Georgian Black Sea coast, parallel to the existing early-oil pipeline. Transport from Supsa to Trieste would be via tanker, crossing the Turkish straits. This option is vehemently opposed by Turkey, on the grounds that more tanker traffic would increase the probability of an oil spill or other accident within the overcrowded Turkish straits. The second-best (23.6 euro/ton) and third-best (24.1 euro/ton) options involve tanker transport from Supsa to the western shores of the Black Sea, followed by various pipeline routes on the European continent. The TBTC pipeline is the fourth-best option (24.8 euro/ton), but it has the advantage of being the only option under consideration that involves absolutely no transport through the Turkish straits or within the Black Sea itself. This option is clearly favored by the Turkish government.

In the meantime, before a main export pipeline is built, the CPC pipeline from Tengiz to Novorossiysk will accommodate additional Kazakh oil streams. Kazakhstan and Turkmenistan will increase their oil swaps with Iran. The well-developed gathering, refining, and distribution infrastructure in northern Iran will be able to handle increases in Kazakh and Turkmen crude for refining into products for domestic use, up to a point. Iran is unwilling to accept more than approximately 500,000 b/d of Kazakh and Turkmen crude, since further imports would involve major investments in refinery infrastruc-

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support of the TBTC pipeline. "US Waives Economic Sanctions Against Azerbaijan," *Alexander's Gas and Oil Connections*, Vol. 7, Issue 4, February 21, 2002.

[8]Tacis = Technical Assistance to the Commonwealth of Independent States; INOGATE = Interstate Oil and Gas Transports to Europe.

[9]Orhan Degermenci, "EU Study of Caspian Area Oil, Gas Pipelines Compares Routes, Costs," *Oil & Gas Journal*, Vol. 99.45, November 5, 2001.

ture, which is tailored for domestic crude oil quality.[10] Furthermore, the capacity of the oil pipeline between Iran's Caspian terminal at Neka and a refinery complex in Tehran is limited to about 370,000 b/d.

Russian exports through the Black Sea are not expected to increase substantially, unless intensive exploration and production efforts in the nascent Russian sector of the Caspian shelf prove successful. However, Russia will have access to a deepwater terminal in the Mediterranean by 2003, making exports to the United States and Asian Pacific Rim much more economical than shipments from Novorossiysk, which are limited to 150,000 deadweight ton (dwt) vessels (Suezmax size and smaller) because of restrictions through Turkey's Bosphorus Straits.[11] By 2003, the Druzhba-Adria pipeline system will have an initial capacity of approximately 100,000 b/d.

Longer Term (2005–2010)

Growing demand in Russia, Ukraine, and Belarus may divert some Russian oil away from Black Sea routes, unless substantial discoveries are made in the Russian sector of the Caspian shelf. Furthermore, the Druzhba-Adria pipeline system, reaching a capacity of 300,000 b/d by 2013, will be able to transport some Caspian crude via the Odessa-Brody pipeline system.[12] Ukraine, Romania, and Bulgaria have substantial slack in refining capacity, and are actively looking to secure feedstock from the Caspian via Bosphorus bypass routes such as Burgas-Alexandroupolis, Burgas-Vlore, or Romania-Trieste. The upgrading of the Baku-Supsa pipeline would help support these bypass routes, while the construction of TBTC might obviate the need for them, since it would direct Caspian oil straight to the

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[10]Robert Smith, "Politics, Production Levels . . . ."

[11]As a result of Ukrainian ratification of a tariff agreement, Russian Urals blend will flow through 1,987 miles of pipeline from Samara (Russia), via Belarus, Ukraine, Slovakia, Hungary, and Croatia, terminating at the Adriatic port of Omisalj. However, the existing pipeline from Omisalj to Sisak must be reversed, for approximately $120 million. The port of Omisalj will be able to handle 500,000 dwt (ultra large crude carriers—ULCCs) tankers. Source: "Tariff Accord Clears Way for Russian Oil Exports Through Med," *Oil & Gas Journal*, Vol. 100.9, March 4, 2002, p. 64.

[12]"Tariff Accord Clears Way for Russian Oil Exports Through Med," *Oil & Gas Journal*, Vol. 100.9, March 4, 2002, p. 64.

Mediterranean. Pipelines through Iran or Afghanistan will depend on highly uncertain political developments, while routes to China are thought to be economically unfeasible under current circumstances.

NATURAL GAS

The most salient difference between oil and gas markets today is that gas markets are almost entirely regional, due to prohibitively high transportation costs.[13] In fact, many energy analysts believe that approximately one-half of the natural gas reserves in the world are currently "stranded"—economically or technically unfeasible to transport to existing markets with today's technologies. Abundant gas reserves in many parts of the world are either flared or reinjected into oil wells to boost reservoir pressure, rather than transported to markets, due to the high capital costs associated with natural gas pipeline construction and operation.

Because of limited domestic demand and chronic payment problems, Caspian states with abundant gas reserves are concentrating on transporting their gas to lucrative foreign markets. However, natural gas pipeline transport involves a careful matching of forecasted supply and demand.[14] Whereas crude oil and other liquid products can be transported by some combination of rail, truck, or ship without major processing, natural gas must be compressed, liquefied, or chemically transformed to take advantage of nonpipeline transport. Although there are other options for "monetizing" stranded gas, as illustrated in Table 5.1, the most realistic options for utilizing most of the Caspian gas in the near to medium term involve pipeline transport.

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[13]It is thought that the evolution of a more robust liquefied natural gas (LNG) trade will tend to link regional markets more closely in the long term. In particular, improvements in LNG technologies and increased capacity in maritime transport and infrastructure will allow for shorter-term contracts that more closely reflect piped natural gas costs.

[14]Since the energy density of natural gas is low relative to crude oil, the opportunities for storage are more limited. Natural gas can also be stored within the pipeline itself by increasing pipeline pressure up to a limit, but this strategy is only feasible for transient mismatching of supply and demand.

Table 5.1

Options for Monetizing Stranded Natural Gas

Method	Advantage	Disadvantage
Dedicated pipeline	• Lucrative foreign markets • Control over exports	• High capital cost • Transit fees eat up profit
Liquefied natural gas (LNG)	• Can reach distant, overseas markets • Europe has established LNG regasification capability/infrastructure • Usually involves long-term contracts, offering possible hedge against daily price fluctuations	• High capital cost • Best if near open-water coast with established maritime infrastructure • Safety and Bosphorus problem
Electricity generation	• Transport over existing wires • Utilize slack in system: many natural gas plants in FSU switched from natural gas to fuel oil, but could switch back, with some modifications	• Significant investment in plants and transmission to implement on a large scale • Local markets saturated quickly • Neighboring states are typically noncash customers
Synthetic fuels (i.e., Fischer-Tropsch Diesel)	• Can use an existing crude oil pipeline, or a variety of standard liquid transport options (i.e., rail, ship, truck) • Hedge against low gas prices (which translates to cheap feedstock)	• High capital cost • Low demand for high-quality synthetic fuels in region (greater potential in Europe)
Chemicals (i.e., methanol, ammonia, dimethyl ether, hydrogen)	• Potentially higher-value products • Hedge against low gas prices	• High capital cost • Limited domestic demand, still needs to be transported • Price fluctuations and tough competition

The primary export markets for Caspian gas will be Russia, Ukraine, and Turkey, followed by southeast Europe, and then more remote possibilities in Pakistan, India, and China. It is highly unlikely that any Caspian gas would ever reach the United States, since liquefaction is probably not a realistic option for Caspian gas.

Western Markets

The Turkish gas market has been coveted by all Caspian natural gas producers, not only because of burgeoning Turkish demand, but also because it could serve as a non-Russian gateway to European markets.[15] However, many independent energy analysts believe that Turkish forecasts of natural gas demand have been overstated, since they depend on optimistic scenarios for the construction of a large number of natural gas–fired electrical generation plants. As a result, it is believed that the Turkish market will not be able to accommodate all of the interested regional suppliers. Despite Turkish economic problems, the remaining underwater portion of the Blue Stream gas pipeline from Russia will probably be constructed,[16] with Russia exporting natural gas directly to Turkey sometime in 2002–2003.[17] Supplies from Azerbaijan and Iran will probably saturate the Turkish market, rendering the proposed Trans-Caspian pipeline from Turkmenistan unrealistic.[18]

In the short to medium term, Turkmenistan will continue to rely on Russian and Iranian infrastructure to transport its natural gas to foreign markets. Since Russia itself is a major natural gas exporter, this strategy might not be sustainable for Turkmenistan if Russia decides

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[15]Currently, the main transmission line between Europe and the western Anatolian peninsula originates in Russia, passes through Ukraine and Moldova, runs along the western coast of the Black Sea in Romania and Bulgaria to Istanbul, and terminates in Ankara. The direction of flow is from Russia to Turkey. Its length is 1,257 kilometers, with a total capacity of 8.6–8.7 billion cubic meters per year (bcm/year), with expansion plans up to 20 bcm/year under way. *Black Sea Energy Survey*, IEA, 2000.

[16]See Chapter Seven of this report.

[17]Robert M. Cutler, "The Blue Stream Gas Project: Not a Pipe Dream Anymore," *Alexander's Gas & Oil Connections*, Vol. 6, Issue 16, August 28, 2001.

[18]Bhamy Shenoy and William James, "Caspian Energy Exports: Turkmenistan Fumbling Opportunities Afforded by Trans-Caspian Pipeline," *Oil & Gas Journal*, May 28, 2001.

to charge prohibitively high transit fees or simply refuses to transport Turkmen gas. Furthermore, Ukraine, a significant market for Turkmen gas, is indebted to Turkmenistan and pays for its gas partly in barter trade instead of hard currency. Turkmenistan's failure to secure a trans-Caspian route and consequent dependence on Russian and Iranian infrastructure has led it to explore riskier options on the eastern market.

Caspian gas will have a difficult time penetrating the European market. Recent movement toward gas deregulation in Europe, LNG cost reductions by North African competitors, and the potential emergence of competitors from the Middle East will tend to depress gas prices. Furthermore, even substantial improvements in the infrastructure to accommodate this gas will not free the Caspian states from their dependence on Turkey and Russia as gateways to the European market. Still, Europe's desire to diversify its supply in the wake of declining North Sea production, the decommissioning of nuclear power plants in Germany in favor of gas-fired plants, and tougher EU regulations on double-hulled LNG tankers could benefit Caspian gas.

Eastern Markets

Although China remains a potential long-term market for Kazakh gas reserves, the volumes of reserves are too low and the transit distance to the western provinces too great for the foreseeable future. In the near to medium term, Russian supplies from western and eastern Siberia and Sakhalin Island are the most promising candidates for the Far Eastern market.

One potential solution to Turkmenistan's stranded gas problem is the large market in India. However, the necessary pipeline routes would have to traverse either Iran or Afghanistan, and then Pakistan, in order to reach India.[19] As a result, India is hesitant to depend on

[19]A gas pipeline terminating in Pakistan is probably not an option, since Pakistan has enough gas reserves to satisfy its domestic consumption needs for approximately 18 years. Rather, Pakistan would benefit from transit fee revenues amounting to approximately $600 million/year, and an option to purchase the piped gas, if one was built with India as the final destination. Source: Hassaan Vahidy and Fereidun

Turkmen gas because Pakistan would be able to control the throughput. Iran and India have discussed the possibility of transporting LNG from Iran's South Pars gas field by tanker, or of constructing a deepwater offshore gas pipeline to bypass Pakistan.[20] However, U.S. sanctions against Iran would preclude American participation and potentially constrain international involvement in the exploration of Iranian fields and the construction of appropriate infrastructure.

From October 1997 to December 4, 1998,[21] Unocal had served as the development manager of the seven-member Central Asian Gas (CentGas) pipeline consortium, whose purpose was to evaluate and potentially participate in the construction of a gas pipeline from Turkmenistan to India via Afghanistan and Pakistan. Civil war, low oil prices, and public pressure over the Taliban's human rights record led to Unocal's withdrawal from the consortium. After Unocal's decision and the victory of the Taliban, the Afghanistan pipeline option had been considered untenable by major energy companies.

In the wake of the September 11 attacks on the United States, it is too early to tell how developments in the region will unfold, and whether the United States will fundamentally review its sanctions and energy policies in the region. Some analysts have argued that a rebuilding of Afghanistan's infrastructure, with a Turkmenistan-Afghanistan-Pakistan-India natural gas pipeline at its heart, could be a powerful incentive for peace in the region.[22] However, it is not clear whether the construction of such a pipeline would actually increase the possibilities of sabotage and extortion from local power centers within Afghanistan. President Niyazov of Turkmenistan and Afghanistan's interim leader Hamid Karzai have expressed interest in reviving

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Fesharaki, "Pakistan's Gas Discoveries Eliminate Import Need," *Oil & Gas Journal*, Volume 100.4, June 28, 2002, pp. 24–34.

[20]Fiona Hill and Regine Spector, *The Caspian Basin and Asian Energy Markets*, Conference Report No. 8, Washington, D.C.: The Brookings Institution, September 2001.

[21]The official Unocal statement concerning its withdrawal from the consortium is available on its web site: *www.unocal.com/uclnews/98news/centgas.htm.*

[22]David Young, "Mideast Political Changes Seen Creating Oil Opportunities," *Oil & Gas Journal*, October 1, 2001, p. 30.

these plans, albeit with a different group of investors.[23] In addition to pipelines, Afghanistan and Turkmenistan have discussed investments in highways and electricity infrastructure between the two nations.[24] Whether major energy companies and financial institutions would be willing to gamble in such a politically and militarily unstable setting is highly uncertain at this time.

Other Options for Natural Gas?

In time, improvements in regional economic performance and domestic payment, elimination of distribution losses, and the growth of natural gas as an electric-generation fuel will create more robust natural markets within the Caspian region itself. Although lucrative export markets in major industrialized countries would provide the most promising revenue sources, there are other options for nations, such as Turkmenistan, that have heretofore failed to secure sufficient transport capacity and diversity in light of their sizable resources. Apart from pipeline transport to foreign markets, stranded natural gas can be "monetized" by physical or chemical transformation, followed by more flexible modes of transportation.

Physical transformation involves compression or liquefaction in order to facilitate transport via truck, rail, or ship. Liquefied natural gas is an important source of energy in parts of East Asia, but it entails significant capital investments in ports and liquefaction facilities by the supplier, and regasification facilities by the recipients. This option is typically pursued by coastal nations without feasible overland demand centers and so is not a serious option for landlocked Caspian nations.

Natural gas can also be chemically transformed, which would entail supplying something other than natural gas. One method is to generate electricity in a natural gas–fired power plant and then transport the energy by transmission line. There is some slack in the current electricity generation system in the region, which is composed of

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[23]Gulshen Ashirova, "Trans-Afghan Pipeline Project a Reality?" *The Times of Central Asia Online*, February 27, 2002.

[24]"Afghan, Turkmen Officials Discuss Electricity and Gas Cooperation," Associated Press, February 12, 2002.

Soviet-built power plants that burn fuel oil, after having substituted away from natural gas during the supply disruptions of the 1990s.[25] Some of these facilities, with modifications, could switch back to natural gas, increasing domestic demand for this resource. However, these opportunities would be limited and any major effort to build additional natural gas–fired power plants would have to be met with a concomitant upgrading of the transmission infrastructure.

Another option for utilizing natural gas reserves is producing chemicals or ultraclean liquid fuels, such as Fischer-Tropsch (FT) diesel. Both benefit from the flexibility of transportation options associated with liquid products. Increasingly stringent diesel sulfur regulations in the United States and Europe have improved the prospects for FT diesel worldwide. However, the capital cost of a gas-to-liquids (GTL) facility could be prohibitive, since these high-quality fuels would probably have limited demand in Central Asia and South Caucasus in the near future. Chemicals produced from natural gas, such as methanol, ammonia, hydrogen, and dimethyl ether (DME) also suffer from high capital costs and insufficient domestic demand. However, the technologies to produce chemicals and synthetic fuels are not yet mature and could potentially benefit from significant cost reductions in the next several decades.

For example, India's demand for DME could become important in the next decade. India's natural gas supply is not expected to meet its growth in electricity generation–driven gas demand in the next decade. Since import options from deep offshore Iranian pipelines or LNG would be very expensive, and overland options from Turkmenistan fraught with uncertainty, several Indian energy companies have partnered with BP Amoco[26] to develop an alternative fuel to natural gas. As a result, India is striving to develop DME[27] as a fuel in electricity generation and residential appliances, and as a diesel

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[25] *Black Sea Energy Survey*, IEA, 2000.

[26] See the India DME Project web site: *www.dmeforpower.net/pg_theproject.html.*

[27] DME is an extremely clean-burning synthetic fuel with a high cetane number that handles like liquefied petroleum gas. Initial tests have shown that it can be used as a diesel substitute that produces negligible soot, smoke, and SO_2, and significantly lower NO_x. It has also shown promise as a replacement for natural gas in some gas turbine applications and LPG in residential appliances.

alternative in compressed ignition (CI) vehicles. DME is manufactured from natural gas, but its advantage lies in its ease of handling, since it can be offloaded and stored using conventional unloading and storage equipment for liquid fuels. It is likely that the natural gas producers in the Persian Gulf, rather than the Caspian region, would be the first to reach the Indian market by converting natural gas to DME and then shipping it in conventional LPG tankers to the Indian coast. However, it is not clear at this point whether these developments will have any significant impact on the dynamics of gas trade in the region.

Natural gas producers will decide among these various options for profiting off their stranded gas, based on technological advancements, volumes of production, distance to markets, existing infrastructure, specific characteristics of their natural gas reserves, foreign investment behavior, and regulatory idiosyncrasies in the region. Although many of these alternative options are probably not economically feasible at this time, it is important to understand that pipeline transport is not the sole method for utilizing natural gas resources.

ENERGY RELATIONSHIPS IN THE CASPIAN SEA REGION

Interstate Dynamics

At its heart, the rivalry over the development of Caspian resources and infrastructure can be represented as a series of bilateral negotiations among rent-seeking stakeholders wielding different types of market power, whose objectives are illustrated in Table 5.2. The main actors are (1) states endowed with natural resources but lacking export routes; (2) states endowed with favorable transit geography but negligible natural resources; and (3) a multitude of private industries, dominated by a smaller subset of major multinational energy companies. This situation is further complicated by (4) outside political actors whose objectives are not necessarily financial, but who can steer the course of infrastructure developments through economic, diplomatic, and even military means.

However, the political component must be placed in the context of Caspian resources not being particularly competitive in foreign mar-

Table 5.2

Stakeholders in Caspian Energy Developments

Stakeholder	Objectives	Actions
Private industry	• Maximum long-term profits • Manage risk	• Develop economically viable infrastructure • Promote government subsidies • Hedge by waiting
Energy-rich, but infrastructure-poor states (i.e., Azerbaijan, Kazakhstan, Turkmenistan)	• Maximum revenue stream • Energy independence and political clout • Maintain power	• Attract foreign direct investment • Secure lucrative foreign markets
Energy and infrastructure-rich states (i.e., Russia, Iran)	• Maintain status quo and market power over transport	• Undermine competing projects • Upgrade existing infrastructure, lower tariffs
Pure transit states (i.e., Georgia)	• Steady revenues • Reliable and affordable supply	• Maximum transit fees without alienating project on its territory
Energy-poor neighbors (i.e., Turkey)	• Cheap, secure supply with as many routes as possible	• Support several options • Overestimate demand • Guarantee cost overruns
United States	• Promote former Soviet Union independence • Bolster non-OPEC supply • Support U.S., companies	• Support multiple pipelines through pro-U.S. countries

kets after transportation markups are added to the already high wellhead prices, since these resources are both expensive to produce and distant from major industrial demand centers and transshipment routes. Therefore, economics will always be an important driver, since enormous amounts of financing would be needed to promote economically unsound routes for the sake of purely political objectives.

Furthermore, certain combinations of pipeline routes are mutually exclusive, because suppliers do not have inexhaustible resources and

because demand hubs can become saturated. This puts "first movers" at a distinct advantage. With the enormous levels of financing needed to bring drilling rigs and other specialized equipment into this remote area and the ensuing slow capital stock turnover, infrastructure investment decisions will be largely irreversible in the short to medium term, locking stakeholders into particular relationships for some period of time. For the next several decades at least, oil—and to an even greater extent, gas—will not be supplanted by other energy sources that involve fundamentally different infrastructure options in the region.[28]

Decisions on oil and gas transportation routes will have significant implications for the revenue streams and energy security of the Caspian states. For example, Chevron has estimated that the CPC oil pipeline will add approximately $84 billion to Russia's GDP and $23 billion in tax revenue (Kazakhstan will receive approximately $8 billion in tax revenue) over its 35- to 40-year lifetime. Furthermore, the lack of a dedicated pipeline has already been shown to be risky to some players. For example, Azerbaijan's northern oil pipeline route to Novorossiysk proved unreliable, with up to 25 percent downtime due to transit fee disagreements, technical problems, and sabotage.[29]

The construction of the Tengiz-Baku-Tbilisi-Ceyhan pipeline would create a secure export route for Azerbaijan and transit revenues for Georgia and Turkey, and it would alleviate significant amounts of oil tanker traffic through the Bosphorus, if it is shown to be economically feasible. Kazakhstan, which already benefits from export flexibility with the CPC pipeline, the traditional Samara pipeline, and Iranian oil swaps, will also have the option to invest in the TBTC pipeline.

As currently envisioned, the TBTC pipeline would not transit Armenia. Advocates of an Armenian portion of the main export pipeline point out that transit through Armenia, instead of Georgia, would decrease the length of the pipeline and thereby reduce transit

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[28]Energy grids, which currently comprise natural gas and electricity infrastructures, will be more thoroughly integrated, with the natural gas pipelines potentially carrying hydrogen in the long-term future (past 2050), according to Ger Klaassen et al., "The Future of Gas Infrastructures in Eurasia," *Energy Policy*, Vol. 29 (2001), pp. 399–413.

[29]*Black Sea Energy Survey*, IEA, 2000.

costs. H. Con. Res. 162,[30] introduced on June 14, 2001, discourages the use of U.S. government funds and other kinds of support for oil and gas projects in the South Caucasus that explicitly exclude Armenia. However, there are indications that the United States is increasingly calling upon Azerbaijan to help in the fight against international terrorism since September 11, 2001. President Bush's waiver, on January 25, 2002, of Section 907 of the Freedom Support Act to end restrictions on U.S. economic assistance to Azerbaijan could be a sign of closer cooperation between the two countries. Furthermore, Armenia's traditional ally in the region, Russia, has begun to share similar views with Azerbaijan with respect to Caspian seabed demarcation, cross-border regulation and trade, and use of the Gabala radar station.[31] Under these circumstances, the inclusion of Armenia in the main export pipeline is not likely. In an effort to diversify its energy resources, Armenia plans to import natural gas from Iran and eventually decommission its Metsamor nuclear power plant.[32] So far, plans for a $140-million, 35-bcf pipeline that would carry gas from northern Iran to Armenia have passed the initial feasibility study.

Intrastate Dynamics

There are also important implications for relationships among the power centers within each state. It can be argued that the pace of petroleum development has been hindered more by multinational corporations' hesitation to operate in states with ad hoc regulations, insecure contractual agreements, and impermanent regulatory regimes than by the fear of interstate armed conflict. Transparent legal and regulatory institutions, including internationally recog-

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[30]Thomas web site:
http://thomas.loc.gov/cgi-bin/query/D?c107:1:./temp/~c107fSDwwu::.

[31]Douglas Blum, "Political Implications of the U.S. Military Intervention for the Transcaspian," *PONARS Policy Memo,* No. 211, January 25, 2002.

[32]Armenia shut down its Metsamor Nuclear Power Plant at Yerevan in 1989 because of safety fears after the 1988 earthquake. As a result of an economic blockade from Turkey and Azerbaijan and ensuing energy shortages, Armenia resumed operation of Unit 2 of Metsamor in 1995, supplying about 45 percent of its electricity. The Armenian government is planning on decommissioning the power plant by 2004 if it secures sufficient alternative energy sources, because of safety concerns. EIA web site: *www.eia.doe.gov/emeu/cabs/armenia.html.*

nized territorial rights, are essential in the quest to entice foreign companies to invest in exploration and drilling, secure financing in international capital markets, and arrange economically feasible transit fee contracts with downstream parties. Necessary internal reforms within petroleum-rich nations have historically been met with institutional inertia and rent-seeking individuals protecting their favored positions. One potential remedy for insulating substantial petroleum revenues from political machinations is the establishment of an independently managed, transparent "oil fund."[33] The course of these developments will be crucial to the stability and health of these regimes.

THE ROLE OF WATER AND ELECTRICITY IN CENTRAL ASIA

The hydrological and fossil fuel infrastructures of the Caspian Sea region, and Central Asia in particular, are inextricably linked. States near the headwaters of major river systems, such as Georgia, Tajikistan, and Kyrgyzstan, have benefited from high per-capita hydroelectric generation capacity and still untapped potential, as illustrated in Figure 5.8. However, the rest of the region, excluding Armenia, benefits from a rich endowment of fossil fuels. Armenia has a nuclear power plant whose future is uncertain.

The early 1990s were marked by disruptions in natural gas supply throughout the Caspian region, leading to the substitution away from natural gas toward fuel oil in thermal power plants.[34] Another post-Soviet trend has been the politicization and inefficient use of the former Soviet Trans-Caucasus Interconnected System, resulting in significant declines in interstate electricity trade. Furthermore, electricity trade has been hampered by disrepair resulting from the lack of investment in the transmission sector. Within Central Asia, the transmission grid is chronically overloaded, leading to frequent blackouts.

According to the International Energy Agency, the Caspian region could benefit from a more efficient allocation of electric power

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[33]See the "Some Potential Mitigating Factors to Conflict" section in this chapter.

[34]*Black Sea Energy Survey*, International Energy Agency, Paris, 2000.

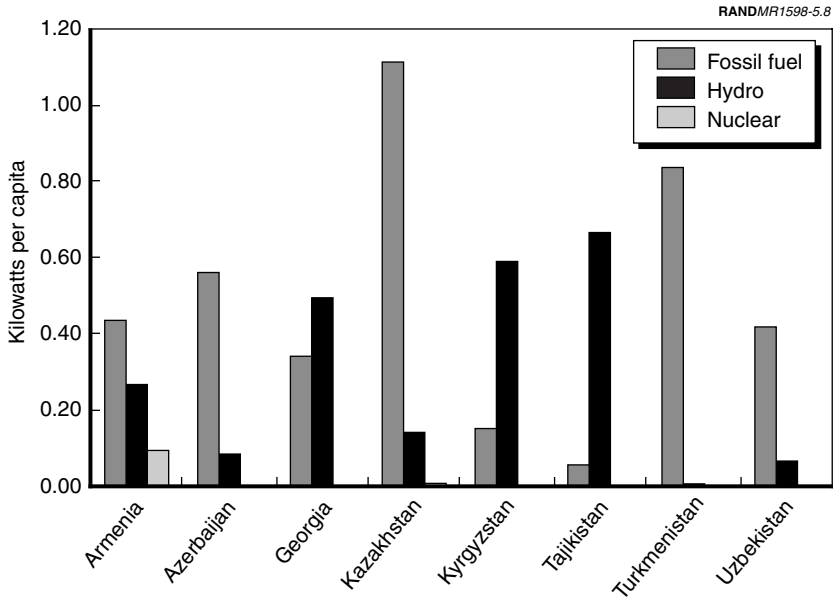

Figure 5.8—Per-Capita Electricity Generating Capacity by Plant Type (Energy Information Administration, 1998)

within the region. Turkey will offer a potentially significant market for electric power generation from South Caucasus.

Table 5.3 illustrates a clear difference between states that are dependent on hydroelectric power generation and those dependent on fossil fuel–powered generation. The fact that those states lacking hydroelectric power are relatively rich in fossil fuels but in great need of water for irrigation, while the hydro-rich states have less need for water but own negligible oil and gas reserves, has led to a fundamental dichotomy between "upstream" and "downstream" states in Central Asia.

The upstream countries, Kyrgyzstan and Tajikistan, lie at the headwaters of the Syr Darya and Amu Darya rivers, which provide the means for hydroelectric power generation. However, natural gas and oil must be purchased from downstream neighbors. The down-

Table 5.3

Water Relationships in Central Asia

Stakeholders	Fossil Fuel Endowment	Water Endowment and Control of Hydrological Infrastructure	Actions
Upstream (Kyrgyzstan, Tajikistan)	Poor	Rich	• Prefer to release water from reservoirs to generate hydroelectric power during peak winter demand • Must import fossil fuels from downstream neighbors
Downstream (Uzbekistan, Kazakhstan, Turkmenistan)	Rich	Poor	• Prefer water to be released from reservoirs in summer for irrigation

stream countries, Kazakhstan, Uzbekistan, and Turkmenistan, rely on this water for the irrigation of extensive, water-thirsty cotton and grain fields. Furthermore, these states differ in demand for water according to season. Upstream countries prefer to release water from their reservoirs to create power during peak electricity demand in the winter. Downstream countries, on the other hand, prefer that water levels be maintained in these reservoirs until the spring and summer, when water demands are at their peak in the arid lowlands.

Recent droughts have exacerbated these historic grievances between upstream and downstream states. Uzbekistan maintains that excessive volumes of water are released from the Toktogul reservoir in Kyrgyzstan to generate electricity during winter months, resulting in chronic water shortages during the summer. As a result, Uzbekistan cut off natural gas supplies to Kyrgyzstan for lack of timely payment during the winter of 2001, leaving residents in the northern regions of Kyrgyzstan without natural gas for part of the winter. The management of water demand among stakeholders in the region will have a

large impact on this relationship in the long term.[35] Thus far, attempts at regional water management have been largely theoretical, overshadowed by bilateral and sometimes trilateral barter arrangements.[36]

CAN NATURAL RESOURCES CONTRIBUTE TO ARMED CONFLICT?

Resources as Target of Conflict: Infrastructure Sabotage

In recent years, the vulnerability of oil and gas infrastructures has been highlighted by incidents of pipeline sabotage in Chechnya and Daghestan in Russia, Colombia, Nigeria, and elsewhere. Rebels and disenfranchised groups have disrupted pipeline operations in an attempt to deprive governments of petroleum revenues and, in some cases, to steal petroleum products. Although such incidents have generally failed to win major concessions from these regimes, they have increased the cost of petroleum operations and drawn international attention to these regions.

Both oil and gas infrastructures are elaborate systems that include production, gathering, processing, transmission, storage, and distribution elements. Long-distance pipelines provide the most attractive and unprotected targets for saboteurs, but they also have the least impact on both the infrastructure itself and the surrounding community, depending on the location, timing, and magnitude of such an attack. For example, over the past decade, more than 750 attacks on oil pipelines have occurred in Colombia, mostly from the Caño Limón oil field complex in the Llanos basin to Coveñas.[37] Rebels in Colombia bombed the overground Caño Limón-Coveñas oil pipeline 77 times in 1998, and more than 60 times in 1999, as a protest against the alleged involvement of foreign oil companies with

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[35]See the "Some Potential Mitigating Factors to Conflict" section in this chapter.

[36]Martha Brill Olcott, "Regional Cooperation in Central Asia and the South Caucasus," in Robert Ebel and Rajan Menon (eds.), *Energy and Conflict in Central Asia and the Caucasus,* Lanham: Rowman & Littlefield, 2000, p. 137.

[37]"Nigeria, Colombia Pipeline Deaths Mounting," *Oil & Gas Journal Online*, October 26, 1998.

right-wing paramilitary forces in Colombia.[38] Although there have been several tragic fires that have devastated local villages, most of the bombings have had major impact on neither the surrounding communities nor the operation of the pipeline itself. On the other hand, natural gas or LPG pipelines, which operate at higher pressures than crude oil or refined liquid products pipelines, are generally more dangerous and costly to repair. These dangers are mitigated, to some degree, by the amount of pipeline that is built underground.

The destruction of a critical component of a pumping or compressor station, which cannot be purchased "off the shelf," could significantly affect operations. On the other hand, such stations are typically located in small, fenced-in areas that can be protected more easily than the entire length of pipeline itself. For example, the proposed 42-inch diameter, 1-million b/d TBTC oil pipeline would be 1,743 kilometers long, with seven pumping stations.[39] Clearly, seven distinct pumping stations could be guarded more securely than the entire length of the pipeline.

Cascading failures from one infrastructure to another could multiply the impact of a damaged system. For example, oil or gas pumping stations could be affected by electric power failures. This contingency has been considered by the Caspian Pipeline Consortium, which has recently outfitted the 1,500-kilometer Kazakhstan-Russia Caspian Pipeline with backup power systems, which will help lower the probability of a cascading failure from the electrical infrastructure to the pipeline system.[40]

It is highly unlikely that infrastructure sabotage could lead to catastrophic disruption of oil and gas operations in the region. For an act of infrastructure sabotage to have anything but a local and transient effect, it would involve extensive planning, resources, knowledge,

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[38]John Wade, "Violence, Crime Continue to Cast Shadow over Future Oil Investment in Colombia," *Oil & Gas Journal Online*, January 17, 2000.

[39]"Construction of the $2.8 Billion Baku-Tbilisi-Ceyhan Oil Export Trunkline Could Begin in the Second Quarter of 2002," *Oil & Gas Journal*, June 18, 2001, p. 9.

[40]One of the battery backups is dedicated to SCADA and telecommunications loads and can last 48 hours in the event of an electrical grid disruption. "Caspian Crude Oil Pipeline Gets Power Systems," *Oil & Gas Journal*, June 18, 2001.

and luck, and would certainly need to be state-sponsored or at least involve a dedicated group with significant financial means and trained personnel.

Resources as Cause of Conflict: Competition over Distribution of Wealth

While few scholars have proposed that the development of natural resources[41] contributes directly to civil strife,[42] most studies of the "natural resource curse" suggest that a high degree of dependence on primary exports tends to have detrimental effects on a state's institutions and long-term economic development, particularly when the development of these resources coincides with modern state-building.

Anecdotal evidence of the "natural resource curse" has been known for many years, from the fate of Spain's economy in the 15th and 16th centuries in the wake of its mercantilist policies in the New World, to the aftermath of the Australian gold rush of the 1850s.[43] More recently, the peculiar economic decline of oil-producing nations in the wake of the oil booms of the 1970s has spurred a wealth of scholarly research on the macroeconomic and political consequences of natural resource development. For example, one study showed that economies with a high ratio of natural resource exports to GDP tended to have low growth rates, even after controlling for other variables known to influence economic growth, such as initial per capita income, trade policy, government efficiency, and

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[41]A distinction must also be made between nonrenewable natural resources, such as oil and gas, and renewable resources, such as water and cropland. The discussion in this section concerns nonrenewable resources.

[42]For example, Collier and Hoeffler find that an important risk factor for civil war is dependence on primary commodity exports. Paul Collier and Anke Hoeffler, "Greed and Grievance in Civil War," October 21, 2001. Available on World Bank web site: *www.worldbank.org/research/conflict/papers/greedandgrievance.htm.*

[43]According to Graham A. Davis, economist John Elliot Cairns described the negative effect of the Australian gold rush as early as 1859. Graham A. Davis, "Learning to Love the Dutch Disease: Evidence from the Mineral Economies," *World Development*, Vol. 23, No. 10, 1995.

investment rates, among others.[44] In fact, only two natural resource–dependent developing countries had sustained per-capita growth rates of greater than 2 percent per annum for the period from 1970 to 1992.[45]

First coined in the late 1970s, as a result of the stagnation of the Dutch economy following significant gas discoveries in the North Sea, the term "Dutch disease" has been used widely to describe the dilemma facing countries that have enjoyed a windfall in oil revenues. Although the term has become a catch-all phrase for a host of macroeconomic pathologies, it refers more specifically to the appreciation of a state's real exchange rate caused by a dramatic rise in primary exports, followed by the flight of capital and labor away from the manufacturing and agricultural sectors. While energy development attracts foreign direct investment, it is not necessarily a vehicle for diversification of the industrial structure, a goal of most energy producers. Some have argued that the draining of factors away from the agricultural sector has more serious implications for developing countries than the contraction of their often uncompetitive manufacturing industries, especially for societies whose cultures are fundamentally challenged by the uprooting of the agricultural employment and lifestyle.

More recently, scholars have supplemented this purely economic view with a synthesis of political, institutional, and economic explanations of the pathologies of natural resource development. The relevant issue is that regimes fail to take well-established corrective actions, instead placating their populations with low taxes and enhanced public spending, or stifling emerging public grievances by excessive spending on a loyal security apparatus. Using time series

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[44]The sample included 97 developing countries. Resource-based exports include agricultural products, minerals, and fuels. A "developing country" here is defined as having less than $5,000 per-capita income on a PPP (purchasing power parity) basis in 1971. "Natural resource dependent" is defined as being in the top quartile of resource-dependence (defined as the ratio of primary product exports to GDP in 1970) of countries in the sample. Source: Jeffrey D. Sachs and Andrew M. Warner, "Natural Resource Abundance and Economic Growth," *Development Discussion Paper*, No. 517a, Harvard Institute for International Development, October 1995.

[45]These countries were Malaysia and Mauritius, known for their efforts to stimulate labor-intensive manufacturing exports through the use of Export Processing Zones and other manufacturing promotion policies.

cross-national data from 121 states between 1971 and 1997, one researcher found that oil has a consistently antidemocratic effect on states.[46] The effect is stronger for states that are highly dependent on oil than those that are moderately dependent on oil. In fact, what may seem as inefficient decision-making can be an integral part of the calculus of rulers hoping to maintain their power. Under these circumstances, competing factions would tend to fight over the distribution of these rents, inefficiently exhausting the public good.

Although the Caspian states have made significant strides in macroeconomic reform over the past several years, there are indications that the OPEC experience of rent seeking and corruption will be an important aspect of the political landscape in this region.[47] The paths of recovery that Norway and the Netherlands took in the 1990s will probably not provide a simple blueprint for those countries with authoritarian political regimes, weak state institutions, and embryonic private sectors. However, the fact that the Dutch Disease appears curable is encouraging. Experience has shown that the transparent handling of oil revenues, privatization of state enterprises, and fiscal discipline are necessary, but not sufficient steps in handling the natural resource "curse." Whether the leaders of the Caspian states have the political will and ability to genuinely implement these remedies is unclear.

SOME POTENTIAL MITIGATING FACTORS TO CONFLICT

Caspian Sea Territorial Disputes

Despite lingering disputes over the legal status of the Caspian Sea and the division of its fossil fuel–rich seabed since the fall of the Soviet Union, there has been little direct military confrontation among the littoral states until recently. On July 23, 2001, Iranian gunboats threatened to use force against a BP research vessel operat-

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[46]For a review of the literature on the natural resource curse, see Michael L. Ross, "The Political Economy of the Resource Curse," *World Politics*, Vol. 51, January 1999, pp. 297–332.

[47]Terry Lynn Karl, "Crude Calculations: OPEC Lessons for the Caspian Region," in Robert Ebel and Rajan Menon (eds.), *Energy and Conflict in Central Asia and the Caucasus,* Lanham: Rowman & Littlefield, 2000, pp. 29–54.

ing in what Azerbaijan considers its territorial waters. This was followed immediately by a declaration from Turkmenistan that Azerbaijan was illegally claiming oil fields in the Caspian Sea, since no demarcation line had yet been agreed to between the two nations. Although Turkmenistan has claimed portions of the Azeri and Chirag fields to which the Azerbaijan International Operating Company (AIOC) holds rights, it has concentrated its dispute chiefly over the oil field that Baku calls Kyapaz and Ashgabat calls Serdar, with estimated reserves of 500 million barrels.

These events can be seen as an attempt, on the part of the "losers" of the Caspian Sea investment race, to exert pressure on the "winners" to agree to a multilateral framework on the status of the Caspian Sea that is more favorable than the status quo to the resource-poor states. These actions have helped accelerate the militarization of the Caspian Sea. A successful resolution would involve a multilateral agreement with possible international mediation.

A long-delayed summit of Caspian states is expected to take place in Ashgabat, Turkmenistan by the end of 2002, in order to resolve the legal status of the Caspian Sea. Over the last several years, Russia has advocated a solution whereby the seabed and subsoil of the Caspian would be divided into national sectors along international boundary lines, according to a variant of the median-line principle, while the waters would be held in common.[48] This approach has won the support of Kazakhstan and Azerbaijan, which have signed bilateral treaties with Russia. Iran has advocated dividing the Caspian seabed and waters so that each littoral state receives 20 percent of the total oil and gas resources. Turkmenistan has been ambivalent in its stance until recently, advocating a condominium principle whereby each littoral state would have a national coastal zone extending 10–20 miles into the sea. However, Turkmenistan insists that no development should take place on subsoil gas and oil deposits on disputed territories until a final multilateral agreement is reached.

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[48]"More Discussions on Caspian Legal Status Issue," *Alexander's Oil & Gas Connections,* Vol. 7, Issue 3, February 6, 2002.

Petroleum Funds

The most direct approach to insulating oil rents from political gaming is to establish a legally sanctioned "oil fund," which is a method of transforming a nonrenewable into a renewable resource by investing oil rents in financial assets. Typically, these funds are composed of a mixture of domestic and foreign financial assets, and are conservatively managed. Current examples of such funds vary in their purpose and the degree of government involvement, such as the Alaskan and Norwegian petroleum funds.[49]

The Alaskan Permanent Fund is unique in its legal independence from both the legislative and executive branches of government. It is unlikely that leaders (or legislatures, when appropriate) in developing countries would be willing to tie their hands by voluntarily proposing such stringent measures. However, different degrees of independence are possible. A Norwegian version, whereby the transparency of a government's budget is ensured, at least with respect to its use of oil rents, could be a very useful tool for many oil-producing governments in promoting fiscal discipline and trans-

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[49]For a review of these oil funds, see Rognvaldur Hannesson, *Petroleum Economics: Issues and Strategies of Oil and Natural Gas Production*, Westport, CT: Quorum Books, 1998, pp. 123–140.

According to Hannesson, the most independent petroleum fund in the world is the Alaska Permanent Fund, whose investment and withdrawal rules are enshrined in the Alaskan Constitution. At least 25 percent of oil revenue must be deposited into the fund, after which only the real return on the fund can be disbursed every year. All Alaskan residents, including children, typically receive a $1,000 annual check in the mail from the fund. The fund is independent of the state legislature, and the statutes that govern its management can be changed only by popular vote. The fund is known for its conservative investment strategy and a small and effective administration, whose operating expenses are roughly 1.5 percent of its total revenue. The income from the fund in 2010 is expected to reach the value of state oil revenues at their peak in 1981.

Hannesson points out that the Norwegian Petroleum Fund, established by law in 1990, contrasts sharply with the Alaskan Permanent Fund. The Norwegian Petroleum Fund is simply an account in the Bank of Norway, with no independent administration. Whereas the Alaskan fund emphasizes not only the independent, but "permanent" nature of its operations, the Norwegian fund was established to make the government's use of oil revenue more explicit and transparent. For example, government budgets that are passed with deficits are automatically covered by the fund's assets, so that the fund had no positive balance until 1996. Although the Norwegian fund seems to have been handled properly over the past decade, its future success will depend on the discipline of future legislators much more than will the Alaskan Fund.

parency. Furthermore, the addition of an egalitarian dividend policy could place enormous pressure on a government to use such public funds wisely.

One of the IMF's conditions for extending to Azerbaijan a recent installment of loans has been the creation of a transparent national oil fund. Although the fund has already been established, the IMF and President Aliyev are at odds over whether the management should reside within the purview of the legislative or executive branches of government, with Aliyev favoring more direct control over this institution. Samir Sharifov, the executive director of the Azerbaijan State Oil Fund, expects Azerbaijan to channel more than $52 billion during 2008–2014 into the fund.[50] Recognizing the need for the fund's independence, Sharifov does not favor using the fund to finance deficits in the national budget.

As of May 2001, Kazakhstan had already transferred $862 million into its own national oil fund, known as the National Strategic Fund for Future Generations, with the purpose of funding social welfare projects for future generations, according to President Nazarbayev.[51] The fund is managed by Kazakhstan's National Bank and is supported by revenues and royalties from oil development projects and certain privatization sales. It remains to be seen how viable and transparent these institutions will become.[52]

Water Management Strategies

Since ambitious, Soviet-style plans to increase water supply by manipulation of the natural environment, such as the diversion of Siberian rivers to Central Asia,[53] are no longer possible, it is

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[50]"Azerbaijan Grappling with Prospects of Oil Wealth Dilemma," *Oil & Gas Journal*, June 18, 2001, pp. 30–32.

[51]"Kazakhstan Reports on Money Deposit into National Oil Fund," *Alexander's Gas & Oil Connections*, Vol. 6, Issue 12, July 2, 2001.

[52]For a detailed review of Caspian oil funds and their political context, please refer to Yelena Kalyuzhnova, "The Economics of the Caspian Region and Development of the Oil Funds," presented at the Second CEAS-ROSES Workshop on Enterprise Reform, March 14, 2002.

[53]*Translations on Major USSR River Diversion Projects*, Foreign Broadcast Information Service, JPRS L/9951, Vol. I–III, September 1, 1981.

imperative that the states of the region find ways to manage water demand. Although the potential for a short-term crisis is high, particularly in periods of high demand and drought, there are several long-term mitigating trends that may avert potential water-energy blackmail scenarios in the future. First, a stable, multilateral agreement on water use in both major river systems is crucial. Second, the trend toward the privatization of water, gas, and electric utilities in the region will eventually eliminate the barter relationship among states. As government distortions of the water and energy markets decrease with the elimination of subsidies, there will be a more rational allocation of these resources based on their commodity price. Finally, investments in reservoirs, hydro capacity, irrigation canals, and a more robust, regional electricity grid will provide a hedge against uncertainties in weather.

However, these mitigating strategies represent a long-term approach to the regional water allocation problem. Whether continued drought conditions in the short term will lead to regional conflict remains to be seen. The water-energy dispute in the winter of 2001 did not result in substantial repercussions for the summer of 2001. This nonevent is hardly surprising; although water disputes have triggered low-level military actions throughout history, there is only one recorded incident of war over water, occurring approximately 4,500 years ago between the Mesopotamian city-states of Lagash and Umma.[54] However, it is unclear how appropriate these historical analogies are for the case of downstream states of Central Asia, whose residential water demand is only a small fraction of agricultural demand, as a result of unsustainable agricultural practices from the Soviet era. In the future, much will depend on downstream states' irrigation plans, where large segments of the population are employed, formally or informally, in the agricultural sector. Potential large-scale dislocations among this workforce resulting from severe water shortages or misallocation could provide a powerful destabilizing factor in the region.

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[54]Sandra L. Postel and Aaron T. Wold, "Dehydrating Conflict," *Foreign Policy*, September/October 2001, pp. 61–67. The authors point out that about one-fourth of water-related interactions have been hostile during the last half-century, with 37 of them leading to some military action.

CONCLUSIONS

At its peak oil and gas production, in approximately 15–20 years, the Caspian Sea region will provide a modest contribution to world oil supply, and it will be an important regional supplier of natural gas. Over the next decade, the region will likely see intense exploration and production activity, along with the gradual creation of a more robust oil, gas, and electricity infrastructure. However, it is too early to tell which direction the Caspian Sea region is going with respect to the management of its natural resource rents, and the ensuing relationships both within and among the littoral states.

The lack of an internationally recognized territorial division of the Caspian Sea has retarded foreign investment in disputed zones, while allowing real and perceived grievances by littoral states to be used as a pretext for the militarization of the region. However, even in the absence of such a multilateral agreement, it is difficult to imagine any of the Caspian states successfully shifting territorial boundaries by force without the implicit approval or explicit backing of Russia, which has a vastly superior military apparatus in the region. The more likely scenario of conflict stemming from the development of these natural resources would be over the internal distribution of revenues, the consequences of social dislocations associated with long-term petroleum-based growth, and the potential for physical sabotage to the infrastructure itself.

The petroleum-endowed states of the Caspian region will find that their government revenues will depend on fluctuating oil and gas prices, successes in exploration, and stability in infrastructure agreements, eventually declining as lower-cost reserves are exhausted in the coming decades. Clearly, fiscal discipline and the implementation of transparent oil funds by Kazakhstan and Azerbaijan are steps in the right direction. However, other legacies of the Soviet-era management of the natural resource infrastructure might prove more difficult to address, particularly in Central Asia, which will face fundamental questions about its potentially unsustainable agricultural policies if severe droughts and disputes among upstream and downstream neighbors continue in the region.

Since the attacks of September 11, there are signs of U.S. support for the TBTC pipeline. At the least, the deployment of U.S. special forces

in Georgia, the waiving of sanctions against Azerbaijan, rapprochement between Russia and Azerbaijan, increased Russian cooperation in the development of Caspian resources, and preliminary Kazakh interest will facilitate the project, barring any major problems found in the detailed engineering study. However, the impact of the rapidly changing events in Afghanistan on the energy situation in the Central Asian states, other than Kazakhstan, is highly uncertain. While Kazakhstan has secured the most flexible export options of any of the Caspian states, Turkmenistan is eager to find feasible markets for its natural gas. The building of a natural gas pipeline from Turkmenistan to India, transiting Afghanistan and Pakistan, is unlikely in the near term. However, it may prove to be a valuable lever for the United States and the international community in dealing with the political and military crises in the region.