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NUCLEAR TRAFFICKING ISSUES IN THE BLACK SEA REGION*

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I. INTRODUCTION

The European Union (EU) non-proliferation policy prioritizes preventing trafficking in nuclear materials.[1] The EU institutions, as well as the member states, have developed tools and expertise to address threats related to nuclear trafficking, which they employ both inside and outside the union. The EU has also supported projects and programmes to combat trafficking with both financial and technical means as part of its overall support to the International Atomic Energy Agency (IAEA). In nuclear trafficking, thefts and seizures of weapon-usable uranium and plutonium cause the greatest concern. As of December 2013, five of the seven most recent trafficking incidents involving unauthorized possession of highly enriched uranium (HEU) had taken place in the EU's neighbourhood in the Black Sea region. One seizure was made on the Bulgaria–Romania border in 1999, three more in Georgia in 2003, 2006 and 2010, and another in Chisinau, Moldova's capital, in 2011. In a sixth HEU case, in France in 2001, the subsequent investigation established criminal connections to the region, particularly to Moldova and Romania, and identified links to the 1999 seizure in Bulgaria. The modalities of the 2011 incident in Chisinau suggested that it might also have been linked to the Bulgarian and

[1] Council of the European Union, 'Council Conclusions and new lines for action by the European Union in combating the proliferation of weapons of mass destruction and their delivery systems', 17172/08, 17 Dec. 2008, p. 7.

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SUMMARY

The Black Sea region is a vital strategic crossroads between Europe, Asia, Transcaucasia, Russia and the Middle East, and has long been used for smuggling of licit and illicit goods, including nuclear material in the past two decades.

Over 630 nuclear trafficking incidents were recorded in the Black Sea states between 1991 and 2012, almost half of them in Russia. Five of the recorded incidents involved highly enriched uranium (HEU), raising concerns about the region's use as a transit route for nuclear material smuggled from the former Soviet Union to the Middle East.

As nuclear security in the post-Soviet states improves and the threat of nuclear theft decreases, trafficking cases involving nuclear material in Russia and other Eurasian states have been steadily declining since the mid-1990s.

However, the recent seizures of HEU samples in Georgia in 2010 and Moldova in 2011 suggest that some amount of previously stolen weapon-usable nuclear material may still be available for illegal transfer and sale to state and non-state actors. Therefore, it is important that the efforts to counter nuclear trafficking in the Black Sea region are continued and enhanced.

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French HEU cases. The three HEU seizures in Georgia also had apparent links between them, including the degree of uranium enrichment, the similarity of the packaging and the involvement of some of the same individuals. The two series of what appear to be interlinked trafficking incidents have raised concern that criminal networks may be using the Black Sea region to smuggle nuclear materials along the routes that are also used for drug and human trafficking.

This paper explores how the problem of nuclear smuggling has affected the Black Sea region. Section II discusses the global trend in trafficking, while the situation in Russia with a view to how it might impact smuggling in the Black Sea states is outlined in section III. The main section of the paper, section IV, describes the trends and patterns of nuclear trafficking that have been observed in the Black Sea region over the past two decades; it concentrates specifically on intentional, profit-motivated smuggling cases, examines the involvement of organized criminal groups (OCG) and identifies nuclear smuggling routes. Section V presents a brief comparison of the situation in the Black Sea region to that in Central Asia, an area that might also be used as a nuclear smuggling corridor because of its geographical location. Some of the efforts to counter nuclear trafficking in the Black Sea region are touched on in section VI, while section VII provides some specific recommendations on enhancing these efforts and improving regional cooperation.

II. GLOBAL TRENDS IN TRAFFICKING IN NUCLEAR AND OTHER RADIOACTIVE MATERIAL

Trafficking in nuclear and other radioactive material became recognized as a potential threat to international security and the non-proliferation of nuclear weapons in the early 1990s. Although incidents of theft and loss of control over radioactive substances were not uncommon earlier, the collapse of the former Soviet Union in 1991 was the occurrence that opened the infamous Pandora's box of nuclear trafficking. The political crisis, fast deteriorating post-Soviet economies, the rapid impoverishment and criminalization of the society, and inadequate protection of nuclear facilities and national borders were factors that contributed to the former Soviet nuclear inventories becoming vulnerable to diversion. As people, both inside and outside the nuclear sector, sought new ways to make a living, or in some cases a fortune, some individuals began to explore illegal trade in nuclear material, and the first successful thefts of uranium and plutonium occurred. As a result, the countries in Eastern and Central Europe experienced a wave of nuclear trafficking from the former Soviet Union. Arrests of criminals trying to smuggle or sell nuclear material were frequently reported by Austria, the Czech Republic, Germany, Hungary, Poland and other European countries, thus creating the impression that a nuclear black market existed in Europe. Nuclear material trafficking peaked in 1994, when local authorities made several seizures of weapon-usable uranium and plutonium of Russian origin in the Czech Republic and Germany. By that time, the danger of nuclear smuggling from the former Soviet Union had become recognized at the highest political level, and international cooperative efforts began in Russia and other post-Soviet and post-Warsaw Pact countries to improve security and combat trafficking of nuclear material.

In the 1990s, the main concern about illicit trafficking was normally associated with state or non-state actors seeking to acquire nuclear fissile material that could be used for making a nuclear weapon. However, over the years, this threat perception expanded to include a potential terrorist use of other radioactive material as well, such as radioactive sources containing non-fissile caesium-137, strontium-90, cobalt-60 and other isotopes, which are commonly used in a variety of industrial, medical and research applications.

From January 1993 to December 2012, the IAEA collected 2331 state-confirmed incidents in its Incident and Trafficking Database (ITDB), including 419 incidents of unauthorized possession and related criminal activities, 615 incidents of theft and loss, and 1244 incidents of other unauthorized activities and events, such as recovered radioactive sources and inadvertent shipment of radioactive material and contaminated scrap metal (figure 1).[2] About 70 other cases were not included in the data set because they could not be categorized due to insufficient information. Although unauthorized possession and related criminal activities have declined since the peak in 1994, a clear increase in the overall number of cases since the 1990s has occurred—from an average of about 50 per year to about 150 cases since the year 2000.

[2] International Atomic Energy Agency (IAEA), 'IAEA Incident and Trafficking Database (ITDB): incidents of nuclear and other radioactive material out of regulatory control', Fact sheet, 2013 <http://www-ns.iaea.org/downloads/security/itdb-fact-sheet.pdf>.

Figure 1. Trafficking and other unauthorized activities involving nuclear and other radioactive materials confirmed by states to the International Atomic Energy Agency's Incident and Trafficking Database between 1993 and 2012

Better awareness, improved reporting and a higher detection rate due to newly installed radiation-monitoring equipment appear to be the main reasons behind this increase. As figure 1 clearly shows, the incidents that contributed most to the increase are losses and other unauthorized activities (i.e. the so called loss-of-control incidents), rather than cases with a clear criminal component, such as thefts, sale attempts and intentional smuggling. The most recent peak, recorded in 2006, was mainly due to a change in the reporting practice of just one state. In 2007 that state reverted to its prior practice, and the level of incidents again declined.[3]

In the 1990s the number of nuclear trafficking incidents reported by the mass media far exceeded what was officially confirmed by states in their reports to the IAEA. For example, the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO) recorded 300 additional cases that were reported in open sources from January 1993 to December 1999, almost 100 per cent more than those confirmed in reports to the IAEA in the same period.[4] In addition, the DSTO collected 77 incidents that took place in 1991–92 that remained outside the scope of the IAEA's ITDB (figure 2). Despite the clear difference in the number of cases, the diagram curves of both data sets reflect the same trends. The DSTO data, which combines open source incidents with the state-confirmed reports collected by the IAEA, indicates that the peak in nuclear trafficking in the 1990s was reached already in 1993—with about 100 cases, half of them involving nuclear material. The share of such incidents increased even further in 1994, to about 60 per cent. In 1996 and 1997 the number of incidents sharply decreased by about half, reflecting the discontinued practice of sting operations by Germany after the scandalous shipment of nuclear material to Munich on an ordinary Lufthansa flight from Moscow in 1994. It was not long before two new peaks occurred: in 1998 with 110 cases, and in 1999 with 142 cases. However, these increases were mostly attributable to cases involving radiation sources and loss of control, rather than criminal incidents. Since that time, incidents without apparent relation to criminal activity have increased even more, and since 2004 they have

[3] International Atomic Energy Agency, 'IAEA Illicit Trafficking Database (ITDB): IAEA information system on illicit trafficking and other unauthorized activities involving nuclear and radioactive materials', Fact sheet, 2008, <http://www.iaea.org/newscenter/features/radsources/pdf/fact_figures2007.pdf>.

[4] Zaitseva, L. and Steinhäusler, F., Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), Division of Physics and Biophysics, University of Salzburg, Austria (confidential).

Figure 2. Trafficking and other loss-of-control incidents recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012

accounted for most of the recorded cases. The DSTO has recorded over 3000 cases since 1991.

The IAEA's ITDB documents 15 confirmed incidents involving unauthorized possession of HEU and plutonium for the period 1993–2012.[5] The DSTO recorded four other highly credible and widely publicized cases involving kilogram amounts of Russian HEU, which had been reported in open sources after 1992 but not confirmed by Russian authorities to the ITDB (table 1). These 19 incidents involved a total of almost 20 kg (19 571 grams), 98 per cent of which was HEU (19 201 grams) and the remaining two per cent plutonium-239 (370 grams). Over 16 kg of this material was stolen and intercepted in Russia. The remaining amount, all of which is suspected to be of Russian origin, was seized in other countries. The majority of HEU and plutonium incidents—all of them in Russia and Central Europe—were recorded in the early to mid-1990s, and only seven have occurred since then.

Five of the seven most recent HEU incidents took place in the Black Sea region, all of them smuggling and sale attempts. In the sixth case, which occurred in France, the investigation identified links to the seizure of HEU in Bulgaria and criminal connections to Moldova and Romania, via which the HEU sample was transported to Paris.[6] This unsettling record indicates that nuclear trafficking routes have shifted from Central to Southern Europe and underscores the importance of the Black Sea region in the global fight against nuclear trafficking, especially given its reputation as a smuggling hotbed between the East and the West. The seventh HEU case, recorded in 2000, was the most recent confirmed incident in Russia that involved weapon-usable nuclear material, and the only HEU seizure in the country of origin since 1995. Although Russia also shares the coastline of the Black Sea, its vast nuclear infrastructure, a large record of nuclear trafficking incidents and a reputation as the country of origin for much of the nuclear material intercepted by other states make it worthwhile to explore its current situation outside the context of the Black Sea region.

[5] International Atomic Energy Agency (note 2).

[6] Baude, S. et al., 'The French response in cases of illicit nuclear trafficking: lessons learned from a real case', International Conference on Illicit Nuclear Trafficking: Collective Experience and the Way Forward, Edinburgh, 19–22 Nov. 2007, <http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1316_web.pdf>, pp. 369–70. See also Otrebsky, M., 'A perspective on supporting an investigation by EUROPOL', Paper presented at the Fourth International Conference on Export Control, Warsaw, 30 Sep.–3 Oct. 2002.

Table 1. Highly credible incidents involving unauthorized possession of highly enriched uranium and plutonium-239, 1992–2013

Date	Location	Material	Amount (grams)	IAEA confirmed
6 Oct. 1992	Podolsk, Russia	HEU (90%)	1500	No
29 July 1993	Andreeva Guba, Russia	HEU (36%)	1800	No
28 Nov. 1993	Polyarny, Russia	HEU (20%)	4500	No
Mar. 1994	St Petersburg, Russia	HEU (90%)	2972	Yes
10 May 1994	Tengen-Wiechs, Germany	Pu	6.2	Yes
13 June 1994	Landshut, Germany	HEU (87.7%)	0.795	Yes
25 July 1994	Munich, Germany	Pu	0.24	Yes
8 Aug. 1994	Munich Airport, Germany	Pu	363.4	Yes
14 Dec .1994	Prague, Czech Republic	HEU (87.7%)	2730	Yes
June 1995	Moscow, Russia	HEU (21%)	1700	Yes
6 June 1995	Prague, Czech Republic	HEU (87.7%)	0.415	Yes
8 June 1995	Ceske Budejovice, Czech Republic	HEU (87.7%)	16.9	Yes
29 May 1999	Rousse, Bulgaria	HEU (72.65%)	10	Yes
2000	Elektrostal, Russia	HEU (21%)	3700	No
26 June 2003	Sadahlo, Georgia	HEU (89%)	~170	Yes
Jan. 2006	Tbilisi, Georgia	HEU (89%)	79.5	Yes
11 Mar. 2010	Tbilisi, Georgia	HEU (89%)	18	Yes
27 June 2011	Chisinau, Moldova	HEU	4	Yes

HEU = highly enriched uranium; IAEA = International Atomic Energy Agency; Pu = plutonium.

Sources: Zaitseva, L. and Steinhäusler, F., Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), Division of Physics and Biophysics, University of Salzburg, Austria; and International Atomic Energy Agency, 'IAEA Illicit Trafficking Database (ITDB): IAEA information system on illicit trafficking and other unauthorized activities involving nuclear and radioactive materials', Fact sheet, 2008, <http://www.iaea.org/newscenter/features/radsources/pdf/fact_figures2007.pdf>. The table does not include a few state-confirmed incidents involving discoveries of HEU in scrap metal yards since they did not involve unauthorized possession. See International Atomic Energy Agency (IAEA), 'IAEA Incident and Trafficking Database (ITDB): incidents of nuclear and other radioactive material out of regulatory control', Fact sheet, 2013 <http://www-ns.iaea.org/downloads/security/itdb-fact-sheet.pdf>.

III. NUCLEAR TRAFFICKING IN RUSSIA

The DSTO recorded 298 trafficking incidents in Russia between 1991 and 2012, a third of them involving nuclear material (figure 3). As is the case in many other countries, the detection rate of unauthorized shipments at Russia's borders has increased since the 1990s due to improved detection capabilities. The increase is likely much more significant than the DSTO data reflects because most of the detected incidents are apparently considered too trivial to be reported in the media on an individual basis. Instead, customs in different regions of Russia publish statistical data. For example, between January and May 2010, Kurgan Customs registered 240 cases involving the transport of 'goods with elevated levels of radiation' across Russia's border with Kazakhstan. The details of the cases were not specified.[7] Officials of the Southern and North Caucasus customs administrations detected 7311 such transport attempts across Russian borders in 2010. However, only 17 of these cases were classified as administrative or criminal offences, with the rest of the

[7] Nuclear Threat Initiative, NIS Nuclear Trafficking Database, 'Russia: Kurgan customs release radiation detection statistics', 24 Apr. 2012, <http://www.nti.org/analysis/articles/russia-kurgan-customs-release-radiation-detection-statistics/>.

Figure 3. Incidents involving nuclear and other radioactive material recorded in Russia as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1992–2012

cases involving mainly naturally occurring radioactive materials (NORM) and radioactive metal scrap.[8] Reflecting, and to some extent even shaping, the global trend, the number of incidents involving nuclear material has declined also in Russia since the early 1990s. The majority of the nuclear thefts in Russia were recorded in the early to mid-1990s. The DSTO lists 21 such incidents in the period 1992–95, although the actual number is probably higher. For example, according to a 1999 statement by the Head of Minatom's Nuclear Material Control and Accounting Division, Victor Yerastov, 52 diversions of nuclear material were recorded at Minatom facilities in these four years.[9] The last successful HEU theft in Russia was reported in 1994, and uranium thefts from Russian nuclear facilities in general dropped from 29 in the 1990s to just 4 since then.[10] The DSTO recorded a total of 90 nuclear material incidents in Russia between 1992 and 2012, including 15 cases of HEU, 13 cases of low-enriched uranium (LEU), and 62 cases of less sensitive types of nuclear material. The overall number of nuclear material incidents has significantly declined since the 1990s, to no more than three cases per year over the past few years (figure 4).

HEU and LEU cases have almost completely disappeared from reports on nuclear smuggling in Russia over the past decade, with the most recent such case recorded in 2006. Although the possibility that some unreported cases of theft and trafficking have occurred since cannot be excluded, the probability of theft in Russia has definitely decreased after almost two decades of security upgrades, material consolidation, HEU down-blending (converting HEU to LEU) and security culture training. The improved economic situation over the past 15 years may also have played a role in so far that incentives for nuclear smuggling and theft no longer exist. Thus, the recent record in nuclear trafficking in Russia is encouraging. The following section explores whether improved

[8] Nuclear Threat Initiative, NIS Nuclear Trafficking Database, 'Russia: statistics of radiation detections at Southern and North Caucasus customs released', 25 Apr. 2012, <http://www.nti.org/analysis/articles/russia-statistics-radiation-detections-southern-and-north-caucasus-customs-released/>.

[9] Kuznetsov, V. M., 'Osnovnyye problemy i sovremennoye sostoyaniye bezopasnosti predpriyatiy yadernogo toplivnogo tsikla Rossiyskoy Federatsii' [Main problems and current state of security of nuclear cycle facilities in the Russian Federation], AtomSafe, <http://www.atomsafe.ru>, Moscow, 2001.

[10] Zaitseva and Steinhäusler (note 4).

Figure 4. Incidents involving nuclear material in Russia as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1992–2012

nuclear security in Russia has had any impact on nuclear trafficking patterns in the Black Sea region.

IV. NUCLEAR TRAFFICKING IN THE BLACK SEA REGION

The Black Sea region is a vital strategic crossroads between Europe, Asia, Transcaucasia, Russia, and the Middle East. Historically shaped by centuries of conflict between different empires, and by the rise and fall of the Soviet Union, the region encompasses over a dozen countries with diverse political, economic, ethnic, cultural and religious backgrounds. With this unique geographical location and thousands of kilometres of hard-to-protect coastlines, the Black Sea has been used for smuggling of various licit and illicit goods for hundreds of years. These activities, ranging from contraband goods to human and drug trafficking, persist to this day, making the region one of the most attractive to transnational organized crime.[11] Indeed, organized criminal groups in South Eastern Europe are believed to control most of the heroin trafficking in Europe, and this so-called 'Balkan route'—through Turkey, Bulgaria, Romania, Macedonia, Slovakia, the Czech Republic and Austria—has become a key drug-smuggling route to Western Europe, with an estimated 110 tonnes of opium passing through the region annually.[12] This and other routes also operate in reverse for smuggling illicit goods that originate in Europe (e.g. stolen vehicles) to destinations in the East.[13] The route of human trafficking into Europe roughly follows that of drug smuggling, although illegal migration has declined since the entry of Bulgaria and Romania into the European Union (EU). The economic disparities among the various countries around the Black Sea also contribute to a significant regional flow of migrant labour force from North to South. This situation has been misused by OCGs to smuggle thousands of illegal immigrants annually, many for sexual exploitation, from poverty-stricken Moldova and Ukraine into the relatively prosperous Turkey.[14]

[11] Toktas, S. and Selimoglu, H., 'Smuggling and trafficking in Turkey: an analysis of EU–Turkey cooperation in combating transnational organized crime', *Journal of Balkan and Near Eastern Studies*, vol. 14. no. 1 (2012), pp. 135–50.

[12] United Nations Office on Drugs and Crime (UNODC), 'UNODC South Eastern Europe on illicit trafficking', <http://www.unodc.org/southeasterneurope/en/illicit-trafficking.html>.

[13] Toktas and Selimoglu (note 11).

[14] Sander Lindstrom, M., 'Turkey's efforts to fight human trafficking in the Black Sea Region: a regional approach' Quarterly Journal, vol. 4, no. 4 (2005), pp. 39–47.

Several unresolved ethnic and territorial conflicts in the Black Sea region and the availability of post-cold war surpluses of weapons and munitions have also contributed to illegal arms trafficking and trade.[15]

About two decades ago, smuggling rings in the Black Sea region added a new type of illicit goods to their portfolio: nuclear and other radioactive material. Already in the early 1990s, Bulgaria, Romania and Ukraine reported their first such trafficking incidents. Turkey made its first seizures of foreign-origin uranium in 1993. Since then, Armenia, Georgia and Moldova have also disrupted multiple smuggling attempts, raising concern that countries in the Black Sea region might be used by organized crime to smuggle nuclear material from the post-Soviet countries. For the purposes of this paper, the Black Sea region encompasses the following 12 countries: Bulgaria, Romania, Ukraine, Moldova, Russia, Georgia, Armenia, Azerbaijan, Greece, Serbia, Albania, and Turkey. Between 1991 and 2012, the DSTO recorded 631 trafficking incidents in these states, except for Albania and Serbia, for which the DSTO had no such data (figure 5).[16]

Almost half (298) of all the trafficking incidents in the region were recorded in just one country: Russia. Ukraine had the second highest number of incidents in the region, while Turkey ranked third, followed by Georgia and Romania. The actual number of incidents in some countries may be higher than recorded in the DSTO. For example, Ukrainian authorities registered 112 thefts of radiation sources and 95 other trafficking cases in the period 1989–2012.[17] This is significantly more than the 120 incidents captured in the DSTO over approximately the same period.

Figure 6 shows the temporal distribution of nuclear trafficking incidents in the Black Sea region in the period 1991–2012.[18] Almost a third of them, 91 cases, involved nuclear material, including 5 seizures of HEU and 28 incidents involving LEU. Of the remaining two-thirds of the incidents (involving all other types of radioactive material), about 70 represent unauthorized shipment of radioactive and contaminated cargoes. Most of them were recorded in 2004 and 2005 by just one country, Turkey, which detected an unusually high number of radioactive cargoes at one of its borders. These detections resulted in the corresponding peaks in trafficking incidents.

Most incidents involving LEU were recorded in the region in the 1990s (figure 7). Only 7 of 28 such incidents have been registered since that time, reflecting the growing scarcity of LEU on the nuclear black market. The seizures of HEU, on the contrary, have occurred more recently, four of them since 2003. HEU was seized in what appear to be two series of interlinked incidents in the region—the first in Georgia (2003, 2006, and 2010) and the second series in Bulgaria (1999), France (2001) and Moldova (2011). The circumstantial evidence of these seizures, however, suggests that the smuggled HEU was probably 'old' material, processed in the 1990s; it could have been stolen at that time as the lapses in security at the source nuclear facilities in the 1990s still permitted undetected theft.[19] It should be noted that none of the HEU seized in the region appears to be of domestic origin. In all five cases investigators believed that the uranium had originated in and was smuggled from Russia, although Russian authorities have not confirmed these allegations.

According to DSTO data, the LEU intercepted in the Black Sea region also appears to be of foreign origin in all but four incidents, in which the uranium was traced back to domestic facilities in Ukraine. Foreign-origin LEU was seized in Turkey (12 cases), Ukraine (4), Romania (4) and Georgia (4), with Russia, Kazakhstan and Ukraine mentioned as the likely countries of origin. The trafficking patterns suggest that the nuclear materials had been moved from both the north and the east to the south, with Turkey as the interim destination for the uranium smuggled from

[15] Grillot, S., 'Small arms control in the Black Sea Region: a regional assessment of small arms control initiatives', Monitoring the Implementation of Small Arms Controls Project (MISAC), Eurasia Series no. 2, 2003, <http://legacy.international-alert.org/sites/default/files/publications/Small_Amrs_Control_In_the_B.pdf>. See also Pavliuk, O. and Klympush-Tsintsadze, I., The Black Sea Region: Cooperation and Security Building (East-West Institute: New York, 2004).

[16] More than 200 orphan source incidents (i.e. losses and recoveries of radioactive material out of regulatory control), which were recorded in these countries, have not been taken into account in this study. The emphasis has been placed on incidents with a clear criminal component (e.g. theft, attempted sale and unauthorized possession) and the cross-border movement of radioactive material (e.g. unauthorized shipment), even if a criminal intent could not be identified.

[17] State Nuclear Regulatory Inspectorate of Ukraine, 'Report on nuclear and radiation safety in Ukraine 2012', 2013, <http://www.snrc.gov.ua/nuclear/doccatalog/document?id=230411>, p. 86.

[18] Given that Russia accounts for almost 50% of all the trafficking cases in the Black Sea region, its data has not been included in the chart. A separate graph with Russian incidents is provided in a separate section below.

[19] Baude et al. (note 6).

Figure 5. Trafficking and unauthorized shipment incidents in the Black Sea region countries as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991-2012 (Albania and Serbia have not been included due to the lack of data on incidents.)

Figure 6. Trafficking and unauthorized shipment incidents in the Black Sea region with the exception of Russia as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012

Figure 7. Trafficking incidents in the Black Sea region involving various types of nuclear material as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012 (Incidents recorded in Russia are not included.)

Figure 8. Profit-motivated incidents in the Black Sea region as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012

the post-Soviet countries. These incidents confirm that the Black Sea region countries have been used by criminals as smuggling corridors, although the number of uranium trafficking incidents has clearly decreased over the past decade, which reflects the improved nuclear security in Russia and other post-Soviet states that possess nuclear material stockpiles.

Profit-motivated trafficking incidents

Despite the apparently scarce supply of nuclear materials in recent years, criminals still continue to trade in radioactive material, resorting more and more often to radioactive sources. Figure 8 shows profit-motivated incidents, most of which were attempted sales, intercepted in the Black Sea region and how their dynamics have changed over the years. The types of material involved in profit-motivated incidents were equally divided between nuclear and other radioactive material. However, while in the 1990s the annual average was 4.3 cases for nuclear and 2.1 cases for other radioactive material, since January 2000 that has changed to 2 and 3.7 cases, respectively (i.e. the frequency of uranium seizures has declined and attempted sales of radioactive sources have increased at the same time). As regards the latter, Ukraine led with 35 profit-motivated cases that involved radioactive sources, 25 of them recorded since the end of the 1990s. Georgia ranked second with 15 such incidents and Turkey was a distant third with 6 cases.

Out of a total of 130 profit-motivated trafficking cases, 118 were intercepted by police and intelligence agencies and only 12 by border security services. This pattern corresponds to the international practice in combating nuclear smuggling. Nuclear smugglers are usually caught in the most vulnerable phase of their operations (i.e. while looking for a buyer). Undercover law enforcement officers assume the role of buyer and seize the material during an attempted sale or a sting operation. However, it is hard to assess what percentage of other, more professional or more fortunate, criminals manage to avoid detection. This kind of undetected trafficking, both internally and across borders, causes concern, given the capabilities of OCGs that specialize in smuggling large volumes of goods and trafficking thousands of people every year. Altogether, 150 trafficking incidents in the Black Sea region were detected as the result of the work of police and intelligence services. Despite some difference in the numbers, there is a significant overlap between these cases and the profit-motivated incidents (see figure 9).

Few real trafficking cases, especially those involving nuclear material, involve interception at borders. As indicated above, between 1991 and 2012 only 10 per cent of the profit-motivated incidents in the Black Sea region were disrupted due to border control. Smuggling attempts involving uranium or plutonium are particularly difficult to detect because these materials can be easily shielded. While most detection devices will detect strong gamma-emitting radioactive sources, not all instruments are sensitive enough to detect the small signature of HEU. This was likely the reason why a smuggler carrying 80 grams of HEU across the border between Georgia and Russia in February 2006 successfully navigated the portal radiation monitors installed on both sides of the border.[20] However, a previous attempt to smuggle HEU across the Armenia–Georgia border in 2003 was detected with the help of United States-supplied radiation detectors that had been provided to the Georgian border guards.[21] It is unclear, however, whether the border control personnel had received advance intelligence about the planned smuggling attempt. Bulgaria's seizure of HEU on its border with Romania was the result of vigilant border guards, rather than effective radiation control. The guards detained and searched a courier because his nervous behaviour appeared suspicious to them.[22]

The involvement of organized crime

Normally, the offenders involved in intercepted nuclear smuggling cases are referred to as 'amateurs' or 'non-professionals' because they lack knowledge of the use and potential value of the material they traffic or try to sell. Although this may be correct in many cases, it is important to remain open-minded in assessment of criminal involvement in the illegal nuclear trade in order not to overlook important trends and developments. For example, Albanian

[20] Bronner, M., '100 grams (and counting...): notes from the nuclear underworld', Project on Managing the Atom, Belfer Center for Science and International Affairs, Harvard Kennedy School, June 2008, <http://belfercenter.ksg.harvard.edu/files/100-Grams-Final-Color.pdf>, p. 9.

[21] Warrick, J., 'Smugglers enticed by dirty bomb components: radioactive materials are sought worldwide', *Washington Post*, 30 Nov. 2003, p. A01.

[22] Nuclear Threat Initiative, NIS Nuclear Trafficking Database, Nikolaeva, M., 'Bulgarian weekly examines 1999 HEU smuggling case', 8 Dec. 2000, <http://www.nti.org/analysis/articles/bulgarian-weekly-examines-1999-heu-smuggling-case/>, pp. 19, 22.

Figure 9. Profit-motivated incidents versus cases intercepted by police and intelligence services in the Black Sea region as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012

officials believe that, despite progress in fighting organized crime in the country, such criminals remain a strong factor in relation to trafficking and there are 'no essential reasons to believe nuclear and other radioactive materials have been, or are, an exception in this regard'.[23] The degree of involvement of organized criminal groups in nuclear smuggling may be underestimated, not only because professional traffickers remain 'invisible' to law enforcement, but also because apprehended criminals are rarely recognized as representing organized crime. While organized crime is usually associated with mafia-type criminal organizations with a hierarchical structure, modern OCGs are more flexible, representing loose networks and coalitions of groups and individuals, who form new associations and partnerships depending on the criminal objectives they pursue.[24] The UN Convention against Transnational Organized Crime defines an OCG as 'a structured group of three or more persons, existing for a period of time and acting in concert with the aim of committing one or more serious crimes or offences established in accordance with this Convention, in order to obtain, directly or indirectly, a financial or other material benefit'. It also states that the structured group 'does not need to have formally defined roles for its members, continuity of its membership or a developed structure'.[25] Analysing profit-motivated nuclear trafficking cases with this definition in mind reveals that ad hoc and task-based OCGs are indeed engaged in many of these cases. According to the DSTO's data, three or more perpetrators were involved in 82 of some 330 trafficking incidents (25 per cent) that were recorded in the Black Sea region between 1991 and 2012 (table 2). The largest numbers of such criminal groups and smuggling rings were apprehended in Ukraine (27), Georgia (18), Turkey (16) and Romania (12). In Russia, 55 of almost 300 trafficking cases involved groups of three or more. This data permits a cautious assessment of the extent of OCG involvement in nuclear trafficking in the Black Sea region and in Russia. The majority of the intercepted groups were supply-driven, trafficking

[23] Albanian official, Presentation at the International Conference on Illicit Trafficking Issues in the Black Sea Region, Chisinau, Moldova, 7–8 Nov. 2013.

[24] Europol, 'OCTA: EU organised crime threat assessment 2006', 2006, <https://www.europol.europa.eu/sites/default/files/publications/octa2006_0.pdf>, pp. 12–13.

[25] United Nations Office on Drugs and Crime, 'United Nations Convention against Transnational Organized Crime and the protocols thereto', 29 Sep. 2003, <http://www.unodc.org/documents/treaties/UNTOC/Publications/TOC%20Convention/TOCebook-e.pdf>.

in both uranium and radioactive sources. For instance, in April 2003 two groups dealing in radioactive material were arrested simultaneously in Odessa oblast, Ukraine, while trying to sell caesium-137 and strontium-90. In the hope of obtaining a good price, the criminals presented the material as weapon-grade plutonium and claimed that they could deliver 40 more such sources. The investigation revealed that thieves who did not know each other had stolen these sources of radiation in various locations and the numbers on the containers had been forcefully removed to prevent identification of their origin.[26] These incidents demonstrate a certain level of organization in this illegal trade.

A significant number of the trafficking incidents in the Black Sea region have been transnational in nature (i.e. they have involved material that either originated in, or was on its way to, a foreign country, or both). Some have also involved foreign nationals. For example, Russian nationals were apprehended in at least 30 trafficking incidents in other countries, mostly in the bordering former Soviet republics (table 2).

From the other Black Sea region countries, Moldovan nationals were implicated in the highest number of incidents, 12, and intercepted in two others, both of them in bordering, countries. Seven such incidents were recorded in Ukraine, and five in Romania. Armenian citizens were involved in eight trafficking incidents abroad, six of them in Georgia, including two HEU seizures in 2003 and 2010. Interestingly, only one seizure involving nuclear material was made in Armenia itself. Azerbaijani nationals were apprehended in five uranium smuggling cases, including four in Turkey and one in Russia that involved a trip to Turkey with a uranium sample. Turkish nationals were implicated in seven trafficking cases in other countries, three of them in neighbouring Georgia. A Turkish citizen, who was arrested in Batumi, Georgia, in July 2006 during an attempted sale of caesium-137, was described by Georgian officials as a member of an OCG based in Abkhazia, a breakaway region on the Black Sea.[27]

In an April 2012 incident in Batumi, two Turkish buyers attempted to purchase four sources of radioactivity from Georgians but were arrested by the local law enforcement authorities. They had planned to transport the material to Turkey, probably for resale.[28] Such transnational incidents deserve careful analysis as they can provide useful insights into the operation of criminal smuggling networks, the origins of the seized material and the weak links in the border control of transit countries. These cases are also helpful in identifying smuggling routes.

Smuggling routes

The availability of both overland and maritime trafficking routes makes the Black Sea region particularly suitable for smuggling activities. However, identifying precise routes for nuclear trafficking is a challenging task due to the relatively low number of relevant seizures. In drug trafficking, a route is apparently acknowledged as such after three seizures.[29] The same approach could also be used for nuclear smuggling.

Georgian officials believe that since the collapse of the Soviet Union Georgia has become a transit country for nuclear trafficking, with the Armenian or Russian border as the point of entry.[30] Both of these two primary routes for material suspected to be of Russian origin run through Georgia to Turkey.[31] Repeated seizures at the Armenia–Georgia border and the unusually high number of Armenian nationals implicated in nuclear trafficking cases in Georgia provide sufficient evidence to confirm the existence of the Armenian route. The DSTO has recorded four incidents of radioactive material being smuggled into Georgia from Armenia, including an HEU sample intercepted in Tbilisi in 2010. Interestingly, the seized HEU was provided to the smugglers by the same Armenian national who was arrested in possession of the first sample of HEU intercepted in Georgia in 2003. Having served a prison sentence of two years, he resurfaced again in 2010 as a supplier of the same

[26] Musatova, I., 'Period poluraspada ... lichnosti' [Half-live of ... personality], Zerkalo Nedeli, no. 45, 22 Nov. 2003.

[27] Georgian official, Presentation at the International Conference on Illicit Trafficking Issues in the Black Sea Region, Chisinau, Moldova, 7–8 Nov. 2013.

[28] Butler, D., 'AP exclusive: Georgia details nuke black market investigations', 9 Dec. 2012, <http://www.utsandiego.com/news/2012/Dec/09/ap-exclusive-georgia-details-nuke-investigations/>.

[29] Law enforcement official from a Central Asian country, Communication with author, Dec. 2013.

[30] Monterey Institute of International Studies, James Martin Center for Nonproliferation Studies, 'Georgia's nuclear odyssey: the path from Soviet atomic legacy to global nonproliferation regime', 2013, <http://cns.miis.edu/books/pdfs/georgias_nuclear_odyssey_final.pdf>, pp. 86–88.

[31] Kupatadze, A., 'Radiological smuggling and uncontrolled territories: the case of Georgia', *Global Crime*, vol. 8, no. 1 (Feb. 2007), pp. 40–57.

Table 2. Nuclear trafficking incidents in Black Sea region countries by categories, as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012[a]

Incident category	Armenia	Azerbaijan	Bulgaria	Georgia	Greece	Moldova	Romania	Russia	Turkey	Ukraine
Total no. of incidents	11	2	24	40	8	10	35	298	84	118
Involving nuclear material	1	0	4	12	–	4	26	90	33	22
Involving HEU	–	–	1	3	–	1	–	13	–	–
Involving LEU	–	–	–	4	–	1	4	12	12	7
Involving other radioactive material	10	2	20	28	8	6	11	208	54	100
Total thefts	–	1	7	5	1	3	11	99	3	20
Nuclear material thefts	–	–	–	–	–	–	4	36	–	2
Other radioactive material thefts	–	1	7	5	1	3	8	63	3	18[b]
Border interceptions	7	1	3	10	2	–	6	61	49	16
Police and intelligence seizures	5	1	12	26	1	4	19	105	29	51
Profit-motivated incidents	4	1	6	28	1	4	17	97	23	50
Incidents involving 3 or more perpetrators	1	1	5	18	–	3	12	55	16	27
Incidents of nationals involved in trafficking in other countries	8	5	–	4	–	12	5	30	7	8

[a] The table does not include Albania and Serbia due to the lack of data in the DSTO database.

[b] According to Ukrainian statistics, 112 thefts of radioactive sources have occurred in Ukraine between 1989 and 2012. See State Nuclear Regulatory Inspectorate of Ukraine, 'Report on nuclear and radiation safety in Ukraine 2012', 2013, <http://www.snrc.gov.ua/nuclear/doccatalog/document?id=230411>, p. 86.

material, 89 per cent enriched uranium.[32] According to Georgian officials, the phenomenon of repeat offenders in nuclear trafficking is not uncommon in Georgia.[33] However, it is particularly alarming with regard to the smuggling of HEU, since the repeated involvement of the same criminals offers strong indications of the existence of an OCG trading in weapon-usable uranium. Armenian nationals were detained in four more trafficking cases reported by Georgia. Two additional cases were reported to have occurred on the Armenia–Georgia border, in which Armenian citizens were apprehended with capsules containing radioactive substances in their pockets. Georgian authorities believed that these were test transport attempts in which professional smugglers had asked couriers who were unaware of what they were carrying to transport the material.[34]

The available seizure-based evidence that smuggled radioactive material enters Georgia through the Russian border is less convincing, although undetected incidents may have occurred. It is also plausible that some of the interceptions, or details from the investigations of known seizures inside Georgia, have not been reported in the open sources. The DSTO has recorded only two cases in which the Russian route was used. The more recent one involved a Russian citizen, who lived in North Ossetia (part of the Russian Federation north of Georgia) and was trying to find a buyer for HEU. When contacted by a Georgian undercover agent in North Ossetia, the Russian reportedly offered to sell the sample there and then. However, the agent, posing as a rich foreign

[32] Krevenyuk, A., 'Radioaktivnaya politika Tbilisi' [Radioactive politics of Tbilisi], GeorgiaTimes, 9 Nov. 2010, <http://www.georgiatimes.info/articles/45832.html>.

[33] Georgian representative, Presentation at the International Conference on Illicit Trafficking Issues in the Black Sea Region, Chisinau, Moldova, 7–8 Nov. 2013.

[34] Kupatadze (note 31).

buyer, insisted that the transaction take place in Georgia's capital, Tbilisi, where the seller was then arrested in January 2006.[35] It is uncertain whether he would have travelled to Georgia without this sting operation. Such law enforcement practices appear to be somewhat provocative and can undermine relations with the states where the sting operations are initiated. They can also create an artificial demand for nuclear material, which may fuel future crime. Sharing intelligence with Georgia's Russian counterparts would probably have been more appropriate in this case and could have contributed to building trust among the law enforcement communities of the two countries. The DSTO has recorded no other incidents in Georgia involving Russian citizens.

According to Georgian researchers and security officials, radioactive materials cross into Georgia from North Ossetia and continue on through the disputed South Ossetia. This channel for nuclear smuggling is considered the most common. The materials are then allegedly transported through the territory of the Autonomous Republic of Adjara to Turkey or through Armenia to Iran.[36] Thus, Georgian officials believed that the HEU seized on the Armenian border in 2003 originated in Russia and was being transported through Georgia for resale in Iran.[37] The use of the Turkey-bound route was demonstrated in a July 2000 incident when an Azerbaijani citizen, who had previously taken a sample of uranium oxide to a buyer in Turkey, was arrested in North Ossetia's capital, Vladikavkaz, in connection with the seizure of 1.5 kg of uranium oxide. The Azerbaijani, who used a fraudulent Russian passport, crossed into Georgia through the Verkhniy Lars checkpoint on the Russian border. He and a former customs inspector had been hired as middlemen by the owner of the material, a lieutenant colonel in the North Ossetian police.[38]

With six countries sharing thousands of kilometres of Black Sea coastline, direct maritime routes appear to be an attractive, even obvious, choice for criminals trafficking radioactive substances. Drug trafficking arrests have shown that a maritime seizure is consistently more likely to be larger than a seizure involving overland or air transport.[39] Small volumes, such as those associated with nuclear or radioactive material, are easier to conceal and more difficult to detect on a large vessel than on a truck or a passenger car. In addition, sea cargo is rarely monitored for radioactivity. Reloading material onto a smaller boat at sea is also an option for smugglers. Several seizures of uranium and other radioactive material in Black Sea ports suggest that maritime routes have indeed been used by nuclear smugglers. The largest number of seizures has been recorded in the Georgian port of Batumi, which is located in Adjara near the Turkish border. The local law enforcement authorities have intercepted eight smuggling attempts in Batumi since 1999, all of them involving individuals seeking to sell radioactive material. One of the four suspects arrested in Batumi in July 2001 was in possession of 1.7 kg of LEU and captain of a ship, 'presumably the vessel on which the smugglers hoped to transport the uranium to Turkey'.[40] Another seizure of LEU, in Adjara in September 1999, involved a Georgian national, who had been previously detained in Turkey on suspicion of trading in nuclear material.[41] One of the most recent incidents, which took place in April 2012, involved two Turkish citizens who sought to buy four radiation sources from a Georgian seller and take them to Turkey.[42] Criminals apprehended in seven other nuclear trafficking incidents in Georgia, including one HEU seizure, either tried or planned to smuggle radioactive material to Turkey for sale. Since 2001 three incidents have been recorded in which criminals intended to use the Sarpi checkpoint in Adjara to cross into Turkey. Together with the eight seizures in Batumi, mentioned above, authorities intercepted a total of 11 nuclear trafficking attempts in Adjara, making it a prominent smuggling route to Turkey for both maritime and land deliveries.

Another possible maritime route may run southward from the Ukrainian port of Odessa, which is notorious

[35] Butler (note 28).

[36] Kupatadze (note 31).

[37] Warrick (note 21).

[38] Lepina, M., 'Prison warden in trouble over enriched uranium', *Kommersant*, 1 Mar. 2001, p. 12.

[39] According to the UN Office on Drugs and Crime (UNODC), maritime seizures constitute less than 11% of all drug interdictions globally. However, each maritime seizure is on average almost 30 times larger than seized consignments trafficked by air. UNODC, *World Drug Report 2013* (United Nations: New York, 2013).

[40] Imedashvili, E., 'V Gruzii peresechena popytka nezakonnogo vyvoza v Turtsiyu okolo 2 kilogramma urana-235' [Attempt to illegally export about 2 kilograms of uranium-235 from Georgia to Turkey thwarted], RIA Novosti, 24 July 2001.

[41] Gordon, M. R., 'Stolen uranium intercepted by Georgia in the Caucasus', *New York Times*, 25 Sep. 1999.

[42] Butler (note 28).

for its centuries-long smuggling tradition and use as a hub for human trafficking to Turkey and the Middle East. The DSTO recorded 10 nuclear trafficking incidents in Odessa and its vicinity between 1993 and 2013, six of them involving criminal groups. In the first case, recorded in December 1993, officers of the Black Sea transport police arrested four Ukrainians and two Moldovans, who possessed 260 uranium pellets, on-board a Ukrainian ship bound overseas. According to press reports, weapons, false documents and 100 kg of mercury were also confiscated from the suspects. The nuclear fuel had allegedly originated from a nuclear facility in Kazakhstan and had first been transported to Chisinau, Moldova, in a lead container. A subsequent raid of a flat in Chisinau led to the discovery of another container with about 1.5 kg of the same material, presumably LEU.[43] A strikingly similar case occurred in Odessa in April 1996, when a group of four was arrested during an attempt to sell two containers of Kazakh uranium that was shipped to Odessa via Chisinau.[44] Although the destination was not mentioned in reports about these or the other seizures in Odessa, it is conceivable that the material was bound for Turkey.

The record outlined above appears to indicate that a nuclear trafficking route existed that ran from Kazakhstan to the Black Sea countries. At least one additional case, recorded in the region in September 1998 when Turkish police in Istanbul seized more than 4 kg of LEU smuggled from the former Soviet Union, may have involved Kazakh uranium. The suspects in the case included three Kazakhstani, one Azerbaijani and four Turkish citizens.[45] In April 1999 an official of Kazakhstan's Ministry of National Security confirmed that the material involved in the case likely came from the Ulba Metallurgy Plant, a fuel production facility in Ust-Kamenogorsk, in eastern Kazakhstan.[46] (This facility and its security problems are described below.) Considering, that the last seizure connected with this route was made in 1998 and the security at the source facility was upgraded in the late 1990s, it is probable that the route no longer exists.

There is also strong evidence to suggest that Moldova has been used as a trans-shipment country for nuclear materials. The country has been associated with the trafficking of almost identical HEU samples in Bulgaria in May 1999 and France in August 2001, when inquiries established that both samples had been transited via Moldova and Romania.[47] According to a Europol official, the Bulgarian and French investigations showed the same links to Moldova and Romania.[48] A Turkish national was apprehended on the Bulgaria–Romania border on his way back from Turkey, where he had intended to sell an HEU sample. When the potential buyers he was instructed to meet in Ankara did not get in touch, he decided to return to Moldova. The courier, who had lived in Tiraspol, the capital of the breakaway Trans-Dniester region of Moldova bordering Ukraine, claimed he had received the uranium from a Ukrainian acquaintance, who had asked him to sell it in Turkey.[49] This suggests that the HEU may have been smuggled into Moldova from Ukraine through Trans-Dniester. Like the Bulgarian HEU sample, the one seized by the French police in Paris was also contained in a glass ampoule protected by yellow paraffin wax, which was likely used as neutron absorber, inside a cylindrical lead container. Analysis conducted by the French Nuclear Energy Commission (CEA) showed that the confiscated HEU was extremely similar to the Bulgarian sample, and it concluded that the two materials, believed to be reprocessed spent fuel from Russia, were probably of the same origin. It was ascertained that the French sample had also transited via Moldova and Romania.[50] The smuggling network that was revealed during investigation of the Paris case included individuals from Cameroon, France, Portugal and Romania, and

[43] Kuznetsov, V., [On physical protection of nuclear power installations of Russia], Yadernaya Bezopasnost, no. 34–35 (Mar./Apr. 2000) (in Russian). See also [Scandals: package containing uranium], Pravda, 29 Dec. 1993 (in Russian); and 'Plot to smuggle radioactive material from CIS foiled', The Guardian, 24 Dec. 1993, available in NIS Nuclear Trafficking Database, <http://www.nti.org/analysis/articles/plot-smuggle-uranium-russia-foiled/>.

[44] 'Yadernoi Smertyu Torguyut Na Razve' [Nuclear death sold by weight], *Komsomolskaya Pravda*, 17 Apr. 1996, available in NIS Nuclear Trafficking Database, <http://www.nti.org/analysis/articles/yadernoi-smertyu-torguyut-na-razves/>.

[45] 'Turkish police arrest uranium smugglers', BBC News, 7 Sep. 1998, <http://news.bbc.co.uk/2/hi/europe/166504.stm>.

[46] 'NISNP discussions with Artur Galishev, official at the Kazakhstani Ministry of National Security', 9 Apr. 1999, available in NIS Nuclear Trafficking Database, <http://cns.miis.edu/wmdme/flow/turkey/absfull.htm>.

[47] Baude, S., 'HEU seized in July 2001 in Paris: analytical investigations performed on the material', International Conference on Illicit Nuclear Trafficking: Collective Experience and the Way Forward, Edinburgh, 19–22 Nov. 2007.

[48] Otrebsky (note 6).

[49] Nikolaeva (note 22).

[50] Baude (note 47).

'appeared to be well-organised and functioned for possibly several years'.[51]

In June 2011 Moldovan police in Chisinau arrested several people who were trying to sell a 4.4-gram sample of HEU, in what appears to be the third in this series of connected cases. As in the previous two incidents, the uranium powder was in a glass ampoule inside a cylindrical lead container, suggesting that it may have been supplied by the same sellers.[52] According to Moldovan officials, the material had been smuggled from Russia through Trans-Dniester. Two of the suspects, one of them a Russian citizen, were from the region and the other four were Moldovan nationals.[53] One press report quoted anonymous UN and US officials who allegedly claimed that the HEU had been traced to 'specific Russian enrichment facilities and was matched later with at least one earlier seizure of uranium'. According to the Moldovan investigators, the suspects had created a stable criminal group 'specializing in acquisition, possession, transportation, and sale of uranium'. The investigation revealed that the group had sought contacts in North Africa in order to sell the material.[54] However, according to the information provided to a Georgian official in connection with this case, the smugglers arrested in Moldova considered bringing the HEU first to Georgia and then to Turkey. Apparently, the material was to be shipped to Turkey from the Ukrainian port of Ilyichovsk through the Georgian port of Poti, which serves as a conduit for the majority of the Georgian trade.[55] These revelations point to the continued vulnerability of the Black Sea ports to nuclear trafficking.

After this incident, officials in Moldova acknowledged that their territory is being used by non-state actors as a trafficking corridor for nuclear materials.[56] Another criminal group, trying to sell depleted uranium to undercover police agents, was arrested in Chisinau in August 2010. According to the police spokesman, some of the implicated suspects had previous convictions for possessing radioactive materials in Moldova, Romania and Russia.[57] Regrettably, the border control in Moldova has not been very effective so far, judging by the lack of known seizures by the Moldovan customs officials. At the same time four smuggling attempts from Moldova were intercepted at the country's borders by Ukrainian border guards and one by their Romanian colleagues.[58] The problems associated with the uncontrolled territory of Trans-Dniester make combating nuclear trafficking even more challenging.

Judging by the many trafficking incidents intercepted in neighbouring countries on the way to Turkey, as well as by the large number of seizures in Turkey itself, it appears to be a major interim destination for the nuclear material smuggled from the former Soviet Union. According to the DSTO, the material involved in at least 20 of 84 trafficking cases reported since 1993 either originated in post-Soviet countries or was smuggled by their citizens. Turkish authorities reported a total of 104 trafficking incidents, 17 of them involving uranium, that they disrupted between 1993 and 2010, with 67 arrested perpetrators implicated in these cases.[59] Interestingly, the majority of nuclear material seizures took place in Istanbul and its adjacent provinces of Bursa, Kocaeli, Edirne and Yalova in north-western Turkey. This cluster of incidents in the area of the Bosporus and the Marmara Sea may point to the likely use of maritime routes for the smuggling of radioactive material into the country.

Turkey sees itself as a purely transit country that is used by nuclear smugglers due to 'its geographical location and the volume of commercial activities between the neighbouring countries'.[60] On the basis of analysis of the intercepted incidents, the Turkish Department of Anti-Smuggling and Organized Crime (KOM) has concluded that Turkey is not a destination country for the smuggled nuclear material.[61] Turkish

[51] Otrebsky (note 6).

[52] Nuclear Threat Initiative, Center for Nonproliferation Studies, 'Illicit trafficking in weapons-usable nuclear material: still more questions than answers', 11 Dec. 2011, <http://www.nti.org/analysis/articles/illicit-trafficking-weapons-useable-nuclear-material-still-more-questions-answers/>.

[53] 'Six Moldovan "uranium smugglers" arrested', BBC News, 29 June 2011, <http://www.bbc.co.uk/news/world-europe-13968903>.

[54] Butler, D., 'AP exclusive: officials say crime ring has uranium', *Seattle Times*, 27 Sep. 2011.

[55] Georgian representative (note 33).

[56] Moldovan representative, Presentation at the International Conference on Illicit Trafficking Issues in the Black Sea Region, Chisinau, Moldova, 7–8 Nov. 2013.

[57] 'Smuggled uranium-238 seized in Moldova', BBC News, 24 Aug. 2010, <http://www.bbc.com/news/world-europe-11074645>.

[58] Zaitseva and Steinhäusler (note 4).

[59] 'Turkey, Balkans fight nuclear trafficking', Turkish Weekly.net, 3 Jan. 2014, <http://www.turkishweekly.net/news/160975/turkey-balkans-fight-nuclear-trafficking.html>.

[60] 'Turkey, Balkans fight nuclear trafficking' (note 59).

[61] Turkish Ministry of Interior and Turkish National Police, Department of Anti-Smuggling and Organized Crime (KOM), 'Turkish Report of anti-smuggling and organized crime 2011', Mar. 2012, <http://www.tadoc.gov.tr/Dosyalar/Raporlar/2011eng/index.html>, p. 43.

Figure 10. Trafficking and unauthorized shipment incidents in Central Asia as recorded in the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO), 1991–2012

officials generally agree that the nuclear material smuggled through Turkey originates in former Soviet republics but they cannot determine the final destination with certainty.[62] Thus, the final destination of the trafficked material after it leaves the country remains unknown. It is doubtful that Turkish authorities intercept 100 per cent of what is smuggled into the country, but no incidents have so far come to light in which the material has been smuggled out of Turkey.

V. COMPARISON WITH NUCLEAR TRAFFICKING IN CENTRAL ASIA

Central Asia, encompassing the former Soviet republics of Kazakhstan, Kyrgyzstan, Uzbekistan, Turkmenistan and Tajikistan, is another strategically important region in Eurasia, located south of Russia. The DSTO recorded a total of 92 trafficking incidents in Central Asia between 1991 and 2012 (figure 10), less than a third of the cases reported in the same period in the Black Sea region. After 1991 thousands of kilometres of the border between Russia and Kazakhstan were left open and virtually unprotected, facilitating the mobility of transnational criminals. Radiation monitors at border crossings did not exist and anything could be smuggled without much risk of being detected. It is not surprising that hardly any nuclear trafficking incidents were recorded in this region in the 1990s and almost none at the borders. The first seizure at a Central Asian border was recorded in 1998, and only after 2000, when international assistance programmes to counter radiological smuggling in the region began, did reports on radiation detection at the borders start to appear more frequently. In the 1990s only 3 of 18 seizures were border interceptions, compared to 12 police and intelligence operation. Of 63 seizures reported in the region since that time almost half, 26 seizures, were intercepted by the border control, compared to 32 seizures in law enforcement operations.

As in the Black Sea region, nuclear material was intercepted in a third of all the incidents in Central Asia. However, the origin of this material was domestic (i.e. the seized uranium had been stolen from local nuclear facilities). One such facility was the Ulba Metallurgy Plant, a nuclear fuel production facility located in the city of Ust-Kamenogorsk, Kazakhstan. Almost 150 kg of low-enriched uranium pellets were stolen from the plant in 1995 as a result of conspiracy between a metal trader and the facility's employees.

[62] 'Turkey, Balkans fight nuclear trafficking' (note 59).

On 7 December 1995 the local authorities in Ust-Kamenogorsk seized 4 kg of LEU from two Kazakh citizens, who planned to transport the material to buyers in Russia. In the course of the investigation, Kazakh officials discovered an additional 145.7 kg of uranium in the possession of the same two men. The whole network of suppliers and middlemen encompassed 18 individuals.[63] Since then, nine more seizures of LEU have been recorded in Kazakhstan, the most recent in 2010. All of the seized material is believed to be of Kazakh origin and was probably stolen in the early 1990s, before the implementation of security upgrades at the Ulba facility. In the 1990s Kazakh material was also seized in other countries. At least four smuggling attempts involving LEU from Kazakhstan have been intercepted abroad: two in Ukraine in 1993 and 1996, one in Russia in 1995, and one in Turkey in 1999. No such attempts have come to light since that time.

Analysis of the available data suggests that despite its proximity to Russia and having to address socio-economic and border security problems similar to those of the Black Sea states, Central Asia has not emerged as a prominent transit region for Russian nuclear material. Although it is possible, that undetected trafficking has taken place in the region, it is likely that Central Asia is geographically less attractive to smugglers than the Black Sea region.

VI. INTERNATIONAL EFFORTS TO COUNTER NUCLEAR SMUGGLING IN THE BLACK SEA REGION

Several international programmes and initiatives on nuclear security and combating trafficking in nuclear and other radioactive material exist that are active in the Black Sea region countries. Some of the most important are the IAEA's Nuclear Safety & Security programme; the US Department of Energy's Material Protection, Control and Accounting (MPC&A) and Second Line of Defense (SLD) programmes; the US Department of State's Export Control and Related Border Security (EXBS) programme and Nuclear Smuggling Outreach Initiative (NSOI); the US Department of Defense's Cooperative Threat Reduction (CTR) programme and International Counterproliferation Program (ICP); the Group of Eight's Global Partnership against the Spread of Weapons and Materials of Mass Destruction; the Global Initiative to Combat Nuclear Terrorism (GICNT); United Nations Security Council Resolution 1540; Interpol's Operation Fail Safe initiative; and the US Department of Homeland Security's US Customs and Border Protection's Georgia Border Security and Law Enforcement (GBSLE) programme.

Aside from participating in several of the multilateral programmes, the EU runs a number of assistance and cooperation projects to counter nuclear smuggling, improve export controls and strengthen border controls in the Black Sea region. The EU Border Assistance Mission to Moldova and Ukraine, which has been ongoing since 2005, is such a programme.[64] The EU has also initiated a chemical, biological, radiological and nuclear (CBRN) Centres of Excellence initiative that covers South East Europe, the Southern Caucasus, Moldova and Ukraine under the EU Instrument for Stability.[65] The European Commission's Joint Research Centre runs a European Nuclear Security Training (EUSECTRA) centre for front-line officers, trainers and experts on how to detect and respond to trafficking of nuclear or other radioactive materials. The facility is located in Karlsruhe, Germany, but the training is particularly targeted at participants from the EU's neighbourhood, including the Black Sea region.[66]

These programmes have dedicated significant resources to non-proliferation and border security priorities in the Black Sea region and have delivered assistance to all its countries. As a result, regional border security and law enforcement personnel have thwarted dozens of nuclear trafficking incidents, both intentional and unintentional, including the seizure of weapon-usable nuclear material. For example, three Moldovan law enforcement officials who participated

[63] 'Utechka Urana Mozhet Povlech Mezhdunarodnaya Skandala, A Utechka Informatsii–Mezhdunarodnuyu Pomoshch' [Uranium leak may lead to international scandal, whereas information leak to international assistance], Delovaya Nedelya (Alma Ata), 11 Oct. 1996, available in NIS Nuclear Trafficking Database, <http://www.nti.org/analysis/articles/utechka-urana-mozhet-povlech-mezhdunarodnaya-skandala-utechka-informatsii-mezhdunarodnuyu-pomoshch/>. See also 'Ukrast Uran? Net Nichego Proshche' [Steal uranium? Nothing easier than that], Kazakhstanskaya Pravda, 14 May 1997, available in NIS Nuclear Trafficking Database, <http://www.nti.org/analysis/articles/ukrast-uran-net-nichego-proshche/>.

[64] Grip, L., 'The role of the European Union in delivering Resolution 1540 implementation assistance', Non'proliferation Papers no. 22, EU Non-proliferation Consortium, Oct. 2012, <http://www.nonproliferation.eu/activities/activities.php>, pp. 14–15.

[65] European Union, CBRN centres of Excellence, <http://www.cbrn-coe.eu/AboutCoE.aspx>.

[66] European Commission, 'New EU training centre to combat illicit trafficking of nuclear and radioactive materials', Press release, 18 Apr. 2013, <http://europa.eu/rapid/press-release_IP-13-338_en.htm>.

in the June 2011 HEU interception had received counterproliferation training in the USA a few weeks earlier.[67] Two of the Bulgarian customs officials who made the seizure of HEU in May 1999 had received ICP programme training.[68] This programme alone has trained over 600 Georgian officials through more than 30 events held in Georgia since 1998. Although it has not been established with certainty, it is likely that some of the officials involved in the three HEU interceptions in Georgia since 2003 had received this training.[69] Training for border guards and customs services has also been provided to countries in the Black Sea region under the Nunn-Lugar Weapons of Mass Destruction-Proliferation Prevention Initiative (WMD-PPI) programme. Many of the other efforts have also been instrumental in combating nuclear smuggling in the Black Sea region. The SLD programme has strengthened the capability of the region's states to deter, detect and intercept trafficking in nuclear and other radioactive materials by providing fixed radiation detection systems, handheld detectors, communications tools and personnel training. The next step planned under this programme is the provision of mobile detection systems to help the states protect green borders (i.e. land, not maritime, borders).[70] The NSOI initiative has entered into bilateral partnerships with Armenia, Azerbaijan, Bulgaria, Georgia, Moldova and Ukraine. Its agreements with recipient countries are based on nuclear smuggling threat assessments established through interagency processes. Although discussions have been initiated, Azerbaijan and Bulgaria have yet to sign the joint action plans. The priority assistance steps to improve countries' capabilities that have been identified are diverse, ranging from security of radioactive sources and nuclear forensics to national incident response plans and anti-corruption training. Several governments and organizations have partnered with this initiative by supporting one or more of the cooperative projects developed by the NSOI. The European Commission, the IAEA, the UN Office on Drugs and Crime as well as Canada, France, Germany, Japan, Norway, Sweden and the United Kingdom are some of the donors in this initiative.[71] The Border Defense Initiative for some of the Black Sea region countries—Bulgaria, Georgia, Moldova, Romania and Ukraine—was launched in 2004 to conduct simulation exercises to combat the proliferation of WMD, strengthen border control and share intelligence on illicit WMD-related activities in the region.[72] It is essential that these and other programmes are well coordinated to ensure the efficient use of resources. It is also important to assess the impact and effectiveness of these programmes by obtaining and analysing data from recipient countries on a regular basis.

VII. RECOMMENDATIONS

As nuclear security in the post-Soviet states improves and the threat of nuclear theft decreases, trafficking cases involving nuclear material in Eurasia have been steadily declining since the mid-1990s. However, the recent seizures of HEU samples suggest that a certain amount of previously stolen weapon-usable nuclear material may still be available for illegal transfer and sale to state and non-state actors. In addition, the deteriorating economies in some European countries, as well as political instability in the Middle East and, more recently, in Ukraine, may bring about new threats to the security of nuclear and other radioactive material in the region. Indeed, sabotage of nuclear facilities or theft and misuse of radiation sources cannot be excluded in conditions of chaos and power vacuum. According to the latest report by Turkey's KOM, 'the ethnic conflicts and civil wars in the neighbouring countries are considered to be significant risk factors in terms of smuggling of dangerous materials into and through Turkey'.[73] Additionally, unemployment, impoverishment and lack of prospects for the future contribute to growing criminality and may provide incentives for radiological theft and trafficking in countries without a previous record of this type of crime. Therefore, it is important that the

[67] 'Enhancing non-proliferation partnerships in the Black Sea region', A minority staff report prepared for the use of the Committee on Foreign Relations, US Senate, 112th Congress, 1st Session, 27 Sep. 2011, <http://www.gpo.gov/fdsys/pkg/CPRT-112SPRT68115/html/CPRT-112SPRT68115.htm>.

[68] Moroney, J. D. P. et al., 'Assessing the effectiveness of the international counterproliferation program', RAND Corporation report, 2011, <http://www.rand.org/content/dam/rand/pubs/technical_reports/2011/RAND_TR981.pdf>.

[69] Moroney (note 68).

[70] US Department of Energy, National Nuclear Security Administration, 'FY congressional budget request', DOE/CF-0084, vol. 1, Apr. 2013, <http://energy.gov/sites/prod/files/2013/04/f0/Volume1.pdf>, p. DN-81.

[71] Nuclear Smuggling Outreach Initiative, <http://www.nsoi-state.net/>.

[72] Grip (note 64).

[73] 'Turkey, Balkans fight nuclear trafficking' (note 59).

efforts to counter trafficking in the Black Sea region are continued and enhanced.

There is a strong case for the European Union to play a significant role in the development of programmes and initiatives to combat nuclear trafficking in the Black Sea region. Such a role would be consistent with the objectives defined in the EU's non-proliferation policy, and would also form an important element in the cooperation with the European neighbourhood. How, from a practical perspective, to incorporate national and regional elements of such a programme into existing EU cooperation frameworks is an issue that deserves urgent attention.

Since no single country can successfully fight the threat of nuclear trafficking alone, it is necessary to promote international and regional cooperation. A set of recommendations of how to improve countries' efforts and cooperation in combating nuclear trafficking in the Black Sea region has been proposed by the participants of the International Conference on Illicit Trafficking Issues in the Black Sea Region, which was organized by the Moldovan National Agency for Regulation of Nuclear and Radiological Activities (NARNRA) in Moldova in November 2013, in collaboration with the Swedish Radiation Safety Authority (SSM), the British Department of Energy and Climate Change and the Norwegian Radiation Protection Authority. These and other recommended measures to improve the efforts in combating nuclear trafficking in the Black Sea region, as well as cooperation among its countries, are listed below.[74]

Standards and regulations

- Harmonize the legislation and regulations of states in the region with IAEA and EU standards;
- develop domestic norms and procedures for response to nuclear smuggling incidents in countries that do not have them (e.g. Moldova); and
- organize tabletop exercises to test the effectiveness of existing response procedures and identify possible gaps or overlaps.

Border control

- Improve the ability to detect unauthorized possession or shipment of nuclear and radioactive materials at the borders of known and suspected transit countries (e.g. Moldova);
- improve the ability to detect unauthorized possession or shipment of nuclear and radioactive materials at all Black Sea ports;
- improve maritime interception and detection capabilities in the Black Sea;
- increase patrolling of green borders to detect trafficking through the areas between border checkpoints;
- consider creative solutions for monitoring vulnerable green borders (e.g. mobile detection systems, night-vision devices and thermal imaging cameras);
- improve neutron-detection capability of portal and handheld monitors;
- strengthen radiation detection capability, including neutron detection, of air cargo and passenger luggage at airports;
- provide temporary storage rooms for the nuclear or radioactive material discovered during border control procedures;
- ensure timely and effective maintenance of stationary radiation detection systems, which has been poor or totally absent in some countries;
- promote security culture among border control personnel to maintain a high level of threat awareness, vigilance and professional discipline;
- conduct unannounced performance tests of detection practices and capabilities using standardized dummy probes;
- basic training for all front line officers on radiation safety, use of radiation detecting instruments and trafficking response procedures;
- provide more in-depth training on the use of expert equipment and software, as well as on the maintenance of all equipment;
- enhance training in basic nuclear forensics for front-line officers;
- conduct train-the-trainers courses in specialized centres to help reach a broader audience within customs agencies;
- improve collaboration between border control agencies and supporting nuclear experts;
- take into account that smugglers' tactics improve and include novel strategies;
- include in training courses aspects of physics-based methods used by criminals to disguise or hide radioactive material (e.g. HEU hidden inside strong, officially declared radiation sources); and

[74] International Conference on Illicit Trafficking Issues in the Black Sea Region, Chisinau, Moldova, 7–8 Nov. 2013.

- include logistical practices and operational approaches used in trafficking of weapons, drugs and people in training course curricula for customs and border security personnel.

Law enforcement

- Reconsider the practice of initiating sting operations in foreign states that lead to cross-border trafficking of radioactive material, as they undermine trust between the states;
- continue education of law enforcement officers using current know-how (e.g. in Armenia);
- provide training for maritime law enforcement;
- improve intelligence gathering in port cities;
- train first responders to preserve forensic and nuclear forensic evidence;
- raise public awareness about the potential security and safety risks associated with possession or trafficking of nuclear and other radioactive material as a deterrent measure; and
- encourage voluntary return of nuclear and other radioactive material through amnesty.

Regional cooperation

- Promote international cooperation among regional law enforcement authorities, especially in the field of intelligence sharing;
- improve information sharing in the law enforcement community, making use of or supplementing existing mechanisms (e.g. Interpol's Operation Fail Safe initiative or the IAEA's ITDB);
- exchange best practices and transfer know-how in countering nuclear trafficking among states;
- increase the effectiveness of joint training and events by targeting audiences with the same professional background, so that they can concentrate on the issues specific to their work;
- conduct annual meetings for border control and law enforcement agencies, which should serve as a platform to exchange information and lessons learned from recent nuclear trafficking incidents;
- conduct regular cross-border training exercises between neighbouring countries to practice joint response procedures;
- organize red-on-blue exercises, simulating unannounced trafficking attempts at selected border crossings, airports and seaports and involving officials (border guards, police and customs) from countries on both sides of the border;
- enhance officer exchange programmes and 'twinning' schemes for relevant personnel, which would help to extend and share their knowledge;
- improve communication among Black Sea region states by creating a regional database of experts involved in combating nuclear trafficking, which will be used for training seminars, workshops, exchange programmes, joint exercises and cooperation in investigating trafficking incidents;
- establish a global open-access Nuclear Trafficking Case Law Database, similar to the UNODC Human Trafficking Case Law Database (such a database could serve as an information and training tool for lawyers, prosecutors, and other stakeholder agencies and organizations, a monitoring tool for governments and an awareness raising tool for media and the public);[75]
- ensure that the limitations of detection equipment are clearly understood, so it is known what can and cannot be found by using the equipment set up in the region;
- improve cooperation between practitioners and scholars so that they can gain and broaden their expertise by working together;
- improve the security culture (e.g. via educational workshops);
- learn from countries that combat trafficking of large volumes of other commodities outside the Black Sea region (e.g. Spain, Morocco and the Netherlands);
- consider developing opportunities and joint mechanisms with other states to follow up on detection of nuclear contraband by following it discreetly in order to identify buyers and ultimate destination; and
- improve cooperation among states and donor organizations to identify vulnerabilities and assistance priorities, coordinate donor input and assess the effectiveness of completed assistance projects.

[75] United Nations Office on Drugs and Crime (UNODC), 'Human trafficking case law database', <http://www.unodc.org/cld/index.jspx>.

ABBREVIATIONS

CBRN	Chemical, biological, radiological and nuclear
CEA	French Nuclear Energy Commission
CTR	Cooperative Threat Reduction
DSTO	Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources
EUSECTRA	European Nuclear Security Training
EXBS	Export Control and Related Border Security
GBSLE	Georgia Border Security and Law Enforcement
GICNT	Global Initiative to Combat Nuclear Terrorism
HEU	Highly enriched uranium
IAEA	International Atomic Energy Agency
ICP	International Counterproliferation Program
ITDB	IAEA Incident and Trafficking Database
KOM	Turkish Department of Anti-Smuggling and Organized Crime
LEU	Low-enriched uranium
MPC&A	Material Protection, Control and Accounting
NARNRA	Moldovan National Agency for Regulation of Nuclear and Radiological Activities
NORM	Naturally occurring radioactive materials
NSOI	Nuclear Smuggling Outreach Initiative
OCG	Organized criminal group
UNODC	United Nations Office on Drugs and Crime
SLD	Second Line of Defense
SSM	Swedish Radiation Safety Authority
WMD-PPI	Weapons of Mass Destruction-Proliferation Prevention Initiative

EU Non-Proliferation Consortium

The European network of independent non-proliferation think tanks

A EUROPEAN NETWORK

In July 2010 the Council of the European Union decided to create a network bringing together foreign policy institutions and research centres from across the EU to encourage political and security-related dialogue and the long-term discussion of measures to combat the proliferation of weapons of mass destruction (WMD) and their delivery systems.

STRUCTURE

The EU Non-Proliferation Consortium is managed jointly by four institutes entrusted with the project, in close cooperation with the representative of the High Representative of the Union for Foreign Affairs and Security Policy. The four institutes are the Fondation pour la recherche stratégique (FRS) in Paris, the Peace Research Institute in Frankfurt (PRIF), the International Institute for Strategic Studies (IISS) in London, and Stockholm International Peace Research Institute (SIPRI). The Consortium began its work in January 2011 and forms the core of a wider network of European non-proliferation think tanks and research centres which will be closely associated with the activities of the Consortium.

MISSION

The main aim of the network of independent non-proliferation think tanks is to encourage discussion of measures to combat the proliferation of weapons of mass destruction and their delivery systems within civil society, particularly among experts, researchers and academics. The scope of activities shall also cover issues related to conventional weapons. The fruits of the network discussions can be submitted in the form of reports and recommendations to the responsible officials within the European Union.

It is expected that this network will support EU action to counter proliferation. To that end, the network can also establish cooperation with specialized institutions and research centres in third countries, in particular in those with which the EU is conducting specific non-proliferation dialogues.

http://www.nonproliferation.eu

FONDATION pour la RECHERCHE STRATÉGIQUE

FOUNDATION FOR STRATEGIC RESEARCH

FRS is an independent research centre and the leading French think tank on defence and security issues. Its team of experts in a variety of fields contributes to the strategic debate in France and abroad, and provides unique expertise across the board of defence and security studies.
http://www.frstrategie.org

PRIF Peace Research Institute Frankfurt — HSFK Hessische Stiftung Friedens- und Konfliktforschung

PEACE RESEARCH INSTITUTE IN FRANKFURT

PRIF is the largest as well as the oldest peace research institute in Germany. PRIF's work is directed towards carrying out research on peace and conflict, with a special emphasis on issues of arms control, non-proliferation and disarmament.
http://www.hsfk.de

IISS

INTERNATIONAL INSTITUTE FOR STRATEGIC STUDIES

IISS is an independent centre for research, information and debate on the problems of conflict, however caused, that have, or potentially have, an important military content. It aims to provide the best possible analysis on strategic trends and to facilitate contacts.
http://www.iiss.org/

sipri

STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE

SIPRI is an independent international institute dedicated to research into conflict, armaments, arms control and disarmament. Established in 1966, SIPRI provides data, analysis and recommendations, based on open sources, to policymakers, researchers, media and the interested public.
http://www.sipri.org/

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