Report

Illicit Trafficking in the Southern Tier and Turkey since 1999: A Shift from Europe?

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Illicit trafficking of nuclear and other radioactive material emerged as a serious international concern after the collapse of the former Soviet Union in 1991. The degradation of economic and social conditions in the Newly Independent States of the former Soviet Union (NIS) that followed the collapse left often poorly guarded nuclear and radioactive material vulnerable to an impoverished and criminalized society that saw it as yet another commodity for trade. In the early 1990s, Europe observed a sharp increase in nuclear smuggling incidents. Stolen nuclear materials—uranium and plutonium—as well as other radioactive material unsuitable for building a nuclear weapon, was brought from the former Soviet republics to Western Europe in the hope of finding a market.[1]

However, so far as can be determined, a market for such material either never existed in Europe, or it was successfully disrupted by efficient European intelligence and security services, particularly those in Germany. Several sting operations, in which German undercover agents posed as buyers, resulted in seizures of nuclear material. In the 1994 Munich incident, the activities of these agents may even have provoked an illegal transshipment of weapons-usable nuclear material from Russia.[2]

Although the controversial sting operations used by German security officials were questioned by critics, they seem to have proved effective in the long run. First, the results of these operations forced the Russian government to acknowledge the leakage of nuclear materials from its facilities, a problem it had denied for several years. Moscow called for major cooperative efforts to upgrade security and accounting practices at Russian nuclear facilities and to strengthen border controls.[3] Second, they may have discouraged many petty traffickers from trying to smuggle nuclear and radioactive material to Europe because they feared arrest by undercover agents—or because they were convinced by the press that no European market for it existed. Third, improved border controls in many European countries may have served as a psychological deterrent to would-be smugglers.[4] Together, these factors contributed to an overall decline in reported illicit trafficking incidents in Europe since 1994 (see Table 1).[5] Moreover, the number of incidents involving seizures of

nuclear material in Europe in 1995 fell almost by half from 1994 and decreased even further in the following years.

Despite these trends, Europe may still be used by sophisticated nuclear trafficking networks, whose activities have escaped detection.[6] This possibility is hinted at by the July 2001 seizure in Paris of a 5 gram (g) sample of highly enriched uranium that may have come from the NIS.[7] Still, in the past few years the movement of nuclear material from the NIS appears to have shifted southward, to the borders of the Caucasus, Turkey, and Central Asia. Analysts have long speculated that nuclear smugglers would exploit this region known as the southern tier, which includes the three Transcaucasian (Armenia, Azerbaijan, and Georgia) and five Central Asian republics (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan), as a transit corridor. Turkey, which borders on the Transcaucasian region, has also been regarded as a likely smuggling route.

These analysts have pointed out that the southern tier would be attractive to nuclear smugglers for a number of reasons. First, it is close to the Middle East and South Asia, where states and terrorist organizations that are the most likely customers for stolen nuclear materials are located. Second, since 1991, the region has become a major transit zone for smuggling of drugs, weapons, and other illicit goods. Third, border controls in the region are notoriously lax and government officials often corrupt, creating a favorable environment for smuggling. As a result, the southern tier seems a much more logical route than Europe for smuggling stolen nuclear and radioactive materials to possible end users. As Rensselear Lee, one such analyst, argued in his book, *Smuggling Armageddon: The Nuclear Black Market in the Former Soviet Union and Europe,* "professional smuggling chains undoubtedly would choose direct routes southward and eastward to states in the Middle East and South Asia rather than shipping nuclear wares through Europe."[8] As will be discussed below, the pattern of recent nuclear trafficking incidents in the NIS suggests well-established smuggling routes and networks in the southern tier may already be used for smuggling not just drugs and small arms, but also nuclear and other radioactive material.

Since 1999, there has been a sharp escalation in reported smuggling incidents involving nuclear and

TABLE 1
ILLICIT TRAFFICKING INCIDENTS IN EUROPE, 1991-2001

Year	Nuclear Material	Other Radioactive Material	Both	Total
1991	10	2	1	13
1992	24	12	4	40
1993	32	24	1	57
1994	35	16	3	54
1995	19	13	2	34
1996	11	10	2	23
1997	10	16	1	27
1998	5	20	1	26
1999	7	23	4	34
2000	7	32	1	40
2001	4	9	3	16

Note: Both state-confirmed and unconfirmed incidents with different degrees of reliability (high, medium and low) are included in the tables in this article. Data on illicit trafficking cases significantly vary in quality. Open press reports tend to sensationalize seizures on the one hand and omit important details on the other. Follow-up reports on investigations and trials are very rare. Therefore, information can often be distorted, inaccurate, and conflicting. (For a detailed discussion of data reliability problems, see Potter and Sokova, "Illicit Nuclear Trafficking." A special parameter—reliability factor—was devised for the Stanford DSTO to define the degree of reliability of information presented in each particular case: high, medium or low. High denotes high credibility of data (confirmed by IAEA and/or confirmed by competent national authorities), medium denotes reasonable credibility of data (not confirmed by the IAEA, but confirmed by local authorities directly involved in the incident investigations, as referenced in mass media reports), and low denotes less credible or conflicting data. It should be noted that more than 80 percent of the incidents recorded in the DSTO are in the reliability categories high or medium.

Source: Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO), Center for International Security and Cooperation, Institute of International Studies, Stanford University, 2002 (restricted access).

radioactive material in the southern tier and Turkey. Data recorded by Stanford University's Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO) show an increase from four such cases in 1998 to 16 in 1999, 12 in 2000, and 10 in 2001 (Table 2).[9] Much of this increase results from a growing number of seizures of radioactive material at border posts in the southern tier. Many of these posts have recently been equipped with U.S.-supplied radiation detection equipment. To some extent, then, the increase in reported smuggling incidents in the southern tier since 1999 may simply be the result of looking harder. However, the number of seizures of nuclear material has grown as well. Most seizures of nuclear material brought in from other countries resulted from intelligence and police work rather than customs and border checks (see Tables 3 and 4), suggesting inadequate border detection capabilities in the region.

Of the 90 trafficking incidents recorded by DSTO that took place in Europe from 1999 to 2001 (see Table 1), one involved a seizure of low-enriched uranium (LEU—uranium enriched to less than 20 percent U-235), two were seizures of gram amounts of plutonium in radiation sources, and one was a sample of highly enriched uranium (HEU—uranium enriched to 20 percent U-235 or more). Of the total of 38 incidents reported in the southern tier and Turkey over the same period (Table 2), there were 11 seizures of LEU, four confirmed seizures of HEU or plutonium, and one unconfirmed seizure of plutonium (these incidents are outlined in Tables 3 and 4).[10] Thus, although the total number of trafficking incidents recorded in the Caucasus, Turkey, and Central Asia from January 1999 to December 2001 remains lower than in Europe, more incidents involving enriched uranium and plutonium have been reported in the southern tier. This pattern suggests that nuclear trafficking from the former Soviet Union may now be flowing southward and that the reduction in smuggling incidents observed in Europe is indicative, at least in part, of this shift rather than an improvement in the situation overall. It should also be noted that the reported cases of illicit trafficking in nuclear and radioactive materials are probably only a small fraction of the actual number of cases. As a result, any conclusions about smuggling patterns based on reported cases should be regarded as tentative. Still the shift in reported cases to the southern tier is suggestive, and indicates that additional measures should be taken to combat illicit trafficking in the region.

This report will look at the situation in the Caucasus, Turkey, and Central Asia, in an attempt to establish whether these regions have become new routes for the smuggling of nuclear and other radioactive material. It will discuss illicit trafficking cases and the observed patterns in each of the three regions. It will also outline the response of countries in the region to illicit trafficking

TABLE 2
ILLICIT TRAFFICKING INCIDENTS IN THE SOUTHERN TIER AND TURKEY, 1991-2001

Year	Nuclear Material	Other Radioactive Material	Total
1991	0	0	0
1992	0	1	1
1993	1	3	4
1994	3	2	5
1995	1	1	2
1996	7	0	7
1997	3	0	3
1998	3	1	4
1999	7	9	16
2000	8	4	12
2001	5	5	10

Source: Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO), Center for International Security and Cooperation, Institute of International Studies, Stanford University, 2002 (restricted access).

and analyze the foreign assistance provided to them. The report concludes with recommendations for steps the international community can take to reduce the threat posed by illicit nuclear trafficking in the southern tier.

THE CAUCASUS

Illicit trafficking in nuclear and radioactive materials in the Caucasus emerged as a problem in the early 1990s, as drugs and arms dealers began shipping their illicit goods through the region. Today, Black Sea and Caspian Sea ports are increasingly used to transship illegal drugs from Afghanistan to Russia and Europe. The region has also become a pipeline for illicit traffic in small arms, which has fuelled crime and armed conflicts in Nagorno-Karabakh, Abkhazia, and Chechnya. Arab fighters have been crossing Georgian borders for several years to join Chechen separatist fighters in their struggle with Russian military forces, and recently the Russian government has accused Georgia of being unable to prevent Chechen fighters from using the Pankisi Gorge in eastern Georgia, along the border with Chechnya, as a base of operations.[11] The region also faces the problem of nuclear material trafficking.

At present, Armenia, Azerbaijan, and Georgia do not have weapons-usable nuclear materials remaining on their territory. However, until recently, Georgia had HEU at its two nuclear research facilities. Up to 2 kilograms (kg) of 90 percent-enriched uranium went missing from an unguarded nuclear site in Sukhumi during an armed conflict in the Abkhazia region of Georgia between 1993 and 1997. With U.S. assistance, the research reactor at the Institute of Physics in Tbilisi shipped 5kg of HEU remaining on-site to Scotland in April 1998.[12]

Against this backdrop, nuclear trafficking in the Caucasus is a growing concern, especially in Georgia, where there have been several reported nuclear smuggling incidents since 1999. In March 2002, the chairman of the Georgian State Border Guard Department indicated that Georgia, which borders on Russian and Turkey, may be used for transit of nuclear weapons components, weapons of mass destruction (WMD), and dual-use materials. He noted that Georgian customs and border control units had already detected attempts to transport such materials across the country.[13] In order to counter the mounting threat from drug, arms, and nuclear materials smuggling, the number of border guards on the Russian-Georgian

TABLE 3
REPORTED ILLICIT TRAFFICKING INCIDENTS INVOLVING LEU, HEU, AND PLUTONIUM IN EUROPE FROM JANUARY 1999 TO DECEMBER 2001

Date	Location	Material	Amount	Origin	Method of Seizure
5/20/1999	Beregovo town, Zakarpattya region, Ukraine	LEU (<20%)	20 kg	Unknown (likely Russia)	Intelligence operation
1/2/2001	Liepaja seaport, Latvia	Plutonium (Pu) in Pu/beryllium sources	6 g	Unknown	Unknown
1/28/2001	Kouri forest, Thessaloniki, Greece	Pu-239 antistatic devices	3 g	Russia	Informant's tip
7/22/2001	Paris, France	HEU (80%)	5 g	Unknown	Police operation

Source: Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO), Center for International Security and Cooperation, Institute of International Studies, Stanford University, 2002 (restricted access).

TABLE 4
REPORTED ILLICIT TRAFFICKING INCIDENTS INVOLVING LEU, HEU, AND PLUTONIUM IN THE SOUTHERN TIER AND TURKEY FROM JANUARY 1999 TO DECEMBER 2001

Date	Location	Material	Amount	Origin	Method of Seizure
5/28/1999	Dounav Most/Rousse, Romanian/Bulgarian border	HEU (76%)	10 g	Unknown (likely Russia)	Border control
8/6/1999	Almaty, Kazakhstan	LEU (3.5-4%)	5 kg	Unknown (likely Ulba, Kazakhstan)	Intelligence operation
9/20/1999	Batumi, Adzharia, Georgia	LEU (3-3.3%)	998.87 g	Unknown (likely Russia or Ukraine)	Intelligence operation
10/2/1999	Kara-Balta, Kyrghyzstan	Pu-239	1.49 g	Unknown	Unknown
12/3/1999	Semipalatinsk, Kazakhstan	LEU	1 kg	Ulba, Kazakhstan	Intelligence operation
1/10/2000	Almaty, Kazakhstan	LEU (3.6%)	530 g	Unknown (likely Ulba, Kazakhstan)	Intelligence operation
4/19/2000	Batumi, Adzhariya, Georgia	HEU (approx. 30%)	920 g	Unknown (likely Russia)	Border control
6/29/2000	Almaty, Kazakhstan	LEU pellets (3.6%)	4 kg	Unknown (likely Ulba, Kazakhstan)	Intelligence operation
7/28/2000	Vladikavkaz, North Ossetia, Russia	LEU	1.5 kg	Unknown (likely Russia)	Intelligence operation
9/16/2000	Tbilisi airport, Georgia	Pu, LEU (6%)	0.4 g 0.83 g	Unknown (likely Russia or Ukraine)	Intelligence operation
10/6/2000	Edirne, Turkey	LEU	150 g	Unknown	Intelligence operation
7/20/2001	Batumi, Adzhariya, Georgia	LEU (3.6%)	1.8 kg	Unknown	Informant's tip
10/15/2001	Tbilisi, Georgia	Pu	23 containers	Unknown	Intelligence operation
11/6/2001	Istanbul, Turkey	LEU	1.15 kg	Unknown (likely Russia)	Intelligence operation
12/19/2001	Samtskhe-Javakheti region, Georgia	LEU	300 g	Unknown (likely Armenia)	Intelligence operation

Source: Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO), Center for International Security and Cooperation, Institute of International Studies, Stanford University, 2002 (restricted access).

border has been increased by two and a half times since 2001. Thirteen additional border crossings have been established on the mountainous section of the border to prevent smuggling through hidden mountain paths.[14]

Nuclear Trafficking Incidents

Indeed, illicit trafficking activities in Georgia have increased noticeably in the past three years. For example, three seizures of enriched uranium took place in Batumi, a Georgian Black Sea port, between 1999 and 2001 (See Tables 3 and 4). One kilogram of 3 percent LEU seized in Batumi from three Georgian nationals in September 1999 was reportedly brought to Georgia from Russia via Chechnya and may have been destined for Iran. A seizure of more proliferation significant material took place in April 2000, when four Georgian nationals were arrested with 920 g of 30 percent-enriched uranium. This was the largest confirmed seizure of weapons-usable material outside Russia since 1994. The material was reportedly first discovered (possibly thanks to U.S.-supplied radiation detectors) when the smugglers entered the country at the Georgian border. It was then followed by the intelligence service. To date there have been no published open-source reports on the investigation of this incident or the trial of the suspects. The origin of the HEU and its intended destination have also not been revealed. In the third incident in Batumi, 1.8 kg of LEU enriched to 3.6 percent was seized in July 2001. According to media reports, this LEU was confiscated from a smuggling ring that included a senior officer in the Georgian Ministry of Defense.[15]

In October 2001, Georgian authorities reportedly seized 23 containers of "radioactive plutonium," most likely in radiation sources such as those contained in smoke detectors, from three suspects in Tbilisi. The plutonium was hidden in several apartments in one of the districts of the Georgian capital.[16] An ethnic Armenian with 300 g of LEU was arrested in Georgia in December 2001. Georgian officials suspected that the material had been stolen from the Metzamor nuclear power plant in Armenia.[17]

Apart from this suspected theft from the Armenian nuclear facility, no significant trafficking incidents involving nuclear material were reported in Armenia. The only two smuggling cases reported by the country were seizures of strontium-90 isotopes at the Meghri border checkpoint on the border with Iran.[18]

The situation in Azerbaijan is comparable to that in Armenia. The only nuclear material smuggling incident, reported by Azerbaijani media in March 2002, involved uranium ore, which was allegedly covertly mined and transported from the Nakhichevan Autonomous Republic of Azerbaijan to Iran for enrichment.[19] Although this incident remains unconfirmed, it still raises concern in view of Iran's alleged involvement in clandestine procurement of enrichment technologies.

However, the dearth of reported nuclear smuggling incidents in Armenia and Azerbaijan does not necessarily imply that trafficking is entirely absent in these countries. Both Armenia and Azerbaijan share borders with Iran, and these borders are notoriously porous, lack radiation detection equipment, and are guarded by untrained and corrupt border guards. Since there are no transit countries between Iran and Armenia and Azerbaijan, the smuggling of nuclear material into Iran is unlikely to cause sensational press reports or indignant government complaints about the inflow of such illicit goods, as it does in Turkey, for example. So far, no such incidents have been reported by Iran. However, both Armenian and Azerbaijani citizens have been implicated in illicit trafficking incidents in other countries in the NIS and Turkey. For example, Armenian citizens were arrested during an attempted resale of 20 kg of LEU in 1999 in Beregovo, Ukraine, and while transporting a very small amount of plutonium and LEU through Tbilisi airport, Georgia, in 2000. Azerbaijani citizens have also been involved in at least three nuclear trafficking incidents in Turkey in 1994 and 1998 and one incident in North Ossetia, Russia in 2000, which is discussed below.

Illicit trafficking activities have also been observed in the southern regions of Russia adjacent to the Caucasus. For example, in July 2000, 1.5 kg of LEU was discovered in a garage in Vladikavkaz, the capital of the Russian autonomous republic of North Ossetia. The seizure resulted from a six-month operation led by the Russian Federal Security Service (FSB). Two residents of Vladikavkaz, including a lieutenant colonel in the North Ossetian police, and a citizen of Azerbaijan were arrested. A cache of arms was also confiscated from the police colonel. In June 2000, the Azerbaijani citizen had reportedly traveled to Turkey with a sample of LEU and located a buyer. Using a fraudulent Russian passport, he carried the material out of Russia through a border checkpoint into Georgia and then on to Turkey. The source of uranium was not identified, though it is believed to have been brought into North Ossetia from another region of Russia.[20]

This case exemplifies a common smuggling scheme. First, the LEU involved was most likely stolen from a Russian nuclear facility. However, even after the trial, the source of the material has not been publicly revealed. Second, the case involved an international ring consisting of Russian suppliers and middlemen, an Azerbaijani trafficker, and buyers in Turkey. Third, the smuggling ring included a corrupt official, the police colonel, whose authority helped implement the operation. For example, he transported the uranium from Russia to Georgia in his car undetected, because border guards did not dare check the car of a colonel in a uniform.[21] Fourth, the parallel seizure of arms could imply that arms trafficking networks may be venturing out into a new market: nuclear material. Fifth, a person carrying nuclear material was able to cross international borders between Russia, Georgia, and Turkey several times, and neither his faked passport nor the uranium was detected, suggesting weak border control in the region.

Efforts to Combat Nuclear Smuggling

The United States and other countries have increasingly supported efforts to counter illicit nuclear trafficking in the Caucasus by organizing regional forums on export control, supplying radiation detection equipment, and providing training to customs and border officials from the region. For example, Armenian, Azerbaijani, and Georgian officials participated in an international border security training course jointly organized by the U.S. Department of Defense (DOD), U.S. Customs Service (USCS), Federal Bureau of Investigation (FBI), and Department of Energy (DOE) in 1999.[22] The course was held at DOE's Hazardous Materials Management and Emergency Response (HAMMER) Training Center at the Pacific Northwest National Laboratory (PNNL) in Richland, Washington, where border enforcement officials were trained to detect, identify, and interdict nuclear material and nuclear weapons components. A nuclear export control enforcement conference sponsored by the USCS was organized by the U.S. DOE in Tbilisi, Georgia, in March 2002.[23] Follow-on conferences and workshops to discuss training and expertise to detect and interdict nuclear material and nuclear weapons components are expected to take place in Azerbaijan and Armenia in the future. In the framework of the Georgia Border Security and Law Enforcement program, the U.S. Department of State spent $200,000 to provide radiation detection equipment as part of its assistance to strengthen Georgia's overall border infrastructure and security against any type of crime, including nuclear material smuggling.[24] In February 2002, the International Atomic Energy Agency (IAEA) conducted a training workshop for a group of Azerbaijani customs officers and provided radiation detection equipment for one border crossing in Azerbaijan.[25]

TURKEY

Turkey does not have large stocks of weapons-useable nuclear materials. Turkey has only one operating research reactor. It is housed at the Turkish Institute for Nuclear Energy, part of Istanbul Technical University, and is fueled by 20 percent-enriched uranium.[26] Although no uranium thefts were reported from this facility, Turkey is now widely viewed as a possible transit corridor for smuggled nuclear material. Lying at the crossroads not only between Europe and Asia, but also between the former Soviet Union and the Middle East, Turkey is already a well-established transit zone for illicit goods of other types, including drugs, weapons, small arms, gold, and illegal immigrants. These commodities are smuggled into and through Turkey by air, land, and sea from every direction. Commercial trade in consumer goods with private entrepreneurs from the former Soviet republics has grown into a large-scale, highly profitable business in the last decade. Any of these smuggling and trade networks could potentially be utilized for the smuggling of nuclear and other radioactive material.

Since Turkey shares borders with both Iran and Iraq, two countries of great proliferation concern, Turkish borders should be closely monitored to prevent anything radioactive from crossing them. However, of the existing 120 Turkish border checkpoints, only four are reportedly equipped with radiation detection systems donated by the United States, one for each border with Syria, Georgia, Bulgaria, and Iran. No detectors have been installed at Habur, a busy crossing between Turkey and Iraq, despite reports about ongoing smuggling across the Turkish-Iraqi border.[27] For instance, of special concern has been an overland cigarette smuggling route that runs across Turkey into Iraqi Kurdistan and down to Baghdad. Reportedly, hundreds of cigarette laden trucks following this route cross the Iraqi-Turkish border daily.[28] Theoretically, each of these trucks could carry nuclear material and go unnoticed by the Turkish border officials, who are known to have condoned the cigarette smuggling to Iraq, and are

not properly equipped to detect nuclear or radioactive material in any case.

Nuclear Trafficking Incidents

According to an internal classified report by the Turkish Atomic Energy Authority (TAEA), 104 nuclear smuggling incidents have occurred in the past eight years in Turkey. Most of the incidents allegedly involved radiation sources unsuitable for making a nuclear weapon, but some incidents were potentially more serious.[29] The DSTO records 23 incidents of illicit trafficking in nuclear and other radioactive material linked to Turkey since 1993, including the seizure of an HEU sample in Bulgaria which was reportedly being transported back to Moldova after a failed attempt to sell it in Turkey.[30] Twenty-one of these incidents involved nuclear material, mostly LEU; only two of the incidents involved other radiation sources. In 11 of the 13 incidents for which the mode of detection was reported, seizures were a result of police or intelligence operations rather than border control. Turkish officials also confirm that most, if not all, of the 104 illicit trafficking incidents listed in the TAEA report were detected through police work, signaling that border controls remain inadequate.

In 13 DSTO incidents, the seized material was either reported to have originated in the NIS or was being smuggled by citizens of NIS countries. For example, in March 1993, 6 kg of enriched uranium (enrichment level unknown) seized in Istanbul were smuggled into Turkey through the Aralik border gate in Kars province.[31] The material was reportedly transported from Uzbekistan to Chechnya, and then to Georgia and the Nakhichevan region of Azerbaijan, before it finally arrived in Istanbul.[32] In October 1994, an Azerbaijani citizen was arrested in Istanbul with 650 g of LEU he had bought in Baku.[33] In February 1997, a Turkish national brought 500 g of LEU from Georgia to Turkey and was arrested while trying to sell it to undercover policemen in Ipsala, Edirne province. In September 1999, almost 5 kg of uranium enriched to 4.6 percent were confiscated from an international smuggling ring, which included four Turkish, one Azerbaijani, and three Kazakhstani citizens. Kazakhstan authorities later confirmed the involvement of at least one Kazakhstani national and speculated that the seized LEU had likely come from the Ulba metallurgy plant in Ust-Kamenogorsk, Kazakhstan, which fabricates fuel pellets for nuclear power plants. In a more recent case, involving 1 kg of LEU seized in Istanbul in November 2001, the suspects said they had bought the substance from a Russian man. An Armenian citizen who was arrested in possession of 300 g of LEU in Georgia in December 2001 was reportedly also on his way to Turkey.[34]

Interestingly, 19 out of 21 seizures of nuclear material took place in Istanbul and its adjacent provinces of Edirne, Bursa, Kocaeli, and Yalova, located in the northwestern part of Turkey, which connects the Black and Mediterranean Seas. Two other Turkish incidents were recorded in Antalya, a large Mediterranean Sea port. The cluster of incidents around Istanbul may point to the existence of a nuclear black market in the area known for its international "bazaar," and the concentration around Istanbul's major seaports may indicate that the material is largely shipped by sea. For instance, an incident with LEU allegedly bound for Turkey and confiscated in Batumi in August 2001 involved the arrest of a ship captain, suggesting that the suspects might have planned to smuggle the material by sea.

Nuclear material originating in the NIS may also be smuggled to Istanbul via Ukraine, Moldova, Romania and Bulgaria, as demonstrated by the seizure of 10 g of 76 percent-enriched uranium on the Bulgarian-Romanian border in May 1999. Bulgarian authorities searched a car of a Turkish national en route to Moldova and found two certificates in Russian relating to the shipment of uranium. A more detailed inspection led to the discovery of a metal container with the HEU concealed inside an electrical compressor in the trunk. The suspect, who had lived in Moldova, said that he had acquired the material from a Ukrainian acquaintance and was supposed to sell it in Turkey. However, the meeting with potential buyers in Ankara did not take place, and he decided to return to Moldova. According to Bulgarian law at the time, the smuggling of small amounts of uranium was not considered a serious offense. The Bulgarian court released the courier soon after the arrest and sentenced him to a fine equivalent to about $900 and two years probation. Bulgarian media have reported that the courier "mysteriously" disappeared shortly after his release and cite "unconfirmed reports" that he later died in a car accident in Moldova.[35] While the amount of HEU involved in this case is small, it is possible that it was a sample and that the courier was exploring not only potential customers, but also potential smuggling routes.

Turkish authorities confirm that most nuclear material seized in Turkey originated in the NIS, particularly Kazakhstan. One of the two main trafficking routes

observed by the Turkish police runs through Romania and Bulgaria and then to Turkey by sea. The other major route is said to go through Northern Iraq.[36]

Yet another potential route for smuggling material from the NIS to Turkey might run from Russian or Ukrainian Black Sea ports, such as Novorossiysk and Odessa, which, just like ports in the United States, examine only a small fraction of shipping containers. The chances for an illegal shipment to go unnoticed in such ports are rather high. At least one seizure of nuclear material, possibly destined for Turkey, was reported in Odessa, Ukraine, in 1993. The local police apprehended a group of smugglers on board a Ukrainian ship bound for overseas in possession of 260 capsules of what was apparently LEU.[37] The fuel reportedly originated from one of the fuel cycle facilities in Kazakhstan, most likely from the Ulba plant.[38]

Efforts to Improve Border Control

The fact that nuclear material was transported undetected into Turkey confirms that the border control exercised by both the Turkish authorities and the transit countries has been inadequate. In 2000, Turkey and the United States entered into a cooperative agreement to strengthen border security. Since then, panel radiation detectors have been installed at four major border crossings, and more points of entry will be equipped in the future. Turkish nuclear regulatory and law enforcement authorities have participated in counter-smuggling training courses organized by the IAEA, the World Customs Organization, and Interpol. TAEA has also conducted similar training courses on nuclear smuggling prevention, detection, and response for Turkish customs and police officials.[39] In October 2002, a bilateral Bulgarian-Turkish exercise was conducted at the Kapikule border crossing to improve cooperation and coordination between the nuclear regulatory, customs, and law enforcement authorities of the two countries in combating illicit trafficking. Representatives of the IAEA, European Police Organization (EUROPOL), and the European Commission observed the exercise.[40]

CENTRAL ASIA

Nuclear facilities in Central Asia are considered potential targets for theft of weapons-usable nuclear material, although the amount of material held at facilities in this region is much smaller than the about 600 metric tons of HEU and plutonium inherited by Russia from the Soviet nuclear weapons program. The four research reactors in Kazakhstan and a research facility in Uzbekistan hold relatively small amounts of HEU and have all upgraded their security systems with international assistance. The fast-breeder power reactor in the Caspian Sea port of Aktau in Kazakhstan—capable of producing more than 110 kg of plutonium annually and once considered the biggest proliferation threat in the region due to its poor security and close vicinity to Iran—was permanently shut down in 1999. The 3,000 kg of plutonium generated during the reactor's operation were mixed in large casks with highly radioactive spent fuel, thus making the material self-protecting and difficult to handle in order to prevent its theft. These casks are now waiting to be removed to a secure location at the Semipalatinsk test site for long-term storage.[41] The fresh nuclear fuel that remained at the facility—about 3 metric tons of HEU—was shipped in summer 2002 to the Ulba Metallurgy Plant in Ust-Kamenogorsk for down-blending into LEU. The Nuclear Threat Initiative, a U.S. nongovernmental organization dedicated to strengthening global security against the proliferation of weapons of mass destruction, sponsored the security arrangements.[42]

Since the collapse of the Soviet Union, Central Asia has become a major transit zone for various illicit goods, suggesting that nuclear smugglers might find it attractive. For example, figures published by the United Nations Drug Control Program in 1999 show that 80 percent of the heroin consumed in Western Europe originated in Afghanistan and Pakistan, and that half of this heroin (about 120 metric tons per year, according to some estimates) is smuggled via Central Asia, along the revived Great Silk Road.[43] Only a negligible portion of smuggled drugs are interdicted on Central Asian borders. The mountainous, hard-to-patrol borders between Kyrgyzstan, Uzbekistan, and Tajikistan, skillfully intertwined by the Soviet government to make the republics interlinked and prevent any possible move toward independence, are ideal for drug trafficking. Continuing economic problems and high levels of unemployment in Central Asia make it easy to recruit willing drug couriers, and opportunities to make quick profits have corrupted local border, customs, police, and government officials. For instance, in August 2002, the head of a Kyrgyzstani frontier post on the border with Tajikistan was arrested in possession of 9 kg of heroin he had carried in the trunk of his car.[44] Russian border troops deployed on Tajikistan's border with Afghanistan have also been accused of providing transportation for drug traffickers.[45]

Some analysts have argued that these drug trafficking routes could be used by nuclear smugglers.[46] There are some signs that point in this direction. *Kazakhstanskaya Pravda* reported in February 2002 that 1.5kg of uranium smuggled from Tajikistan through Uzbekistan were seized in the southern region of Kazakhstan together with a large cache of heroin.[47]

Another major concern regarding Central Asia is the possible involvement of Russian organized crime in nuclear materials trafficking. Russian crime groups are heavily involved in the drug trade in the region. These resources could be put to use for smuggling nuclear material. The financial means and human intelligence resources available to Russian crime groups, as well as their liaisons with the highest governmental structures, could help them avoid detection and persecution. Many of these same groups are also involved in smuggling small arms and conventional weapons, which could bring them into contact both with possible customers for stolen nuclear material and with possible sources of such material. As analyst Rensselaer Lee argues, "if Russian criminals are positioned to sell a submarine from Krondstadt, they might be able to supply weapons-grade uranium or plutonium from Obninsk or Chelyabinsk to foreign buyers."[48]

As an example of such possible links, Spanish intelligence produced reports in 2001 that al Qaeda representatives had approached Semyon Mogilevich, an Israeli businessman of Ukrainian origin, with a request to obtain weapons-usable nuclear material from Russia.[49] Mogilevich had allegedly been involved with al Qaeda in trafficking drugs from Afghanistan. However, he has denied any involvement with bin Laden and his network.[50]

Nuclear Trafficking Incidents

Given Central Asia's location, it is puzzling that this region has not observed more nuclear trafficking incidents in the past decade. Most incidents recorded in Central Asia that involved nuclear material were seizures of LEU, and a large number of these involved material stolen from the Ulba Metallurgy Plant. Such incidents have decreased in the past few years, however, as international assistance has helped upgrade security at Ulba. No incidents involving HEU and only one involving just over a gram of plutonium, seized in Kara-Balta, Kyrgyzstan, in October 1999, were recorded in the region.[51]

All of the LEU seizures took place in Kazakhstan. Between 1999 and 2001, kilogram amounts of LEU were seized by Kazakhstani security services on four occasions (see Tables 3 and 4). For example, three Kazakhstani citizens carrying a container with 5 kg of LEU pellets enriched to up to 4 percent, which apparently had been stolen from the Ulba plant, were arrested in Almaty in August 1999 as a result of a joint operation between police and the Kazakhstani National Security Committee (KNB). In December 1999, 1 kg of LEU fuel pellets stolen from the Ulba plant by one of its employees in January 1997 was confiscated from his acquaintance, who was trying to sell it to an undercover KNB officer in Semipalatinsk.[52] The security system at the Ulba facility has been significantly upgraded since 1998 with the assistance of the U.S. government. However, the plant management admits to a continuing concern over material unaccounted for, which usually accounts for up to 2 to 4 percent of the output and can be easily diverted and stashed away by plant employees undetected.[53]

Thus far, only two reported illicit trafficking incidents have taken place in Tajikistan, which has a long border with Afghanistan. In April 2000, six residents of Leninabad Oblast in Tajikistan were sentenced to various terms of imprisonment for the theft and attempted sale of 1.5kg of uranium oxide. According to Tajikistani officials, one of the six convicted thieves was an employee of Vostochnyy Rare Metal Industrial Association (Vostokredmet), a uranium mining and milling facility in the town of Taboshar. In March 2002, 2 kg of natural uranium, also stolen from the Vostokredmet plant, were confiscated from another criminal ring that had allegedly traded in radioactive material since 1998 in Chkalovsk.[54]

No incidents of illicit trafficking in nuclear and other radioactive material have been reported in Turkmenistan. It shares a long, flat terrain and easily accessible borders with Iran and Afghanistan that are used heavily for smuggling Afghan drugs destined for Turkish, Russian, and European markets. The lack of incidents in Turkmenistan involving nuclear materials does not mean that they do not take place, but rather that they may not be detected as a result of poor border control and the lack of radiation detection equipment. Since the media in Turkmenistan are state-controlled, it is also possible that nuclear trafficking incidents have gone unreported there.

Similarly, no nuclear smuggling incidents were recorded in Uzbekistan, which has a 137-kilometer border with Afghanistan. As in Turkmenistan, state control of the media may lead to underreporting of incidents. However, Uzbekustabu nationals were involved in illicit trafficking cases detected in other countries. An

Uzbekistani national who was trying to smuggle a capsule of radioactive material onto a flight to the United Arab Emirates was arrested in Kyrgyzstan at the Manas airport in May 1999. Another Uzbekistani citizen was arrested together with two Kazakhstani nationals in Almaty in June 2000 while trying to sell 4 kg of LEU, also suspected to have been stolen from the Ulba metallurgy plant.[55]

Radiation detection capabilities at the borders in Central Asia range from poor to nonexistent. Russian customs officials have repeatedly complained that they have stopped many radioactive cargos from Kazakhstan after the Kazakhstani customs officials had presumably checked them for the presence of radioactivity levels. In several cases, detection equipment supplied by the United States or international organizations to strategically important border checkpoints has not been installed or used because of the lack of personnel trained in operating such equipment.[56] Although customs and border enforcement officials from Kazakhstan, Kyrgyzstan, and Uzbekistan participated in the DOD/USCS/FBI/DOE training program at PNNL's HAMMER training center in 1998, their number was apparently only a small fraction of what is actually needed given the length of the countries' borders and the number of checkpoints.

Efforts to Combat Nuclear Smuggling

In August 2001, the U.S. Customs Service organized a three-week International Border Interdiction training session for Central Asian officials in Texas. About eighty participants from Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan were trained in the use of state-of-the-art detection technology and techniques, such as locating hidden compartments in vehicles, identifying false documents, and recognizing suspicious behavior by smugglers.[57]

The United States has also provided some radiation detection equipment to Central Asian countries over the past few years, which has already helped to interdict radioactive shipments through the region. For example, Uzbek authorities at the Gisht Kuprik border crossing stopped and turned around a truck entering from Kazakhstan, which reportedly carried 10 radioactive containers concealed in scrap metal, which subsequently disappeared in Kazakhstan. The Iranian driver and his cargo were reportedly bound for Pakistan via Uzbekistan, Turkmenistan, and Iran.[58] The customs officers who found the radioactive material used portable radiation detectors provided to Uzbekistan by the USCS.[59]

Following the September 11, 2001 terrorist attacks, which have prompted increased attention to the problem of illicit trafficking in nuclear materials, the United States significantly boosted its assistance programs in Central Asia designed to secure nuclear facilities and strengthen border controls. Thus, in March 2002, an implementing agreement was signed by the governments of the United States and Uzbekistan, which foresees U.S. assistance in the repatriation of the Russian-produced HEU from the research reactor at the Uzbekistani Institute of Physics to Russia.[60] The Uzbekistani government also pledged to convert the reactor, which currently operates with a combination of 36 percent- and 90 percent-enriched fuel, to LEU.[61]

In April 2002, the U.S. State Department's Nonproliferation Bureau announced that $30 million in assistance would be distributed among Central Asian states to combat WMD trafficking. In explaining the rationale for this assistance, a U.S. State Department representative noted that eight attempts to smuggle radioactive material out of Central Asia were thwarted in 2001.[62] In addition, $20 million was pledged solely to strengthen borders in Uzbekistan. The Uzbekistani Institute of Nuclear Physics has started to produce its own radiation monitors, which are expected to be installed at every customs point in Uzbekistan as early as 2003. The detectors have been developed jointly with the U.S. Lawrence Livermore National Laboratory using a DOE grant.[63]

DOE is also planning to extend its Second Line of Defense program, which provides radiation detection equipment and training, to include Central Asia. Previously, the program worked only with Russia and Ukraine. Program personnel began surveys of priority border checkpoints in Kazakhstan in 2002, laying the groundwork for future installation of equipment.[64] Kazakhstan intends to follow Uzbekistan's example and develop its own indigenous radiation detection equipment for use at the borders and internal transit points. Since most of the seizures of nuclear and other radioactive material in Kazakhstan resulted from police and intelligence operations rather than from border control, Kazakhstani authorities have also been promoting the participation of law enforcement officials in all training courses on illicit trafficking issues.

The U.S. initiatives described above have been augmented by nonproliferation assistance efforts of other countries, such as Sweden and Germany. The Swedish Nuclear Power Inspectorate (SKI), acting in the framework of the Swedish Nuclear Non-proliferation

Assistance Programme (SNNAP), coorganized with Kazakhstani authorities a regional seminar in March 2000 and a regional conference in March 2002. These meetings addressed the legal and administrative aspects of illicit trafficking and national and regional responses to the threat. Both events took place in Almaty and brought together participants from Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. Turkmenistan was the only country from the region that did not participate in either event. The goal of the meetings was to exchange information, identify problems that states confront in the field of illicit trafficking, discuss national and international legislation and export control systems, review national strategies, and discuss the need for coordinated bilateral efforts between the countries in the region.[65] A follow-up conference will be held in Yerevan, Armenia, in Spring 2003. Negotiations are under way between SKI and the Kazakstani Customs Committee with regard to Swedish assistance in providing detection equipment to the Kazakhstani borders.[66] The German Society of Nuclear Reactors and Facilities (GRS) conducted two workshops in Kazakhstan in 1997 and 2000 dedicated to the design of physical protection systems and the analysis of threats faced by the nuclear facilities in the region. The European Union will sponsor participation by Kazakhstani and possibly other Central Asian delegates in a training workshop to be held in Karlsruhe, Germany in November 2002.[67] The workshop will train law enforcement and radioanalytical laboratory experts in methods of combating illicit trafficking of nuclear and other radioactive materials.

CONCLUSIONS AND RECOMMENDATIONS

One explanation for the decrease in the number of proliferation-significant nuclear smuggling incidents in Europe and the parallel increases in such incidents in the Caucasus, Turkey and Central Asia, is that illicit trafficking routes have shifted from the increasingly better protected European borders with more trained personnel and radiation detection equipment to the poorly protected southern republics of the former Soviet Union and Turkey. However, the uncertain nature of the available open source data make it difficult to confirm this hypothesis.[68]

For example, while Georgia and Turkey have intercepted materials brought on their territories from abroad (see Tables 3 and 4), Armenia and Azerbaijan and the republics in Central Asia have had no recorded activity to suggest that they are used as smuggling corridors, despite their potential attractiveness. All reported seizures of nuclear material in Central Asia appear to have involved material that originated from Central Asian facilities, such as the Ulba Metallurgy Plant in Kazakhstan and the Vostokredmet plant in Tajikistan, rather than material brought from outside. The absence of significant seizures of "foreign" material in these countries does not prove that they are not being used as smuggling routes, however. The lack of reported cases could mean that nuclear material smuggling has gone unnoticed because of inadequate detection equipment on Central Asian borders, because the available equipment is limited in its ability to detect some types of material (such as HEU), or because the border guards or customs officials are not trained in the equipment's proper use.[69] Police and intelligence work in cases of transit of the "foreign" material may not be effective if the smugglers have neither been detected at the border nor tried to find a buyer in their country—the stage where most known nuclear traffickers have been caught. Central Asian media may also underreport nuclear trafficking incidents. As a result, even though Georgia and Turkey would appear to be the countries most in need of assistance in combating illicit trafficking, other countries in the Caucasus and Central Asia should also receive assistance because it is entirely possible that they are transit corridors for nuclear and other radioactive material.

The international community has historically been less concerned about the southern tier than Europe because no major seizures of weapons-usable material took place in this region until 2000, when almost a kilogram of HEU was seized in Batumi, Georgia. This seizure and the incursions of the Islamic Movement of Uzbekistan—a new terrorist group purported to have links with the Taliban and al Qaeda network—into Kyrgyzstan in 1999 and 2000 brought the international community's attention to the significance of the region to the global security environment. International assistance programs, which aim to strengthen the southern tier countries' borders against drugs, arms, and WMD trafficking, increased. As noted above, newly installed radiation monitoring equipment at several major border checkpoints in the southern tier has contributed to the increase in detected trafficking incidents in the past three years.

The international community, however, did not fully acknowledge the severity of the situation in the region and its potential implications for international security until the terrorist attacks on September 11, 2001. The demonstrated sophistication of the al Qaeda network

and its resolve to carry out mass killings of civilians made the threat of nuclear terrorism more credible than before. Since then, the United States and some European countries have significantly enlarged their nonproliferation assistance programs in the Caucasus, Turkey, and Central Asia to include efforts that range from helping regulating authorities develop national legislation, to converting the Uzbek HEU-fueled research reactor to LEU fuel, to equipping more border crossings with radiation detection equipment.

Although these efforts need to continue, the challenge will be daunting in view of the widespread corruption in the former Soviet republics. A 2002 survey by Transparency International, an international nongovernmental organization monitoring corruption, ranks Azerbaijan, Kazakhstan, Georgia, and Uzbekistan, as well as Turkey, as among the most corrupt countries in the world.[70] The situation is comparable in other countries of the region as well. All these countries are suffering, to varying degrees, from an unstable political regime and insufficient economic development. Unless the overall economic conditions are improved, underpaid public officials will consider it "their right" to better their financial situation by demanding bribes for their services. Therefore, it remains to be seen to what extent these assistance programs will actually deliver practical results. Because the annual income of a customs officer or a border guard in these countries rarely exceeds $1,000—an insignificant amount in comparison to either the perceived or actual monetary value of smuggled nuclear and radioactive materials—these personnel are susceptible to bribery. This unsatisfactory situation will continue to exist until its socio-economic roots are addressed.

Still, there are some critical steps, which the international community can take to mitigate the threat of illicit nuclear trafficking in the southern tier. These include:

- Equipping all strategic border crossings and points of entry, such as seaports and airports, in Central Asia and the Caucasus, especially those on the borders with Afghanistan, Iran, and Turkey, with neutron radiation detectors, which are better able to detect nuclear materials than other types of radiation detectors. Such detectors should be of indigenous production to assure cost-effectiveness and sustainability.
- Making the installation of radiation detection equipment on Turkish borders with Iraq and Iran the highest priority. Georgia, which has also detected multiple nuclear trafficking incidents, would also benefit from additional border security assistance programs.
- Increasing training for customs and border patrol officers in operating radiation detection equipment, understanding the resultant readings, recognizing suspicious behavior of smugglers, applying various search techniques, and responding effectively to detected incidents.
- Assisting states in the southern tier to begin covert monitoring by hidden detection devices and mobile radiation detection units along "green" borders—long border sections without continuous control—known or suspected to be used for trafficking. Apart from increasing the detection rate of smuggling incidents, such activities could also serve as a psychological deterrent to would-be smugglers.
- Assessing the impact and effectiveness of donor-supplied equipment and training[71] by requiring recipient countries to share information with donor countries on detected illicit trafficking incidents on a regular basis.
- Increasing anticorruption efforts on the national level to prevent the involvement of law enforcement authorities, as well as nuclear facility guards and employees, in illicit trafficking schemes. Improve the pay scales of these personnel. Introduce financial rewards to customs and border guards for detecting trafficking incidents as a means to counter bribery and keep them motivated. Such reward schemes could also be considered for informants.
- Improving coordination of foreign assistance programs to the region to eliminate duplication of efforts and to adequately address all the segments of southern tier borders.[68]
- Improving intelligence sharing on thefts, trafficking incidents, and suspects among law enforcement agencies of southern tier and other countries to facilitate more effective interdiction of nuclear smugglers and their networks.
- Enhancing transparency and international cooperation between nuclear and law enforcement authorities of the countries involved in illicit trafficking cases to facilitate follow-up analysis of the seized material, identification of its origin, and criminal investigation of the incidents.
- Enhancing international investigation and research into the potential involvement of organized crime, existing trafficking networks, and international terrorist organizations in illicit trafficking activities.

[1] For the purposes of this article, the term nuclear materials includes enriched uranium and plutonium. The term radioactive materials includes other radioactive isotopes used in industry, research, and medicine, such as cesium-137, strontium-90, and cobalt-60. Although radioactive materials other than highly enriched uranium and plutonium cannot be used to make a nuclear explosive device, they are still a proliferation concern because they could be used to manufacture a radiation dispersal device, which would contaminate an area with radioactive substances. The same groups and individuals that traffic in radioactive materials may also peddle nuclear materials, so that understanding the pattern of radioactive material trafficking may help reveal previously undetected nuclear trafficking routes. On this point, see William C. Potter and Elena Sokova, "Illicit Nuclear Trafficking in the NIS: What's New? What's True?" *Nonproliferation Review* 9 (Summer 2002), p. 119.

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[3] Vladimir Orlov, Roland Timerbaev, and Anton Khlopkov, *Nuclear Nonproliferation in U.S.-Russian Relations: Challenges and Opportunities* (PIR Center, 2002), pp. 38-39.

[4] For the description of national responses to nuclear trafficking in Europe, see *Proceedings of the IAEA International Conference "Security of Nuclear Material¾Measures to Prevent, Intercept and Respond to Illicit Uses of Nuclear Material and Radioactive Sources," Stockholm, May 7-11, 200*, C&P Papers Series 12/P (Vienna, Austria: International Atomic Energy Agency, 2002), pp. 434-476.

[5] All charts and the table in this paper are made based on the analysis of the Database on Nuclear Smuggling, Theft and Orphan Radiation Sources (DSTO), Center for International Security and Cooperation, Institute of International Studies, Stanford University, 2002 (restricted access).

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[8] Lee, *Smuggling Armageddon*, p.26.

[9] For the purposes of this paper, the Caucasus region also includes the southern Russian autonomous republics of North Ossetia and Dagestan.

[10] These figures were derived from the DSTO database, Center for International Security and Cooperation. Stanford University, Palo Alto, California.

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