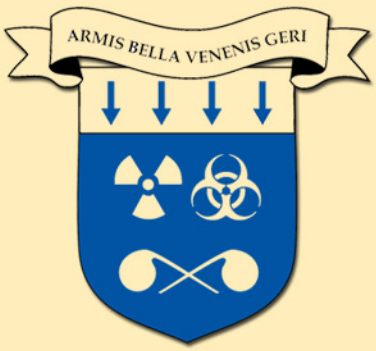
Trafficking Nuclear and Radiological Materials

And the Risk Analysis of Transnational Criminal Organization Involvement

Major Matthew R. Kershner, USA



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by

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Abstract

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About the Author

Major Matthew Kershner, USA, currently serves as a Nuclear Weapons Planner in the Nuclear Exercise Division of the Defense Threat Reduction Agency, Fort Belvoir, Virginia. He is a graduate of Appalachian States University where he earned a Bachelor of Science in Criminal Justice and a USA ROTC Commission. Initially, Kershner served within the Infantry as a mechanized platoon leader and scout platoon leader before transitioning into the Ordnance Corps where he excelled and volunteered for the much needed specialty of Explosive Ordnance Disposal (EOD). He has had three EOD commands and was deployed to Iraq as the Senior DOD EOD Advisor to the Iraqi Army Bomb Disposal School. MAJ Kershner then transferred into the Nuclear Counterproliferation Functional Area (FA52) where he was assigned to the Defense Intelligence Agency, where he learned the trade craft of the operational military intelligence officer and successfully led the Microbial Forensics Initiative for the Office for Forensic Intelligence developing a capability. He deployed to Afghanistan as a Senior Site Lead for of a Level III Laboratory supporting the United States Special Operations Command (Task Force 3-10) with Technical Collections / WMD Sensitive Site Exploitation focused on Biometric and Forensic Enabled Intelligence. In 2012, MAJ Kershner graduated from the National Defense University, College of International Security Affairs with a Masters of Strategic Security Studies from which this monograph was created.

Abstract

The single greatest threat facing the world today is that of terrorism, specifically nuclear terrorism, due to its unparalleled destructive power. This study aims to determine if Transnational Criminal Organizations (TNCO) are smuggling nuclear and radiological material for those contemplating acts of terrorism. To the casual observer, it may appear that the risks and consequences associated with entering into this market are too great for TNCOs, explaining why this market has been monopolized by opportunists and smaller, more local, criminals.

In an effort to maximize the validity and accuracy of information presented here, a homogeneous set of data is used to provide indications of current trends occurring in the market, along with observations as to why TNCOs are not moving into this market. These observations are demonstrated through the explanation of two cases where risk thresholds associated with smuggling nuclear and radiological material were too great to continue with a course of action and too great to begin to enter this market.

Although there were five cases that implicated a TNCO, or organized crime, there no indicators that pointed to TNCOs migrating into this market. The policy implications discussed in this study focus on a shift from a strategy of deterrence to one of dissuasion where the intent and motive is removed while still maintaining the ability to conduct deterrence activities. The future research implications are to conduct a comprehensive analysis of the accountability of nuclear and radiological material in order to understand how much of this material has been left unaccounted for.

CHAPTER 1

Introduction

> *The gravest danger our Nation faces, lies at the crossroads of radicalism and technology. Our enemies have openly declared that they are seeking weapons of mass destruction, and evidence indicates that they are doing so with determination.*[1]
>
> President George W. Bush
> West Point Graduation Speech
> June 1, 2002

Problem

The single greatest threat facing the world today is that of terrorism.[2] The threat of terrorism is not new nor has is abruptly come to the forefront of the national, social, and political conscience. Rather, terrorism is as old as civilization itself. At any point in recorded human history, the act of terrorism has been a part of every society. However, terrorism was not always called or even considered terrorism at the time.

The term *terrorism* is relatively new in the global lexicon. Terms like slavery, indentured servitude, coercion, anarchy, discord, and rebellion – where one group attempted to rule, provoke, or influence another through threat, fear, and intimidation, have been around far longer than the term terrorism. Terrorism, in today's world, is more or less defined as resorting to violence to achieve one's goals. The aim of these goals can be the desire to be heard above the din of political, societal, national, and global rhetoric – or an attempt to effect change. Terrorism comes in many forms and ranges from targeted killings or assassinations and bombings to kidnappings. Groups like the Irish Republican Army (IRA), the Red Army

Faction (RAF) in Germany, and the Al Qaeda franchise[3] have all been known to employ these tactics.[4]

Within terrorism, nuclear terrorism[5] possesses the greatest concern because the destructive power from nuclear device is unparalleled.[6] For example, in New York City on September 11, 2001, over 2,500 people died from two Boeing 767 Airplanes being intentionally crashed into the World Trade Towers within 102 minutes. However, in Hiroshima, Japan on August 6, 1945, an estimated 70,000 people were killed instantly from the "Little Boy" nuclear bomb. By 1950, an additional 200,000 had died from cancer and other long-term effects as a result of the "Little Boy."[7] It is unlikely that a 13kt nuclear weapon, which was the estimated yield of "Little Boy," will be detonated within a United States city. Regardless, this example clearly illustrates the destructive power of a nuclear weapon even when nuclear weaponry was in its infancy.

Since the sheer power and destructiveness of a nuclear weapon has clearly been demonstrated on a population center, not many countries are willing to unleash this power again. The more realistic scenario, for groups such as Al Qaeda, is to acquire radiological material and either build/create their own nuclear weapon or improvised nuclear device (IND), or construct what is known as a radiological dispersion device, or RDD. An RDD, as defined by the U.S. Department of Defense (DoD) is;

> *An improvised assembly or process, other than a nuclear explosive device, designed to disseminate radioactive material in order to cause destruction, damage, or injury.*[8]

The RDD shape and size can vary, but the most common and widely discussed design type is an explosion type, whereby the nuclear material is explosively dispersed into the environment. The characteristics of this design type are very simple. First, a group must acquire the radiological material and the explosives to detonate the material. The design itself and the material used can vary from a plastic bag to a suitcase, and do not need to be overly complex. Then, the radiological material must be placed near the explosives, and the explosives detonated.

It is widely believed that the effects of a RDD would be minimal, in terms of radiation exposure. However, the detonation of the explosives would create more collateral damage in terms of property and individual

casualties than the actual effects of the radiation exposure. Nonetheless, the affected area would certainly feel the effects of a RDD in terms of psychological and economical impact. Those that live or work in that area would, more than likely, not be willing to return and when coupled with the environmental costs associated with the clean up, would take a devastating toll on the local economy.[9] The economic effects would also be felt regional and nationally as well.

The accountability and security of nuclear and radiological material has always been of great concern to most nations. This concern stems from the publicized intentions of terrorist groups. Unfortunately, some countries, such as Russia and a number of its former satellite states, have not been as meticulous and diligent in the accountability and security of their material since they first began their nuclear enterprise. Historically speaking, there have been significantly more nuclear and radiological material seizures within, or coming from, Russia than from the United States. The types of nuclear or radiological material that could be used in RDD have historically and are currently being used within many different industries from medical, commercial, and manufacturing fields. Although these industries serve to assist man in having a better life, the security of these sources, which are also referred to as sealed sources, is not the first concern when it comes to the development or fielding of such equipment.

Of all of the terrorist groups throughout the world, Al Qaeda has been one of the most vocal towards its hatred of non-Muslim societies, especially the United States. The current leader of Al Qaeda, and former second-in-command under Osama bin Laden, Ayman al-Zawahri, wrote, "Pursuing the Americans and Jews is not an impossible task. Killing them is not impossible, whether by a bullet, a knife stab, a bomb or a strike with an iron bar." He went to on define the Al Qaeda goal as to inflict "as many casualties as possible."[10]

Along with Al Qaeda's public statements wishing for America's demise are their sometimes explicit intentions on how that will come about. In the past they have used bombings, assassinations, and kidnappings to strike fear into the world. However, it is their publicly stated intention to acquire Weapons of Mass Destruction (WMD) in order to "unleash radiological terror."[11] Prior to the September 11, 2001, terrorist attack, Osama bin Laden stated, "acquiring weapons (WMD) for the defense of Muslims is a religious duty."[12] Making these statements

does not get them any closer to actually acquiring nuclear or radiological material as they would still need to work out their logistics for the acquiring of this material. The extent of Al Qaeda's smuggling infrastructure is unknown. However, it would be fair to say that their smuggling infrastructure pales in comparison to that of a transnational criminal organization (TNCO).

The United Nations (UN), from the *United Nations Convention against Transnational Organized Crime*, defines an Organized Criminal Group 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… in order to obtain, directly or indirectly, a financial or other material benefit.*[13]

TNCO networks are more adaptive, flexible, responsive, and most importantly, more prevalent throughout every country than terrorist organizations. And although terrorists are primarily motivated by religious or ideological reasons, criminals, (in this case, TNCOs), are primarily driven by money and are typically focused on the movement of stolen and/or illegal goods for profit. The crimes of a TNCO vary, and are typically secretive in nature, but part of their activities revolves around today's terrorism definition in that they intimidate, threaten, commit violence, use bribery to manipulate politicians, government officials, and businesses in order to increase profits.[14] President Barrack Obama stated it best in his *Strategy to Combat Transnational Organized Crime*, when he said:

> *Transnational Criminal Organizations have taken advantage of our increasingly interconnected world to expand their illicit enterprises…Criminal networks are not only expanding their operations, but they are also diversifying their activities, resulting in a convergence of transnational threats that has evolved to become more complex, volatile, and destabilizing.*[15]

It is in these characteristics that terrorist groups are found wanting as they lack the ability to transnationally smuggle, or at least they are not on par with that of a TNCO. This is why a TNCO is a much more ideal body to acquire and transport nuclear material. However, if TNCOs were to move into this line of business, they would pose a greater threat than that of a terrorist group.

Thesis Statement

The risks and consequences for entering into nuclear and radiological smuggling are too great for TNCOs and as a result the majority of this market is conducted by opportunists and criminals.

Methodology

A varying research method was used beginning with a qualitative analysis of historical documents complied from the *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Materials* from January 2002 through May 2011. These reports have been published monthly by the Nuclear Assessment Operations at Lawrence Livermore National Laboratory (LLNL) under contract from the Department of Energy (DOE) and then later transferred to the Department of Homeland Security (DHS). The information contained in these reports is derived from open sources, such as foreign and domestic Internet sites, printed media (periodicals, newspapers, and books), television, and radio broadcasts. Additional information has been complied to further analyze each seizure from the National Nuclear Security Administration's (NNSA) Office of International Materials Protection and Cooperation (IMPC), Nuclear Assessment Program databases on Illicit Trafficking of Nuclear Materials, and the International Atomic Energy Agency (IAEA) Database on Illicit Trafficking. Secondly, two case studies are explained and discussed in this study to demonstrate the principles of risk and self-preservation, which will help illustrate the motivating factors that cause a person, or group, to not act a certain way – or in this case, why an entity has the unwillingness to choose against the riskier option.

Limitations

A compressed research period did not allow for extensive research of multiple databases, field research, or interviews. One homogenous set of data is analyzed in this study to improve the validity and reliability of the result. However, the drawback of using only a single set of data, or source is that it only presents one view of the illicit trafficking of nuclear and radiological material. There are many other databases that could have also been used in order to get a complete view and understanding of this type of trafficking. For example, the IAEA established the *Illicit Trafficking Database* (*ITDB*) in 1995, in order to

> *…record and analyze incidents of illicit trafficking in nuclear and other radioactive material. It incorporates all incidents in which nuclear and other radioactive material out of regulatory control.*[16]

Another independent database that could have been reviewed is Stanford University's *Database on Nuclear Smuggling, Theft and Orphan Radiation Sources* (DSTO), which is a compilation of the IAEA's ITDB and the Center for Nonproliferation Studies (CNS) *Newly Independent States' Nuclear Trafficking Database*.[17] These databases, given the time to extensively research each case, would have provided a much clearer picture of trafficking nuclear and radiological material. However, there are drawbacks to these additional sets of data as well. Author Louise Shelly illustrated the issues associated with using these databases, in general, when she stated,

> *Other problems of relying on the IAEA database and other such databases is that they include a significant number of cases that could be called "random noise," low levels movement of illicit nuclear materials by opportunists who do not have established supply or demand chains*.[18]

Secondly, these reports are all open source reports. Meaning, all data in these databases that relates to these cases is from newspapers, electronic chart media, news broadcasts, or Internet news. Rarely do these media outlets have all of the facts for every story they produce and most of these

sources are foreign sources and the translations may be suspect. Open source material also has issues with confirmation and accuracy – not all material is confirmed as accurate and true. Some sources may have provided a reporter, beat writer, or web blogger with "anonymous inside information" that is either unconfirmed, unsubstantiated, or the means with which to achieve a few dollars as a paid informant. However, news outlets are supposed to confirm all material in a story prior to dissemination. Another aspect to consider is that of sensationalism. Since open sources are generally news outlets in the form of print, broadcast, and electronic media, and giving that the bills are paid by ad sales and circulation, it is possible that many of the reports have been sensationalized in order to sell more papers or garner more hits on an Internet site or increase viewership or ratings on the TV show. This can lead to the exaggeration and overstatement of events or hazards that this type of material actually poses to the citizens of their country.

Definitions

The characterization or classification of perpetrators are broken down into four categories and differ from other authors in that they do not focus on the profession of the perpetrators. The focus of this study is not on where they fit into the nuclear architecture or industry of any particular country except to illustrate their employment status when characterizing opportunists. Each seizure may not fit into these groups perfectly, but taking into account these characteristics, in part or holistically, this research distinguishes between one seizure and another.

The first group of perpetrators is the ***opportunists*** as they are motivated solely by money to either make ends meet or to supplement existing income. Basically, they are greedy. Many opportunists fall victim to shoddy scientific work by not testing the material. Because of this, opportunists oftentimes fall victim to their very motivation – greed. They believe material to be one thing but it turns out to be a different material entirely. They believe they have stolen, or acquired, Highly-Enriched Uranium (HEU) but in actuality they are in possession of depleted uranium, or something even less hazardous. They become susceptible to these mistakes because they believe that, due to the materials radioactivity, it to be worth something. Conversely, someone may have marked the

opportunist and knowingly stole or acquired a weaker radioactive material in an attempt to scam a potential buyer. Lastly, if the report categorizes a member as being previously or currently unemployed, that squarely places them into the opportunist category.

The second group of perpetrators is the local, or even regional, ***criminals*** whereby the report categorizes a perpetrator as being a member, or a suspected member, of a criminal gang but not rising to that of a TNCO. They also have a previous arrest for trafficking nuclear material. This indicates a pattern of smuggling attempts and, since they are being openly written about in these reports, at least one unsuccessful attempt. Lastly, they remained in the area in which material was acquired, which implies a local connection with the area and most likely the perpetrator lives in the same area.

A ***TNCO*** is typically organized and has a global reach, as opposed to staying stagnant, like local or regional gangs. Furthermore, if the report categorizes a perpetrator as being a member, or a suspected member, of an organized criminal group, then they were placed into the TNCO category. In one particular case, which will be discussed later, the report does not classify this group as a TNCO; however, the argument will be made that they belong squarely into the category of a TNCO.

Lastly, the ***other*** category includes seizures that do not fall into any of the previous categories. These seizures show no direct evidence of any criminal behavior and in most cases show any connection to any person or persons, meaning that they do not involve the apprehension of anyone. These seizures, for example, involve the recovery of radioactive materials, contaminated scrap metal, orphaned sources, or the recovery of previously stolen radioactive material.

In order to simplify the definitions of the most commonly used categories of material, this study will use the definitions provided with the LLNL reports as illustrated in Table 1.

Closely related to the definitions of *radioactive source*, *low-grade nuclear material*, and *weapons-usable nuclear material* are sometimes commonly referred to as ***sources*** or ***sealed sources***, ***low enriched uranium*** (LEU), and ***highly enriched uranium*** (HEU), respectfully. Nuclear material can be categorized into three groups. First, there are sources referred to as sealed sources. These are in the form of encapsulated radioactive material, in limited quantities, and are being used

everyday throughout the world for peaceful applications within the medical and commercial/industrial fields. For example, this material provides doctors with the ability to conduct non-invasive diagnostic exams of patients, assists companies in the exploration of oil, and also removes unwanted bacteria and viruses from food.

Table 1: Common Definitions[19]

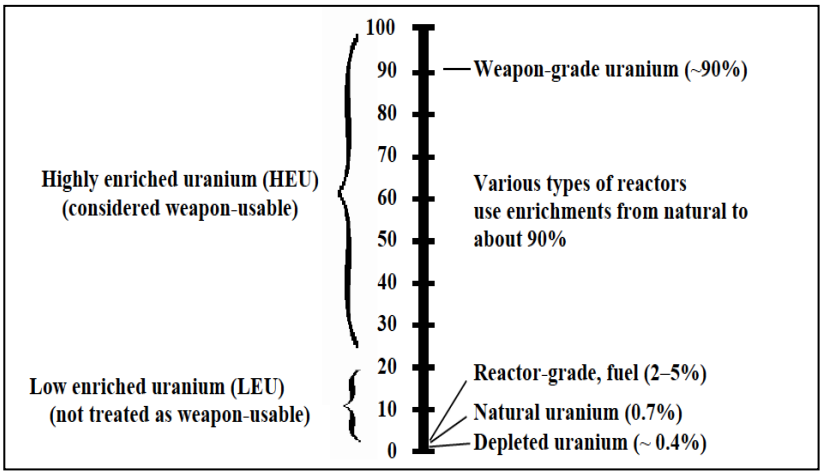
Nuclear material	Any material that is radioactive or contains radioactive material. Sometimes applied more specifically to materials usable in nuclear power fuel cycles or in nuclear weapons.
Illicit trafficking	The diversion, purchase, sale, transportation, or storage of nuclear material in violation of local, national, or international law.
Radioactive source	A manufactured source of radiation, typically used for industrial, research, or medical applications. Common radioisotopes used in radioactive sources include cesium 137, strontium 90, and cobalt 60. Plutonium ionization sources also fall into this category.
Low-grade nuclear material	Includes uranium and thorium ore, natural uranium, depleted uranium, and low enriched uranium (< 20% enriched) in any form.
Weapons-usable nuclear material	Nuclear material in any form that can be readily used to fabricate a nuclear explosive device. Typically, highly enriched uranium and plutonium 239.

Of the types of sealed sources being used throughout the world, there are a small number that are of real concern due of their prevalence of availability. Sealed sources containing Americium-241 (Am-241), Californium-252 (Cf-252), Cesium-137 (Cs-137), Cobalt-60 (Co-60),

Iridium-192 (Ir-192), Plutonium-238 (Pu-238), Polonium-210 (Po-210), Radium-226 (Ra-226), and Strontium-90 (Sr-90) are extremely prevalent for civilian applications. However, from that small list, only three are of great concern because they are strong high-energy radiation sources; Cs-137, Co-60, and Ir-192. With that being said, the most common type of material being trafficked, making up the second largest group is Cs-137.

Secondly, there is low-grade nuclear material. This is uranium and plutonium that has been enriched to a threshold less than 20%, but the most common material within this group is typically uranium. Throughout this period, uranium has been smuggled in many different forms, which include uranium ore or natural uranium, depleted uranium, and low-grade enriched uranium. Uranium ore is one of the most common and naturally occurring elements in the Earth's crust with the largest deposits have been found in Australia, Central Asia, Europe, and North America. This material is regularly found in rock, soil, rivers, and oceans.

Figure 1: Uranium Enrichment[20]



The third type of nuclear material is the weapon-usable, or weapons-grade, nuclear material. This material is comprised of uranium or plutonium that has been enriched to a threshold greater than 20%. It is this material, in any form, that is needed for a nuclear device but it is also the least smuggled or seized. Figure 1 illustrates the levels of enrichment for uranium and assists in the understanding for later in this study.

Thesis Outline

Chapter 2 discusses the existing literature, in which scholars like Graham Allison, Rensselaer Lee, and Louise Shelley, are in agreement as to the threat and hazards surrounding nuclear and radiological material. These scholars are also in agreement with regard to the severity of ignoring these threats and hazards. This literature encompasses a historical understanding of the nuclear smuggling problem set, trend analysis that begins in the 1980s and spans to today, and the proposed steps and advice on how to further prevent such acts. Also included is the categorization, dynamics, and capabilities of TNCOs and how they fit within certain countries and societies. Lastly, many authors and scholars make certain conclusions related to who is smuggling nuclear and radiological material and there seems to be two camps when it comes to identifying the participants, or perpetrators. One side argues that TNCO's are not as involved as people might think, whereas the other side argues the opposite by stating that TNCO's are definitely involved. Unfortunately, those that argue that TNCOs are involved do not offer the reader much, if any, evidence to prove such a claim.

Chapter 3 illustrates the analysis of these reports. These case reports are categorized to demonstrate the trends within the smuggling of nuclear and radiological material from 2002 through 2011. This analysis explains the "who" when it comes to the act of smuggling, what type of material is being smuggled, in which countries and/or regions is the smuggling occurring, and lastly, go into further detail of any case with implicit TNCO involvement. Regardless of whether or not the United States or scholars consider this a strategic level security issue, some TNCOs will view the smuggling of nuclear material as another avenue for a more diversified income.[21] The closing of this chapter offers an explanation as to the incentives for individuals or groups who pursue this type of smuggling.

The fourth chapter discusses the negative incentives, consequences, and deterrents for why a TNCO would chose to not traffic nuclear material. The largest and most significant, deterrent to smuggling nuclear or radiological material is the risk associated with getting caught with that type of material. For some TNCOs, the risk is below their threshold. For others, the risk is too high. This research does not analyze an individual or

groups' risk management or decision-making process, but rather, it offers an explanation as to why an organization might consider staying away from nuclear or radiological material. Ultimately, this risk is closely related to the self-preservation instincts of the individual or group and consequently, their financial livelihood. During the same timeframe that these reports were compiled, the world witnessed an increase in the frequency and the publicity of terrorist acts. Subsequently, the reaction of nations to address these terrorist groups shifted in priority and focus. Nations such as the United States, United Kingdom, and others, have responded to these acts with the use of their militaries and law enforcement agencies to defeat these groups.

Soon after 9/11, President George W. Bush famously said; "We will make no distinction between the terrorists who committed these acts and those who harbor them."[22]…"Either you are with us, or you are with the terrorists."[23] These statements go to the point that while TNCOs are not currently regarded or classified as terrorist groups, they would be regarded as such if it were discovered that they knowingly and, even perhaps, unknowingly assisted a group like Al Qaeda with any aspect of an attack. The reclassification of a TNCO as a terrorist organization would bring with it all elements of a nation's national power, specifically military, economic, and law enforcement. The new and focused attention resulting from this reclassification would directly affect their profit margins from their existing illegal markets.

Two case studies further illustrate the idea of risk and self-preservation, which include Libya's 2003 decision to give up their WMD program after 40 years of development and the Al Qaeda decision not to attack Pakistan's nuclear facilities. In these cases, the leader, or leadership, of the organization weighed the risk versus the reward and determined that the risk was too great.

Chapter 5 concludes with an interpretation of what is (or is not) occurring with the nuclear and radiological smuggling field, and why. This chapter also discusses the implications of these trends and analysis and how the United States could adjust its strategy to combat a TNCO.

Notes

1. “West Point Graduation Speech,” George Bush, White House, On-line, Internet, 28 April 2012, available from http://georgewbush-whitehouse.archives.gov/nsc/nss/2002/nssintro.html.

2. The unlawful use of violence or threat of violence to instill fear and coerce governments or societies. Terrorism is often motivated by religious, political, or other ideological beliefs and committed in the pursuit of goals that are usually political. “DoD Dictionary of Military and Associated Terms,” Department of Defense, On-line, Internet, 25 February 2012, available from http://www.dtic.mil/doctrine/dod_dictionary.

3. Al Qaeda franchise includes Al Qaeda in Iraq (AQI), Al Qaeda in the Arabian Peninsula (AQAP), and Al Qaeda Islamic Maghreb, (AQIM).

4. United States Congressional Research Service. *Al Qaeda and Affiliates: Historical Perspective, Global Presence, and Implications for U.S. Policy*, Washington, D.C.: Government Printing Office, 2011.

5. *International Convention for the Suppression of Acts of Nuclear Terrorism*, (2005).

6. State-sponsored designed and built nuclear weapon, improvised nuclear device (IND), or radiological dispersion device (RDD).

7. F.G. Gosling, “The Manahattan Project - Making the Atomic Bomb,” *United States Department of Energy* (2010), 96.

8. United States Department of Defense. *Operations in Chemical, Biological, Radiological, and Nuclear (CBRN) Environments*, Washington, D.C.: United States Department of Defense, 2008, 147.

9. “Terrorist CBRN: Materials and Effects,” Central Intelligence Agency, On-line, Internet, 24 April 2012, available from https://www.cia.gov/library/reports/general-reports-1/terrorist_cbrn/terrorist_CBRN.htm.

10. “New Al Qaeda Leader Ayman Al-Zawahri’s Hatred of U.S. is Deeply Personal,” Associated Press, On-line, Internet, 25 April 2012, available from http://www.nydailynews.com/news/world/al-qaeda-leader-ayman-al-zawahri-hatred-u-s-deeply-personal-article-1.132383.

11. Charles D. Ferguson, Tahseen Kazi, and Judith Perea, *Commercial Radioactive Sources: Surveying the Security Risks*, Monterey, California: Monterey Institute of International Studies, 2003.

12. Wilson John, "Islam, WMD and Al Qaeda's Final Goals," *Observer India*, On-line, Internet, 28 April 2012, available from http://www.observerindia.com/cms/sites/orfonline/html/paper/pdf/wilson.pdf.

13. "Organized Crime," United Nations, On-line, Internet, 28 February 2012, available from http://www.unodc.org/unodc/en/organized-crime/index.html.

14. Ibid.

15. President of the United States. *Strategy to Combat Transnational Organized Crime*, Washington, D.C.: Government Printing Office, 2011.

16. "Illicit Trafficking Database (ITDB)," International Atomic Energy Agency, On-line, Internet, 26 April 2012, available from http://www-ns.iaea.org/security/itdb.asp.

17. "New Database Tracks Illicit Trafficking of Nuclear Material Worldwide," Stanford University, On-line, Internet, 26 April 2012, available from http://www.stanford.edu/dept/news/pr/02/database36.html.

18. "Trafficking in Nuclear Materials: Criminals and Terrorists," Louise I. Shelley, *Global Crime* 7, no. 3 August, 2006, 547.

19. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA), compiled by author, 2002-2011.

20. Ibid.

21. "Terrorism, Organized Crime, and WMD Smuggling: Challenge and Response," Phil Williams, Naval Postgraduate School, On-line, Internet, 14 February 2012, available from http://www.nps.edu/Academics/centers/ccc/publications/OnlineJournal/2007/Aug/williamsAug07.html.

22. "September 11, 2001 Presidential Address to the Nation," George Bush, White House, On-line, Internet, 26 April 2012, available from http://www.opm.gov/guidance/09-11-01GWB.htm.

23. "Address to a Joint Session of Congress and the American People," George Bush, White House, On-line, Internet, 26 April 2012, available from http://georgewbush-whitehouse.archives.gov/news/releases/2001/09/20010920-8.html.

CHAPTER 2

Literature Review

There are many commonalities among academics and scholars when discussing a TNCO's involvement with the smuggling of nuclear and radiological material. These themes include that:

1. The involvement of TNCOs is unknown.
2. Even if a TNCO was implicated, the nature of their business is secretive and thus no solid evidence is available.
3. Previous attempts to sell this type of material have been conducted by inexperienced smugglers who did not know what they had and/or did not know who to sell the material to.
4. Much of the material that is being sold is intentionally being misrepresented as higher-quality material in order to intentionally deceive the buyer (e.g. fraud or scam).

Even with these common themes, there are a few authors and scholars that offer an alternate thought of what is occurring and who is doing the smuggling. This alternate view states that, TNCOs are heavily involved in the smuggling of nuclear and radiological material; however, they operate in what is commonly referred to as a "Shadow Market."

Scholars such as Rensselaer Lee, Lyudmila Zaitseva, and Kevin Hand have argued that nuclear smuggling traffic is not filled with certainty but rather the unknown. As stated earlier with regard to the limitations of this research project, the data that was gathered comes from open sources, which is usually incomplete or inaccurate. The nuclear smuggling trade does not display characteristics of a true market of buyer and seller, but rather just sporadic sellers. Furthermore, the association of terrorists and criminals is rare in nuclear smuggling but, as many researchers have argued, that does not indicate that these relationships do not exist.[1,2]

Lack of Evidence Implicating a TNCO

One of many characteristics of a TNCO, or criminals in general, is that they are extremely secretive. Meaning, as an individual or as a criminal organization, it is in their best interest to keep their activities and intentions to themselves. Broadcasting their successes and/or failures would be self-defeating and detrimental to themselves and/or their organization. Groups like these do not utilize advertising, slogans, and catch phrases to create a mass following, nor are they invested in company or group websites where members could go and check updates and news. However, what they do have in all of levels of criminality is an underlying desire to lie, cheat, steal, and possibly kill their way to money and power. Therefore, when an author or a scholar illustrates that there is little evidence, direct or indirect, that implicates a TNCO, it is an indication that the group is savvy enough not to get caught in the first place. The lack of hard evidence is a prevalent theme throughout every scholar's research. Zaitsva and Hand go on to say;

> *To date, there is no hard evidence to link organized crime groups with nuclear smuggling activities. There have been few confirmed nuclear smuggling cases in which the involvement of organized crime was suspected…So far, there have been more small criminal groups involved in nuclear smuggling rather than large organized crime syndicates.*[3]

Zaitseva, Hand, and Lee use two cases to illustrate that a connection exists between the smuggling of nuclear and radiological material and smaller, more localized criminal groups rather than a TNCO. The first of these two cases involved a smuggling ring located in Balashikha, Russia. The Moscow police had the ring under surveillance for months prior to any arrests, and as a result, in March 2001, a large cache of approximately 200g of Cs-137 and $250,000 was recovered along with the arrest of members, or suspected members, of a criminal gang. These authors go on to show that some of these members "were acting as middlemen and found the buyers, who, according to the police, were nationals of one of the Middle Eastern countries." Later in 2001, there was an arrest of seven men

who were suspected of being members of the Balashikha criminal gang. The perpetrators had procured 1kg of LEU from the Electrostal Machine-Building Plant, east of Moscow. The seven men were arrested as they were attempting to sell the material for an unknown amount.[4,5]

Attempts to Sell

Aside from these two cases, Shelly, Zaitseva, Hand, and Lee documented attempts to sell nuclear and radiological material. These attempts involved individuals, typically those that work within a nuclear related field, who have stolen the material in the belief that they can generate a quick profit for themselves. Quite obviously, the single reason we know of these cases is that they were caught and, historically speaking, in these types of cases, the perpetrators are caught quite often. Another aspect of the attempted sale of this material is that the asking price for varying quantities of the material ranges from a few hundred dollars to tens of millions of dollars. This point further illustrates that these individuals haven't a clue as to what they have, what is worth, where to sell it, or who to sell it to. The majority of the cases addressed by the authors illustrate this point. Incidentally, the cases called upon by the authors typically date back to the early 1990s when the Soviet Union was dissolved. Soon after the demise of the Soviet Union, much of the government's property found its way to the black market. The nuclear industries, both military and energy, were not immune to this fact.

Zaitseva and Hand provided a helpful classification of who supplies, moves, and demands such material and these classifications were used later in this project. Within their respective works of literature, they both distinguish between suppliers, intermediaries, and end-users. These classifications prove helpful in understanding the complexity of those involved with smuggling this material. However, when discussing the suppliers and intermediaries they include the employment status of these individuals to better illustrate how and where they fit into society and within the nuclear industry. This aspect of employment, as earlier stated within the definitions, is something that this research does not take into account, as it does not help categorize the types of smuggling incidents.[6]

Fraud/Scam

Another aspect of nuclear smuggling that Shelley, Zaitseva, Hand, and Lee account for is a modest percentage of cases that involve fraud. These types of cases represent roughly half of all seizures. Many other markets (i.e. economic, electronic, credit, etc.) around the world have to deal with fraud and this one is no different. For example, the medical, industrial, and commercial industries use nuclear and radiological material on a daily basis for cancer treatment, natural gas and oil exploration, and non-destructive testing, which allows for the inspecting of the structural integrity of welds. Throughout all of the literature that has been discussed, one of the most common and frequent categories of smuggling nuclear or radiological material is classified as a fraud and/or scam. These scams include a wide variety of material, which includes all forms of uranium (natural, ore, depleted, and low enriched), the most common forms of radioisotopes, which are encapsulated into sources like cesium, cobalt, iridium, strontium, and radium, and lastly an element referred to as Red Mercury, which is a material that has no radioactive properties but has been historically used throughout the world in scams. All of these sources, except Red Mercury, are radioactive and if tested for radioactivity by a potential buyer, would be very convincing as authentic. However, to date, would-be nuclear material buyers have not been able to field-test for the exact type of material they are attempting to purchase, let alone the level of enrichment. In the end, these authors conclude that most of the material being sold on the black market could better be described as radioactive junk. Luckily, for the rest of the world, these sources do not offer a terrorist the ability to harm anyone due to the relatively low enrichment strength of the material. They do, however, offer an entrepreneur the ability to scam someone.

Shadow Market

Shelley, Zaitseva, and Hand agree that a "shadow market" of nuclear smuggling exists and is operated by organized crime organizations. They also conclude that the shadow market is occurring at all times and that they are so sophisticated in their operations that states and their law enforcement agencies do not notice. However, these same scholars, again,

offer few explanations as to why they believe this "shadow market" exists.

> *However, if this market exists, it remains largely invisible due to the sophisticated smuggling schemes employed by the powerful players, such as organized crime groups and well-placed insiders at source facilities.*[7]

First, they attempt to define and link the characteristics of organized crime. The characteristics for organized crime contain well-established transport networks, sophisticated smuggling schemes, both of which are typically aided and facilitated by corrupt law enforcement and political officials. Secondly, the use of couriers, or middlemen, to transport and make initial contact limits the exposure of the real actor and many scholars suggest that the use of this "tradecraft" implicates organized crime syndicates. Third, organized crime groups move a variety of commodities and that nuclear material is only one of those. Lastly, they argue that globalization has made the world smaller for the exchange of ideas and goods, which allows for smaller groups to become larger players. All four aspects of their correlation between the characteristics of organized crime entities present a solid argument as to why such material is not being captured. However, the single fact that they have provided is exceptionally thin. The manner in which these authors have presented shadow markets as direct proof of TNCO involvement makes me believe that the authors themselves are sensationalizing these events.

Conversely, it appears that Lee is the more cautious scholar when explaining the correlation between a TNCO and smuggling of nuclear and radiological material. First, he begins by explaining that "some anecdotal evidence point[s] to the existence of a shadow market that is more professionally organized and operated than the visible market…"[8] He then begins to elaborate, explaining the level of proof by stating "…these Shadow trafficking networks that deal with weapons-usable uranium and plutonium cannot be authenticated by direct proof."[9] In the end, he offers that,

> *Moreover, the illicit nuclear trade in its visible guises does not display characteristics of a true market. In the above-mentioned incidents evidence of a connection to any bona-*

> *fide buyer – whether a state seeking nuclear weapons, a terrorist group or a criminal entity – was extremely slim.*[10]

Author Summary

Among fellow scholars and authors' research and opinions, Lee appears to be the most sensible and practical. Lee presents the material objectively by offering the possibility of a connection between TNCOs and the smuggling of nuclear and radiological materials, but stops short of stating, or more forcefully implying, this connection. Even though other researchers have not found the smoking gun just yet, they still offer readers the theory that just because there is no definitive proof of TNCOs involvement, it does not mean that it does not exist; nuclear smuggling is so sophisticated, it remains unseen. As a theory, it is just as good as any; however, they offer no proof in support of their view. Lee goes on to illustrate,

> *Little material of direct military significance (at least for a fission weapon) and no nuclear warheads have surfaced in international smuggling channels. Low-grade uranium and assorted radioactive sources account for most of the flow. Total seizures of HEU in uranium-235 equivalent and plutonium, respectively, in the period 1992 to 2006 amounted to about 9.4 kilograms and a little less than a pound – not enough for a bomb.*[11]

The two cases that have been used to implicate the Russian Balashikha Criminal Gang as proof of TNCO involvement fails to prove that, 1) the individuals arrested were actual members of this gang; or 2) that this group is anything more than a local criminal entity. A more likely scenario is that some scholars and authors simply stopped researching this group and case once they had established that they were criminals. It appears that regardless of how small or how large the criminals were in any particular organization, the evidence was good enough to draw the correlation.

Notes

1. Rensselaer Lee, *Smuggling Armageddon: The Nuclear Black Market in the Former Soviet Union and Europe*, (New York: St. Martin's Press, 1998).

2. Lyudmila Zaitseva and Kevin Hand, "Nuclear Smuggling Chains: Suppliers, Intermediaries, and End-Users," *American Behavioral Scientist* 46, no. 6 (2003), 830.

3. Ibid.

4. Ibid., 832.

5. "Nuclear Smuggling: Patterns and Responses," Rensselaer Lee, *Parameters* 33, no. 1 (Spring 2003), On-line, Internet, 15 March 2012, available from http://search.proquest.com/docview/198022224?accountid=12686.

6. Zaitseva and Hand, *Nuclear Smuggling Chains: Suppliers, Intermediaries, and End-Users*, 830.

7. Ibid., 840.

8. Lee, *Smuggling Armageddon: The Nuclear Black Market in the Former Soviet Union and Europe*, 139.

9. Ibid.

10. Rensselaer Lee, "Why Nuclear Smuggling Matters," *Orbis* 52, no. 3, 15 July 2008, 434-444.

11. Ibid., 434-435.

CHAPTER 3

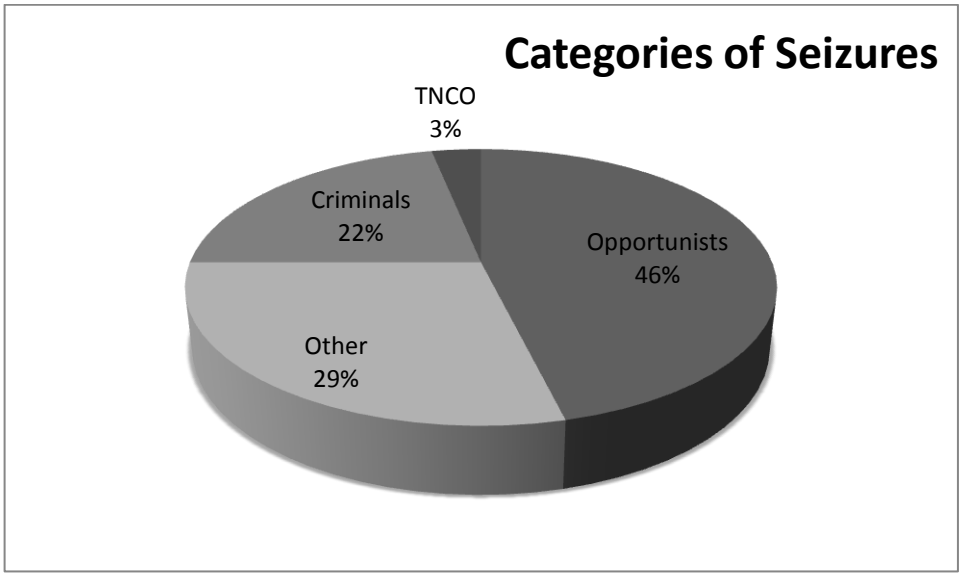
Trends (2002-2011)

From January 2002 to May 2011, there were 156 seizures of nuclear and radiological material. These seizures and confiscations occurred on every continent, except Antarctica, and the seized materials ranged from harmless radioactive material to highly enriched uranium (HEU). Seizures occurring during this time period were of the typical smuggling variety. Meaning, these cases involved extremely small quantities of nuclear material being captured. However, the one constant in these cases appears to be the type of groups, or perpetrators, that are attempting to carry out these smuggling operations. From earlier research, these groups can be generally categorized into opportunists, criminals, transnational criminal organizations, and other.[1] However, there are a few cases that do not fit this mold. As noted in Figure 2, of these smuggling cases, 29% are being carried out by groups that do not fall neatly into the opportunist, criminal, or TNCO categories.

Several of the seizure cases have been a little more interesting and creative when it came to the depth and method with which the perpetrators attempted to smuggle material. One group, for example, attempted to smuggle radioactive dice out of Thailand and into the United States in an elaborate scheme to cheat members of the U.S. gambling industry.[2] A British terrorist cell, which had been planning attacks in England and in the United States, was attempting to harvest smoke detectors for their Americium-241 (Am-241) radioactive sources.[3] Another case, although not a seizure, was the intentional radiation poisoning of Alexander Litvinenko, a former KGB/FSB Colonel, with what turned out to be Polonium-210 (Pu-210).[4] Although never proven, many believe Russian agents killed him for his outspoken comments against the Russian State. Although these instances do not represent the majority of cases involving nuclear or radiological material, and clearly fall well outside the norms

and this type of smuggling, the continuation of this trend seems to be most prevalent. There were no large shifts, or deviations, in the historical smuggling trends. Rather, there was a slight decrease in the seizure rate and a slight shift in the type of material being smuggled.

Figure 2: Categories of Seizures[5]

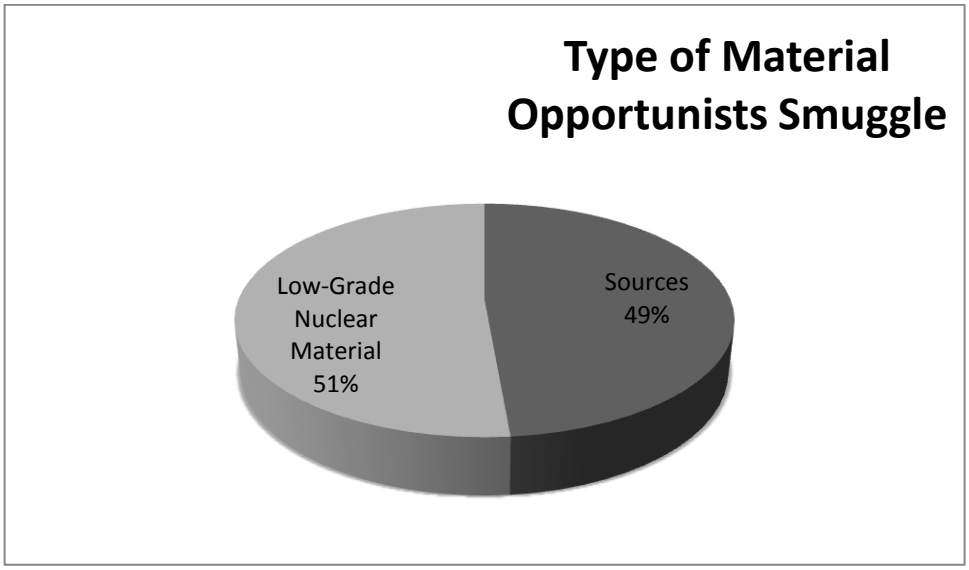


Opportunists

This group of perpetrators represents the largest category of those smuggling nuclear and radiological material and, as defined earlier, they are motivated by the potential profit of a quick sale. One of the largest reasons leading to their arrest is that they do not know where, how, and/or who to sell this material to. That being said, opportunists account for 72 of the 156 cases during this time period, which is shown in Figure 2 as accounting for 46% of the cases, have concentrated their efforts on easily to acquire material like sources and low-grade material. Opportunists do not account for any cases involving weapons-grade nuclear material. This is because access and placement is required in order for anyone to have any hope of acquiring that type of material. Based on the cases during this

timeframe, it is clear that opportunists have neither.[6] It is apparent that opportunists lack knowledge of who to sell to, but that fact hasn't stopped them from attempting to acquire the contacts and make the sale in order to achieve their goal of a quick profit.

Figure 3: Type of Materials Opportunists Smuggle[7]

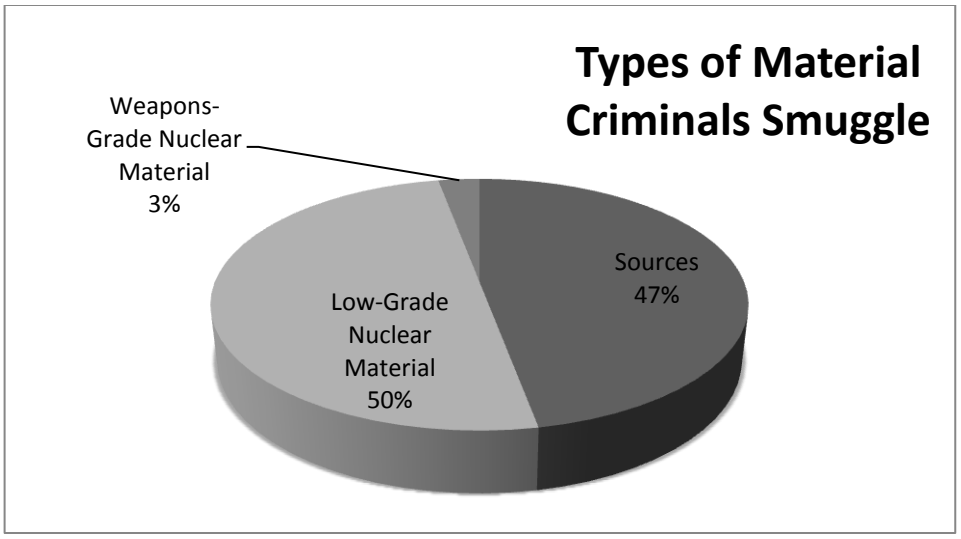


Criminals

This group of perpetrators is regarded as local and/or regional criminals having previously been arrested for attempts to smuggle, or sell, nuclear material. Conveniently, many of these arrests have taken place near their residence. The criminal category accounts for 34 out of 156 cases, or 22%. Like the opportunists, criminals have not smuggled weapons-grade nuclear material and also seem to be fairly evenly split between sources and low-grade nuclear material, as noted in Figure 4.[8] However, in August 2005, two men were arrested in Istanbul, Turkey with 173g of what was later determined to be 17% enriched Uranium 235 (U-235). Turkish security forces caught the perpetrators in an undercover operation where the criminals had agreed to sell the U-235 for $7 million.

Although it was never proven, the Turkish security forces report on the incident indicates that the material was believed to have originated from Russia and that the buyer was a terrorist group.[9]

Figure 4: Type of Materials Criminals Smuggle[10]

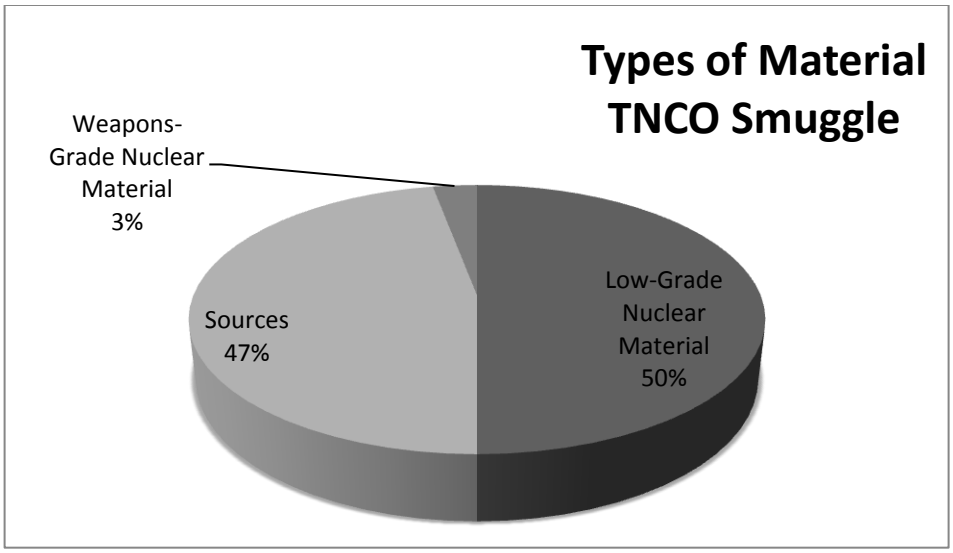


Transnational Criminal Organizations

Within this reporting period, only 3% – five cases out of the 156 cases – indicate a direct, or implied, association with a TNCO or organized crime, the first of which was a seizure that occurred on December 6, 2003. This seizure involved four Belarus citizens who were arrested for attempting to sell two containers of Cs-137 for a reported $500,000. One of the open-source reports indicated that the material originated in Russia but no indication was given as to whom, or where, it was to end up. These men were categorized as members of an "international criminal organization," and apparently the police, for a previous incident, wanted one of the perpetrators, although no further information was provided regarding the previous incident.[11] It is unclear how the source connected these individuals to a criminal organization, but

this incident clearly falls within the TNCO category even though the report also indicated that they were resident of Bobruisk, Belarus where the arrest was carried out (a criteria for the criminal category).

Figure 5: Type of Materials TNCOs Smuggle[12]



The second case, which was categorized as an "*organized radioactive material trafficking ring*," consisted of two Slovak nationals that were arrested in Brno, Czech Republic on November 14, 2003, for attempting to sell 3kg of uranium to undercover police. The report indicated that "*the material was of Russian origin.*" However, after further analysis, the material turned out to be depleted and natural uranium. This case carries the hallmarks of a scam because sellers will often misrepresent the type of material they are selling in an effort to maximize their profit.[13]

The third case received quite a bit of notoriety because it involved HEU. In February 2006, Oleg Khintsagov, a Russian citizen, and three Georgian citizen cohorts, were arrested by the Georgian Secret Service for attempting to sell approximately 100g of HEU. After further analysis by the DOE, it was reported that the material was enriched to 89%, which is quite significant based solely on the enrichment level because these types of seizures are uncommon. Khintsagov stated, just prior to his arrest, that

he had more HEU material in Ossetia but that material was never recovered. This event had an interesting ending because Khintsagov received only an eight-year prison sentence. However, for some unknown reason, he was pardoned by the President of Georgia and released after serving just 6 years of his sentence. The other 3 perpetrators, for their part, each received no more than five-year prison sentences.[14]

The fourth case occurred in 2010 where a "*group of foreign citizens*" were arrested while attempting to smuggle an unspecified amount of HEU through Georgia. Some reports indicate that the material was enriched to over 70% but no analysis of the material had been completed. This HEU seizure is the eighth case since 1999 where material of this nature was attempted to be smuggled through Georgia. Soon after this event, Zaal Lomtadze, who is the head of the Georgian Ministry of Environmental Protection and Natural Resources' Nuclear and Radiation Safety Service stated, *"The frequency of the attempts indicates that there is likely an 'organized' effort to smuggle HEU through Georgia."*[15] This lends credence to the idea as to indicate that this is one of the preferred smuggling routes from Russia.[16]

Out of all of these cases, the fifth case is the most notable as it involved the seizure of 66 pounds of depleted uranium from the *Fuerzas Armadas Revolucionarias de Colombia – Ejército del Pueblo* (Revolutionary Armed Forces of Colombia – People's Army; FARC-EP, or simply FARC) from Colombia in March of 2008. Earlier that same month, Colombian Forces conducted a raid just over the Ecuadorian border, which targeted then FARC leader, Luis Edgar Devia Silva, also known as Raul Reyes. As a result of this raid, Reyes was killed and the Columbian government recovered a wealth of information from hard drives and files seized from multiple computers and other media devices. The information recovered from this raid led them to locate and seize a cache containing the 66 pounds of depleted uranium.[17] Two years prior to that seizure, in March 2006, government officials arrested two Columbians when they attempted to sell a depleted uranium bar to undercover officials whom they thought were members of FARC. After the arrest, one of the perpetrators stated that he obtained the bar from a scrap-metal dealer who then stated it came from a ship (commonly used in ships as ballast or counterweights) that was being salvaged.[18]

Although the FARC origins are that of a Marxist/Leninist organization whose aim is to overthrow the Colombian government and install a socialist government, for the purposes of this research, they have been classified as a TNCO because of their narcotics enterprise. This industry is estimated to generate up to $1 billion in profit, which in turn supports their insurgency against the Colombian government.[19] To further illustrate the point, Bartosz Stanislawski, of the Moynihan Institute of Global Affairs, Syracuse University had the following to say when classifying the FARC;

> *Not all so-called terrorists, however, operate on the basis of political, ideological, religious, or ethnic goals. Not anymore, anyway. The Revolutionary Armed Forces of Colombia (FARC), for example, used to be a politically motivated guerrilla organization. Presently it profits from drug trafficking; the organization benefits monetarily from this enterprise and is unlikely to give such activity up easily. Its members have always acted criminally in order to support themselves financially; ransom-motivated hostage taking was and still is a significant part of the FARC funding. But they seem to have crossed a line. The political rebels have become pirates, while still pretending to be rebels to recruit new members, maintain a "legitimate" public image, justify, many would argue, some of their own acts to themselves.*[20]

Other

This category encompasses 29% of all seizures of nuclear and radiological materials that do not fit into the previous opportunist, criminal, or TNCO categories. These "other" seizures consist of contaminated materials like scrap metal or earth. However, the majority of this category is filled with the recovery of, what is commonly referred to as, Orphaned Sources.

Orphaned Source

These types of events are radiological sources that are often overlooked, abandoned by civilian agencies or organizations, or are either forgotten and/or discarded. For whatever reason, these sources have fallen outside of, or never were under, regulatory control. The IAEA defines an orphan source as;

> *A radioactive source which is not under regulatory control, either because it has never been under regulatory control, or because it has been abandoned, lost, misplaced, stolen or otherwise transferred without proper authorization.*[21]

Figure 6: Photo of Alleged Soviet Radioactive Waste[22]

One of the most publicized examples was in 1987, in Goiânia, Brazil where a radiological source containing about 93g of highly radioactive cesium chloride (a cesium salt made with a radioisotope, Cs-137) was removed from a private hospital by scavengers who believed it to have scrap value. As a result over, 100,000 citizens were screened, 249 people were contaminated, four people died, 70 tons of earth was removed, and 85 houses were contaminated from which 200 people were evacuated.[23] The four that died had direct access to the source where the others that were contaminated only had limited exposure. Although nothing like this

occurred during the time period, this type of incident has the potential to drastically increase over the next few years due to the projected increase of scrap consumption and the increased proliferation of radiation detectors located within scrap processing facilities.[24]

Closely related to this group is the intentional and unauthorized disposal of radiological materials. These events include cases such as illegal dumping and there were two cases that were exposed, that occurred as far back as the 1990s but were discovered during this reporting period. The first case involved the Italian Mafia allegedly disposing hazardous waste for pharmaceutical companies. This event has come to light from the testimony of a former 'Ndrangheta' Mafia member who personally sank a ship in 1993 and assisted in at least two other sinkings. The second case involves the dumping of radioactive waste near the Swedish island of Gotland in the Baltic Sea (Figure 6), where apparently the withdrawing Russian military dumped this material before returning to Russia in the early part of the 1990s.

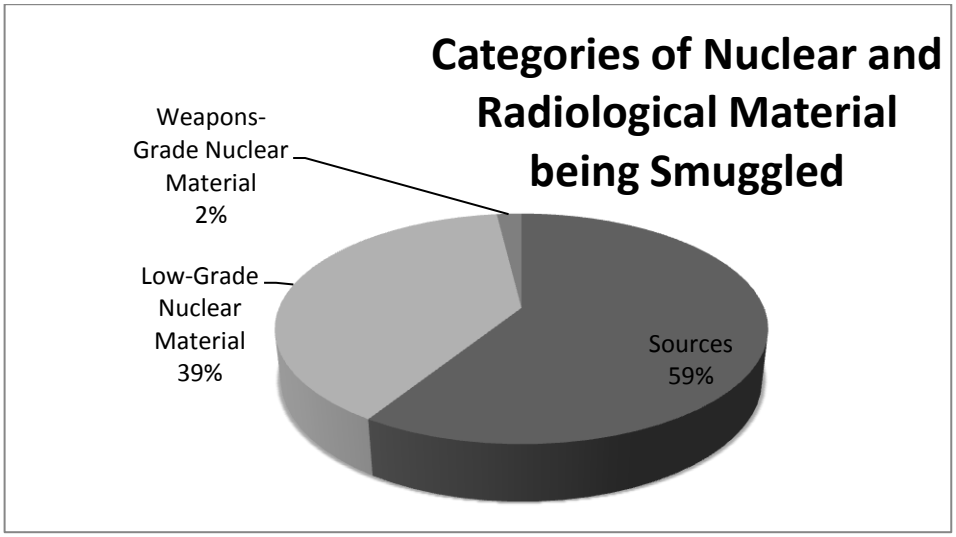
Although there were no recoveries of orphaned sources that posed significant health risk to anyone, the potential for this type of material to fall into the wrong hands to still too great.

Contaminated Scrap Metal

The contaminated scrap metal incident type is very common because of the theft of unsecured metal. Scrap metal sometimes includes a radioactive source or is a contaminated material. As mentioned before, orphaned sources can find their way into scrap metal because people collect and turn in this material in order to make a living. This material will, in turn, eventually arrive at a metal reprocessing plant where the increased prevalence of radiation detectors would detect the material. In one particular case, a mound of radioactive scrap metal, two kilometers long, was formed by shipments of contaminated scrap metal that were denied entry into China at the Torugart border checkpoint. The scrap metal, which originated in Kyrgyzstan, was inspected by the Chinese border guards and, at that point, it was discovered to be contaminated and the trucks were turned away. The truck drivers carrying the contaminated scrap metal were forced to dump their loads between the two countries border checkpoints because the Kyrgyzstan border guards would not allow

them to return, and as a result both countries now have a significant environmental cleanup to deal with.[25]

Figure 7: Categories of Nuclear and Radiological being Smuggled[26]



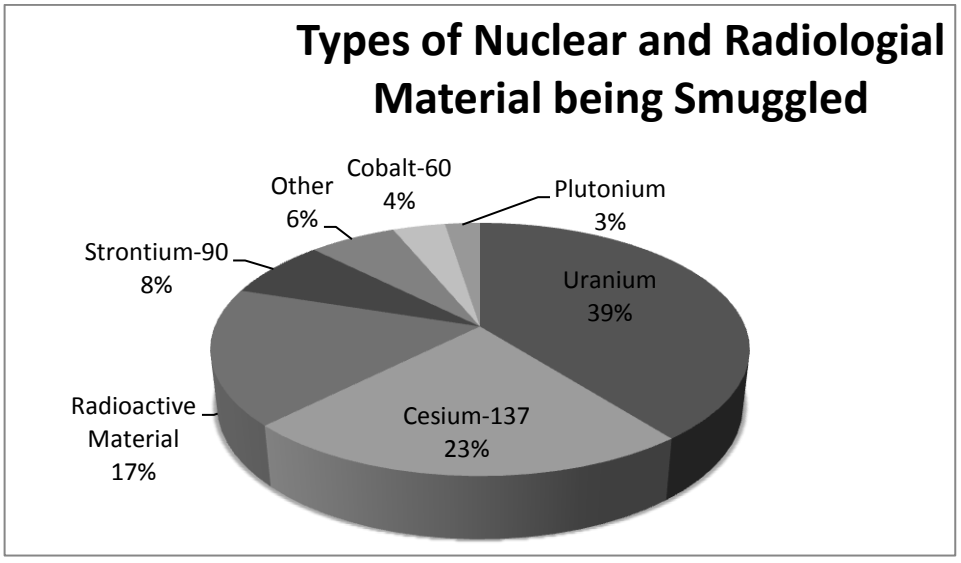
Also during this time period, there were multiple occasions where scrap metal or reprocessing plants were shut down because of contaminated material. The financial costs of lost revenue due to the closure of the plant, coupled with the costs associated with the environmental cleanup, are not cheap. From these events, there has been an increase in radiation detection equipment being installed at these types of plants in order to prevent such an event. The June 2004 special report *Radioactively Contaminated Scrap Metal* explains it quite thoroughly;

> *In general, the radioactive material involved in contaminated scrap incidents has been either naturally occurring material such as uranium ore, or orphaned radioisotopic sources that have been inadvertently or deliberately disposed of within scrap metal. The origin of such orphan sources is generally not obvious at the time of the incident, and difficult to ascertain after the fact.*[27]

Material

Out of 156 seizures of nuclear and radiological material, from 2002 to 2011, well over half (59%) were sources, followed by 39% of low-grade nuclear material, and lastly just 2% were cases involving weapons-grade nuclear material (Figure 7). These percentages appear to support, and coincide, with who is doing the smuggling. That is to say that opportunists and criminals appear to have access to the lesser threat material of sources and low-grade nuclear material and not that of weapons-grade nuclear material. To take it a step further, and look at specifically what type of material is being smuggled, as shown in Figure 8, you can clearly see that Uranium and Cs-137 are the most trafficked. Out of the three cases in which HEU was involved, two have all ready been discussed earlier within the TNCO section. The third case, however, was actually the first to occur during the reporting period.

Figure 8: Type of Nuclear and Radiological being Smuggled[28]



On June 26, 2003, an Armenian national, Garik Dadayan, was arrested for attempting to smuggle 170 grams of HEU across the Georgian and Armenian border in the town of Sadakhlo. All indications were that he

knowingly tried to smuggle this material, but at the time of the report, it was unknown where the material came from. Only later was it reported that the material had actually come from Russia, but it is still unclear where and to whom this material was destined.

Location

Considering that Russia has produced an abundant amount of material, has a history of failing to adequately secure the material, and has inaccurately accounted for its nuclear, radiological, and fissile material over the last six decades, it is really no surprise that these countries, not counting India, have the largest amount of seizures (Figure 9). When looking at the seizures occurring in Europe, and in the Caucuses as shown in Figure 10, the majority of these reports indicate that the likelihood is very high that the material is coming from Russia, or one of its former states. On the other hand, and somewhat of an anomaly, is India accounting for the third largest number for seizures.

Figure 9: Seizures by State[29]

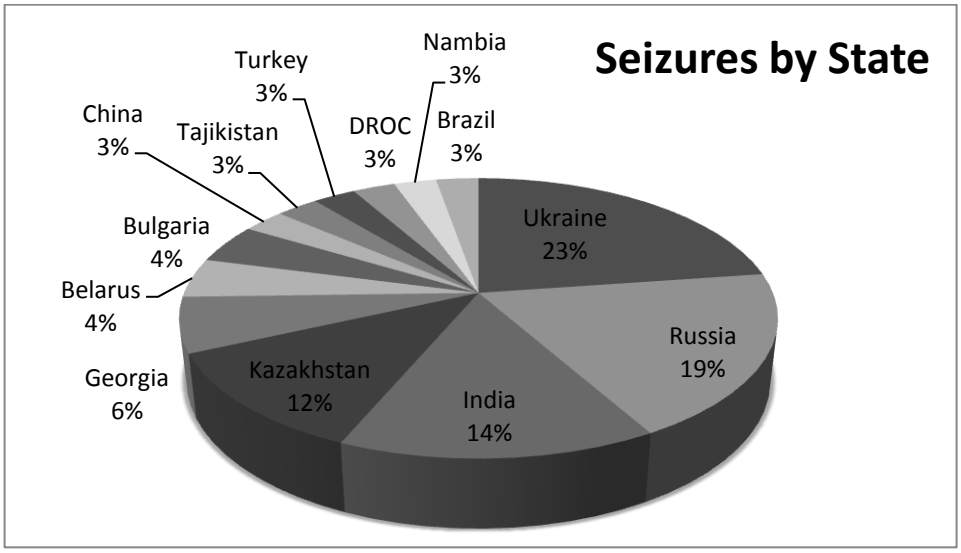
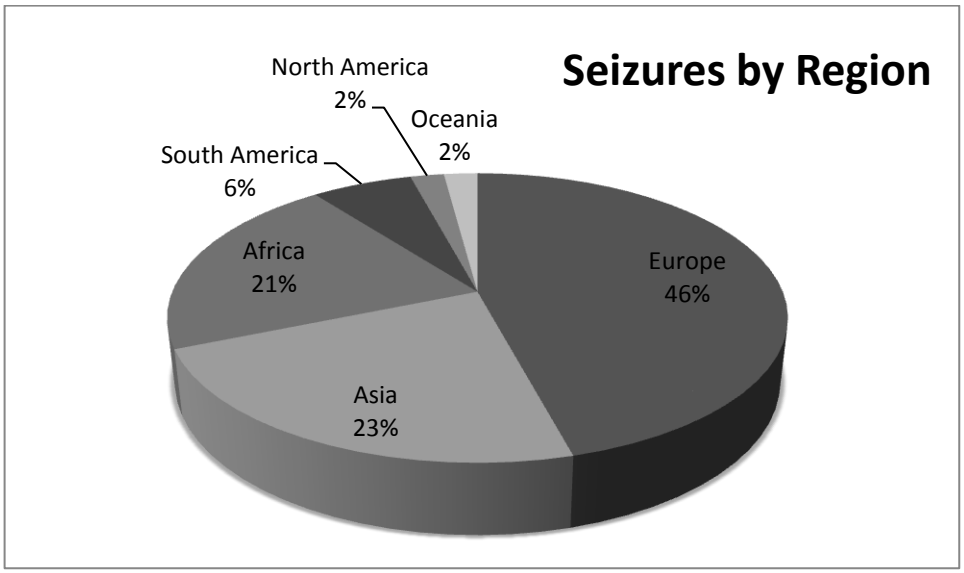


Figure 10: Seizures by Region[30]



Scam

Littered throughout this timeframe are examples of scams, which take many forms and shapes but the one constant throughout all of these events is the misrepresentation of material for another in the hopes of maximizing profit. Some of the scams go to great links to demonstrate authenticity of material, for example, through the use of certificates. The seller provides these documents with the intention of providing a certain level of comfort, or reassurance, so that the buyer believes that they are purchasing the genuine article.

Secondly, with this certificate, or other types of documentation, smugglers will sometimes ask for an outrageous sum of money and, given the purported material, the buyer deems the cost to be appropriate. However, what typically ends up happening is that the seller is selling anything except what is being advertised. These materials include, all forms of uranium (natural or ore, depleted, or low-enriched), cesium pellets, and even transport containers for radioactive material.

These source holders are designed to safely hold, store, and transport radioactive sources, such as Cs-137 and Co-60 throughout the world. They

are constructed out of dense material, which include natural and depleted uranium, lead, and other similar material. The advantage of using these holders in scams is:

1. They are already appropriately marked with radioactive symbols as required by international standards.
2. They are lined with natural and/or depleted uranium, which in turn means;
3. They are already radioactive without placing a source within it.

Incentive

The single largest incentive, and arguably the only incentive to smuggle nuclear material, is financial. Not only to gain profit but to do so as quickly as possible and with very little effort. The asking price of any nuclear material seems to be based on absolutely no factual understanding of what these materials are actually worth. From one attempted sale to another the price fluctuates from a few thousand dollars to tens of millions of dollars, regardless of quantity.[31] Prices seem to be determined solely on the perceived level of need of the buyer on the part of the seller.

Notes

1. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Materials*, (Livermore, CA: Lawrence Livermore National Laboratory, 1977-2011).

2. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Materials; August 2002*, (Livermore, CA: Lawrence Livermore National Laboratory, 2002).

3. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Materials; October 2004*, (Livermore, CA: Lawrence Livermore National Laboratory, 2004).

4. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Materials; November 2006*, (Livermore, CA: Lawrence Livermore National Laboratory, 2006).

5. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, compiled by author, 2002-2011.

6. Ibid.

7. Ibid.

8. Ibid.

9. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material; August 2005*, (Livermore, CA: Lawrence Livermore National Laboratory. August 2005).

10. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, compiled by author, 2002-2011.

11. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear Materials; February 2003*, (Livermore, CA: Lawrence Livermore National Laboratory, 2003).

12. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, compiled by author, 2002-2011.

13. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear Material; November 2003*, (Livermore, CA: Lawrence Livermore National Laboratory, 2003).

14. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material; February 2007*, (Livermore, CA: Lawrence Livermore National Laboratory, 2007).

15. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material; April 2010*, (Livermore, CA: Lawrence Livermore National Laboratory, 2010).

16. "Tbilisi Busts Enriched Uranium Smugglers," Molly Corso, *EurasiaNet.Org*, On-line, Internet, 28 April 2012, available from http://www.eurasianet.org/node/60945.

17. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material; March 2008*, (Livermore, CA: Lawrence Livermore National Laboratory, 2008).

18. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material; March 2006*, (Livermore, CA: Lawrence Livermore National Laboratory, 2006).

19. "Colombia: FARC Profiting from Narco-Trafficking," Carlos Andrés Barahona, InfoSurHoy.com, On-line, Internet, 20 April 2012, available from http://www.infosurhoy.com/cocoon/saii/xhtml/en_GB/features/saii/features/main/2011/11/21/feature-02.

20. Bartosz Stanislawski, "Transnational Organized Crime, Terrorism, and WMD," *International Studies Review* 7, no. 1 (03, 2005), 158-160.

21. International Atomic Energy Agency, *Safety Standards: Categorization of Radioactive Sources*, (Vienna, Austria: International Atomic Energy Agency).

22. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, February 2010).

23. "The Radiological Incident in Goiânia," International Atomic Energy Agency, On-line, Internet, 20 October 2011, available from http://www-pub.iaea.org/mtcd/publications/pdf/pub815_web.pdf.

24. "Global Steel Scrap Consumption to Reach 631.5 Million Tons by 2015," Global Industry Analysts Inc., On-line, Internet, 17 April 2012, available from http://www.prweb.com/releases/steel/scrap/prweb4370234.htm.

25. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA: Lawrence Livermore National Laboratory, September 2004).

26. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, compiled by author, 2002-2011).

27. Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear Material; June 2004*, (Livermore, CA: Lawrence Livermore National Laboratory, 2004).

28. Ibid.

29. Ibid.

30. Ibid.

31. Ibid.

CHAPTER 4

Negative Incentives

> *Although some argue that such groups (TNCO or Organized Crime Syndicates) most likely have no interest in dealing with nuclear material because they are gaining sufficient profits from their other activities and do not want to jeopardize what they have…*[1]

This chapter discusses the idea of risk, self-preservation, and retribution and how these concepts affect the decisions of individuals, groups, and states. Although we have been discussing the idea of TNCO involvement with smuggling nuclear and radiological material, two case studies that clearly demonstrate how these concepts affect the decisions with regards to WMD. In one case a state decided to forgo a four-decade long program and in the other case a group's decision not to attack a nuclear site.

The largest negative incentive to smuggling nuclear material is the risk associated with getting caught. Every day, citizens in every country in the world make everyday decisions based on what they deem to be an acceptable level of risk. If it is below that threshold, they are likely to proceed. If not, they will likely hesitate and decide against that course of action. These everyday decisions can be simple things like the speed they choose to drive to increasingly more complex decisions like determining their chosen profession, which stocks to invest in, or whether or not to serve in the military while the country is at war. All of these decisions have a certain level of inherent risk associated with it. So, depending upon the individual person, they might decide that investing in Weapons of Mass Destruction (WMD) is worth the risk of an international response where the response could include sanctions, embargoes, military action, or even that individual's death.

Risk & Self-Preservation

The theory of risk, or risk theory, is better described by Arcady Novosyolov of the Siberian Federal University as,

> [A] *theory of decision-making under probabilistic uncertainty. From mathematical point of view it is a branch of probability theory, while its applications cover all aspects of life. Financial applications are most advanced, including banking, insurance, managing market and credit risks, investments and business risks…there are also applications to managing risks of health hazard, environment pollution, engineering and ecological risks.*[2]

Directly associated with risk is the concept of self-preservation, which can be traced as far back as 1651 when Thomas Hobbes penned in his book, *Leviathan*, where he wrote that self-preservation is fundamentally good.[3] The term self-preservation can be best described as preserving your own existence and even Dr. Sigmund Freud contributed to the self-preservation concept when he wrote:

> *[T]he undeniable opposition between the instincts which subserve sexuality, the attainment of sexual pleasure, and those other instincts, which have as their aim the self-preservation of the individual, the ego instincts.*[4]

One of the most common forms of self-preservation is within politics whereby politicians trade votes, also known as horse-trading, to one another in order to maintain or gain support. In an election year, incumbent politicians, at all levels, begin to strategically assess certain issues. These strategic assessments are performed on issues like gas prices, employment percentages, job creation, budgets, and healthcare, to name a few. Although these issues might not have been at the forefront of their daily activities during the bulk of their terms, they must now, in order to continue to serve in that capacity, invoke their self-preservation instinct and do whatever it takes to be re-elected. Conversely, when it comes to organized crime or a sovereign state's decision to traffic nuclear material,

or develop a WMD program, the idea of self-preservation is at the forefront of their daily decision-making process.

Retribution

Closely following risk is retribution from the international community. Many countries, not just the United States, will turn all of the elements of their national power against that person, group, and/or state. The United States has put forth a lot of time, effort, and money to the security of its citizens and its national interests, especially with regard to WMD. Following 9/11, the majority of nations provided their support to the United States in numerous forms, not least of which were the NATO countries support for the mission in Afghanistan. All nations condemned the 9/11 attacks and the actions of Al Qaeda and took the unprecedented step of sharing intelligence and invoking U.S. military regional basing rights agreements that allowed for multinational strikes on Al Qaeda's safe havens. A similar response from the international community would follow in the event of a WMD attack. This response would be wide ranging and would include any person, group, and/or state that participated in the attack. The response would also include any person, group, and/or state who had previous knowledge of the attack and actively chose to ignore, or negligently failed to inform, allies and/or affected nations. It is this retaliatory response that gives organized crime syndicates, transnational criminal organizations, and even terrorists pause when considering the use of WMD. When it comes to exerting elements of national power, each nation, some more so than others, generally have the same elements at their disposal: diplomatic, military, intelligence, economic, financial, information operations, and law enforcement. Persons, groups, and/or states that have deployed a WMD as a terrorist act would be most affected by the economic, financial, and law enforcement elements of any states national power. It is in these three areas that the local or regional agencies could be most effectively imposed.

The local or regional response would have devastating effects upon organized crime syndicates, transnational criminal organizations, and terrorists alike. Because organized crime is just that – organized – these organizations have well established and sophisticated smuggling routes. They also have officials that have been bribed at all levels of government,

law enforcement, and intelligence agencies. However, even though they may have been bribed, or turned a blind eye to the more minor crimes, these officials are not completely oblivious to their activities. It is unrealistic to expect a crime free society in today's world. Therefore, many agencies will concentrate their efforts on crimes of greater significance, especially those crimes where people can be killed or injured. That is not to say that these agencies do not care, it is simply that they need to concentrate their efforts on the "larger fish" or the larger crimes. As a result, their retaliatory response would target every known and/or suspected member of an organized crime syndicate, transnational criminal organization, and terrorist network. This targeted response would include residences, businesses, associates, family, and neighbors. The effect of this retaliatory response would be the utter disruption of their daily activities and, more importantly, the disruption of their established money producing enterprises.

Financial disruptions will wreck the most havoc and can come in many forms. The most common financial disruption being used today is the freezing of financial assets within the financial institutions themselves. Nations are able to do this through the established national and international legal framework of the prevention of money-laundering and terrorist financing. Historical examples include the freezing of Japanese assets in 1941 by President Roosevelt in retaliation for the Japanese occupation of China, the freezing of Cuba's assets in 1963 by President Kennedy as part of an embargo which is still in place today, and the freezing of over $100B worth of Libyan assets in 2011 by the United States, Great Britain, Germany, France, and other nations in an effort to prevent then President Muammar Qaddafi from stealing and/or fleeing with the country's wealth during the Arab spring.

Libya

The two case studies that illustrate this concept of risk analysis are Libya's 2003 decision to give up their WMD program and Al Qaeda's decision to not attempt the capture of Pakistan's nuclear weapon site as early as 2003. These examples go to the heart of risk management and self-preservation. First, the catalyst for Libya to give up its program was not just the United States invasion of Iraq in 2003, although it was a factor

in their decision. Rather, it was the economic plight that the Libyan citizens had endured for decades and the potential and anticipated succession by Qaddafi's son, Saif al-Islam Gaddafi. Libya had been a member of the IAEA since 1963 and began its peaceful pursuit of nuclear relationships as early as the 1970s when Argentina agreed to provide Libya with assistance for uranium mining. It was such a widely held belief that Libya possessed uranium deposits and that France agreed to build a nuclear research plant. However, Russia seemed to be the largest commercial nuclear ally to Libya as they provided peaceful nuclear energy by way of a ten-megawatt reactor in 1981. In the few years that followed, Russia then agreed to build an 880-megawatt power plant and nine 440-megawatt nuclear power plants. However, those plans were short lived as construction never began.[5]

Although Libya had been pursuing peaceful means of nuclear power, they had also been simultaneously pursuing a nuclear weapons program. In the 1970s, Qaddafi approached China regarding the possibility of purchasing nuclear weapons to respond to Israel's nuclear capabilities.[6] China, weighing their risk and self-preservation instincts, smartly turned Qaddafi away. During the same time period, Libya was providing Pakistan with financial and material assistance while they developed their own weapons program. The material assistance provided to Pakistan by Libya came in the form of uranium, "yellow cake," that originated in Niger. Even though Libya clearly had taken the initial steps toward its own program, they would still, publicly, demonstrate their peaceful use of nuclear power and denounce the pursuit of a weapons program. During this time period, Qaddafi is quoted as stating "*We consider nuclear weapons production a great mistake against humanity*," and that they would not assist Pakistan in their quest for a nuclear weapon.[7]

A decade or two later, Qaddafi is still in power in Libya and the Dr. Abdul Qadeer Khan (A.Q. Khan) nuclear network had begun its proliferation around the world to places like North Korea, Iran, and Libya. The A.Q. Khan network later admitted meeting Libyan officials in Turkey as early as 1990. Dr. Khan, who is considered the grandfather of the Pakistan nuclear weapons program, began selling the excess equipment from Pakistan's program and assisting other countries in acquiring material through third party "shell" corporations. By the early part of 2000s, A.Q. Khan had even created his own production facilities where he

was able to build and ship material and equipment to these countries. The most notable case involved one particular shipment that was transported through Dubai. The shipment was relabeled as ''used machinery'' in Dubai and rerouted to Libya. However, German and Italian forces intercepted the shipment once it had negotiated the Suez Canal. On December 19, 2003, after nine months of secret talks between Libya, United States, and British governments, Libya officially announced that they were giving up their WMD programs after 40 years. It was during these nine months of secret talks that the United States and other intelligence agencies learned of the full extent of Libya's program and covert treachery. Libya's involvement in nuclear proliferation included both of Pakistan's centrifuge designs; G-1 and G-2 (P-1 and P-2).[8,9]

There are several reasons why Qaddafi decided to give up his nuclear weapons program. Even though Libya had spent billions of dollars over 40 years, sent hundreds of students to school overseas, and continued to purchase equipment from the A.Q. Khan network, they determined that they lacked the engineering and scientific expertise to manufacture and, more importantly, maintain a WMD weapons program. Qaddafi purchased the necessary equipment from the A.Q. Khan network but Libya could not retain the internal knowledge needed to create, sustain, and produce the necessary materials for a successful WMD program. This lack of expertise would have eventually exposed them to foreign intelligence agencies. This exposure would have been generated by either their continued solicitation of help from, not only, the Khan network but also from legitimate companies and nations who could have informed the international community.

Secondly, many countries, and even the United Nations, have imposed sanctions and embargoes against Libya beginning in the 1980s. These sanctions were the result of their involvement, or suspected involvement, in the 1985 bombing of two European airports. In 1993, the UN Security Council imposed the ban of oil, among other things, until Libya agreed to extradite two suspected perpetrators of the 1988 Pan Am 103 bombing. Later in 1996, the U.S. Congress passes the Iran Libya sanctions act (ILSA), which penalizes companies who invest more than $40 million into the Libyan gas and oil industry. As result of the mounting sanctions, the financial losses to Libya were well into the hundreds of billions of dollars.[10] Shahram Chubin, of the Carnegie Endowment for

International Peace, whose research has focused on Middle East security issues, has previously stated;

> *I think it's a combination of a trend in Libya in the sense that Libyans had a great deal of difficulty as a result of the United Nations sanctions imposed on them as a result of their involvement in the Lockerbie bombing, and they first negotiated their way out of that by admitting responsibility.*[11]

Third, Gaddafi was not getting any younger and at some point someone would have to succeed him. The most likely to do so would be one of his sons. Many believed that successor to be his son Saif al-Islam Gaddafi. Saif al-Islam Gaddafi graduated from the London School of Economics (LSE) with a PhD in Philosophy, however, some believe his dissertation contained plagiarism. Although he has claimed not to be his father's designated successor, many believed this to be the case.[12] Again, Chubin goes on to state;

> *I think, secondly, that Libya – and in particular its leadership – are getting ready for succession. They must have recognized that it makes sense to bring Libya back into the fold of the international community, and to do that they'd have to dispense with these programs that they've been having for many, many years, which clearly serve no rational purpose. And I think it's a recognition by Gadhafi that he wants to let his son succeed him and to leave Libya in a slightly better position if he gets rid of these useless weapons, which have created unnecessary distrust and suspicion on the part of its neighbors and, of course, the international community as a whole, including Britain and the United States.*[13]

Lastly, which I believe was the catalyst that started Libya to give up the WMD programs, was the U.S.-led invasion of Iraq in March of 2003. This painted Libya further and further into a corner. If the United States was willing to invade Iraq based on what many in the world perceived as suspect intelligence, then from Libya's perspective, they probably saw the

United States to be more than willing to invade Libya as well.[14] Later that same year, Gaddafi, as stated to Mr. Berlusconi, the Italian prime minister, said that; "I will do whatever the Americans want, because I saw what happened in Iraq, and I was afraid."[15]

Al Qaeda

The second case study was Al Qaeda's decision not to attack Pakistan's Kahutta nuclear weapon facility for fear of retaliation from, not only, Pakistan but also the rest of the world. Since the attacks on September 11, 2001, Osama bin Laden had not stopped planning for future attacks. Many of these attacks were successful at killing and injuring hundreds of people. However, there were a few unsuccessful attacks as well.

Three successful attacks standout among the others not because of the amount of people killed or injured, but rather because they occurred after the 9/11 attack's when Al Qaeda was supposed to be weakened and constantly on the run. These three attacks show that Al Qaeda was still able to effectively function around the world. Chronologically, the first attack occurred in 2002 in Bali, Indonesia. This attack killed over 200 people and injured hundreds more when a suicide bomber detonated a vest laden with explosives inside a nightclub. Those not killed in that initial explosion fled the nightclub, which is when a vehicle borne improvised explosive device (VBIED) was detonated and inflicted the majority of the collateral damage. The second attack occurred in Madrid, Spain in 2004, where multiple bombs were detonated on four different trains as morning commuters were heading to work. The Madrid attack resulted in the killing and injuring of dozens not to mention the long-term disruption of public transportation and the instilment of a culture of fear and panic. Lastly, in 2005 in London, England, over 50 people were killed and 700 injured when the public transportation system was bombed by four suicide bombers. Three of the four bombers detonated themselves within the subway system while the fourth bomber detonated himself on a crowded bus a short time later.

In each of these attacks, Al Qaeda either claimed responsibility, funded all or part of the operation, or directly carried out the attack. Regardless of Al Qaeda's level of involvement, these attacks clearly

demonstrated to the world that they were capable, determined, and clearly not going away. Even with these well-publicized successes, Al Qaeda also had failures. The first of these failures came as a result of a would-be bomber, Richard Reed, in December 2001. Reed unsuccessfully tried to ignite explosives hidden within his shoes while as a passenger on American Airlines flight 63 from England to the United States. As a result, Reed was commonly referred to as the "Shoebomber." Later in 2009, on Christmas day, Umar Farouk Abdulmutallab (Omar Farooq al-Nigeri) was arrested in Detroit, Michigan after he failed to detonate the explosives that were hidden within his underwear. Abdulmutallab received the nickname "Underwear Bomber" in the press. Lastly, in 2010, a car bomb parked in Times Square in New York City failed to detonate and the perpetrator, Faisal Shahzad, was later arrested as he was attempting to flee the United States to Dubai.

After the raid into Pakistan that took Osama bin Laden's life, recovered files, computers, and drives show that he continued to plan attacks against the United States and its allies until his dying day. Interrogations of Al Qaeda personnel have revealed that it was clear to the senior leaders and Lieutenants just beneath Bin Laden, that he was past his prime and that he should remain as a public figurehead far removed from the duties of planning attacks. Pakistani Brigadier General (Ret) Shaukat Qadir, who has written a yet-to-be-published paper, was given unlimited and direct access to Bin Laden's Abbottabad compound shortly after the May 2, 2011 raid, which claimed his life. Within this paper he goes on to state;

> *Bin Laden and his deputy, al-Zawarhi, suffered serious disagreements that led to bin Laden's been pushed to the sidelines. This devise grew with time, it remains a source of tension until the day he died," and that "his wall had been diminished.*[16]

One of Bin Laden's plans that was not carried out was the plan to capture Pakistan's nuclear facility in Kahutta. This facility housed the Khan Research Laboratory (KRL), which, as one of Pakistan's uranium enrichment facilities, is estimated to produce enough HEU for two to three weapons a year.[17] Interestingly enough was what he wanted to do; capture

not attack. Although there are some reports that indicate that Pakistan's nuclear facilities have already been attacked, it is unclear as to what Bin Laden's end state of capturing such a facility would have been.[18] The reaction of al-Zawarhi and the high council of Al Qaeda was that this event would have serious repercussions from Pakistan and especially the United States and, as a result, no attack has occurred.[19] John Wilson summarizes it best in *Islam, WMDs, and Al Qaeda's Final Goals* when he wrote;

> *The 'hawks' wanted the group to acquire WMD and they feared that the United States was planning to attack Afghanistan with such weapons. They said it was imperative to have such a capability as a deterrent so as to retaliate, if attacked. Those who opposed the proposal were equally strong in their arguments and warned that WMDs would attract a strong reprisal from the United States and a loss of public support, among other fallouts. There was, however, consensus among the discussants that WMD was a dangerous capability, and could attract punitive action from the west.*[20]

It is clear that every person, group, or organization has a point they will not cross for fear of a negative response – from a child's decision to either tell the truth or lie for fear of a parent reaction to a state decision to continue with a course of action that has no possible positive outcome. Such is the case with Libya and Al Qaeda where each decided to either forgo a course of action or not even attempt a course of action in the first place. As Phil Williams writes in his article, *Terrorism, Organized Crime, and WMD Smuggling: Challenge and Response*;

> *There are complex but reinforcing reasons for reluctance, ranging from concerns about risk and retribution to a relevance to disrupt existing illegal markets and their accompanying revenue streams.*[21]

While it would be difficult to categorize Libya or Al Qaeda as organized crime or even as a TNCO, their decision to give up or not

pursue an attack on a nuclear facility goes to the very heart of the point of risk.

Notes

1. Zaitseva and Hand, *Nuclear Smuggling Chains: Suppliers, Intermediaries, and End-Users*, 830.

2. "Risk Theory," Arcady Novosyolov, Siberian Federal University, On-line, Internet, 23 April 2012, available from http://risktheory.net/.

3. "The Natural Law Tradition in Ethics," *Stanford Encyclopedia of Philosophy*, Stanford University, On-line, Internet, 23 April 2012, available from http://plato.stanford.edu/entries/natural-law-ethics/.

4. Sigmund Dr. Freud, *The Psychoanalytic View of Psychogenic Disturbance of Vision*, (1910), 214.

5. "Libyan Nuclear Weapons," Global Security, On-line, Internet, 23 April 2012, available from http://www.globalsecurity.org/wmd/world/libya/nuclear.htm.

6. Ibid.

7. Ibid.

8. "U.S. Seized 1,000 Centrifuges Bound for Libya," World Tribune, On-line, Internet, 23 April 2012, available from http://www.worldtribune.com/worldtribune/WTARC/2004/ss_libya_01_19.html.

9. "Libyan Nuclear Weapons."

10. "Intervention and Exploitation: US and UK Government International Actions since 1945: Libya," On-line, Internet, 24 April 2012, available from http://www.us-uk-interventions.org/Libya.html.

11. "Libyan Nuclear Weapons."

12. "Profile: Saif Al-Islam Gaddafi," *BBC News* On-line, Internet, 24 April 2012, available from http://www.bbc.co.uk/news/world-africa-14617511.

13. "Libyan Nuclear Weapons."

14. Chester A. Crocker, Fen Osler Hampson and Pamela R. Aall, *Leashing the*

Dogs of War: Conflict Management in a Divided World, (Washington, D.C.: United States Institute of Peace Press, 2007), 310.

15. "UN should Fight for Rights, Says Berlusconi," Robin Gedye, Telegraph Media Group Limited, On-line, Internet, 24 April 2012, available from http://www.telegraph.co.uk/news/worldnews/europe/italy/1440562/UN-should-fight-for-rights-says-Berlusconi.html.

16. "A Personal Quest to Clarify Bin Laden's Last Days Yields Vexing Accounts," Declan Walsh, *New York Times*, On-line, Internet, 27 April 2012, available from http://www.nytimes.com/2012/03/08/world/asia/quest-to-clarify-bin-ladens-last-days-in-pakistan-yields-vexing-accounts.html?_r=1&pagewanted=all.

17. "Kahuta – Pakistan Special Weapons Facilities," John Pike, *Federation of American Scientists*, On-line, Internet, 26 April 2012, available from http://www.fas.org/nuke/guide/pakistan/facility/kahuta.htm.

18. "Jihadis Thrice Attacked Pakistan Nuclear Sites," Chidanand Rajghatta, *Times of India*, On-line, Internet, 24 April 2012, available from http://articles.timesofindia.indiatimes.com/2009-08-11/pakistan/28160861_1_shaun-gregory-pakistan-nuclear-sites-nuclear-weapons.

19. Abbas, Hassan. Interview by author. Washington, D.C., 26 April 2012.

20. "Islam, WMD and Al Qaeda's Final Goals," Wilson John, *Observer India*, On-line, Internet, 28 April 2012, available from http://www.observerindia.com/cms/sites/orfonline/html/paper/pdf/wilson.pdf.

21. "Terrorism, Organized Crime, and WMD Smuggling: Challenge and Response," Phil Williams, Naval Postgraduate School, On-line, Internet, 14 February 2012, available from http://www.nps.edu/Academics/centers/ccc/publications/OnlineJournal/2007/Aug/williamsAug07.html.

CHAPTER 5

Conclusion

Historical Trends

Material

LLNL began compiling this data in 1977 in order to convey the open-source data of smuggling nuclear and radiological material. When data sets from January 1977 through December 2001 and January 2002 through May 2011 are compared, you begin to understand how this type of smuggling has evolved.

Table 2: Type of Nuclear and Radiological Material seized from 1977-2011[1]

Types of Material	January 1977 – December 2001		January 2002 – May 2011		+/- % Increase Between Data Sets
	Cases	% of Data Set Total	Cases	% of Data Set Total	
Sources	301	55.5%	92	58%	+ 2.5%
Low-Grade	228	42%	61	39.1%	- 2.9%
Weapons-Grade	14	2.5%	3	1.9%	- 0.6%
Total	**543**		**156**		

Despite the modest fluctuation in the types of material being smuggled, everything depicted in table 2 is a positive for Western governments. First and foremost, the percentage of weapons-grade nuclear material, the material of greatest danger and concern, has decreased. This decline may be attributed to a greater awareness and countries doing a better job of securing the material. Secondly, the percentage of sources being seized increased 2.5%. This could be an indicator that sources are all that remains for smugglers. However, 40% of those five TNCO cases involved HEU, which is quite a troubling statistic when compared to what opportunists and criminals are smuggling. This larger percentage indicates that TNCOs are not falling victim to scammers and opportunists as they are ensuring that they are trafficking the right material. In effect, TNCOs are doing their due diligence which is a hallmark of organized crime.

Location

Sixty-seven percent of all material seized was captured in Russia or in a former state of Soviet Union (figure 10). This statistic is not coincidental because Russia was and continues to be one of the largest, if not the largest, manufacturer of nuclear and radiological material. Additionally, this statistic justifies the financial and resource commitments that the United States has expended over the years to combat, track, and arrest perpetrators. Two-thirds of all materials seized is a sobering statistic and provides more than circumstantial evidence that, if an individual or group is serious about acquiring nuclear or radiological material, there is a greater likelihood that they will attempt to do so in this region of the world.

Seizure Rate

The seizure rate is an indication of the frequency that smugglers or material are being apprehended and/or recovered. From January 1977 until December 2001 there were a total of 543 seizures, or one seizure every 16 days. From January 2002 until May 2011 there were a total of 156 seizures, or one seizure every 22 days. This equates to a 27% decline in seizures rates between the two data ranges. This could be an indication of one of two things; first, there is less material to smuggle, which could

indicate that states are doing a better job in securing their material; and secondly, those that are smuggling, regardless or category, are becoming better at smuggling and are not getting caught. The idea that individuals and/or groups are becoming better at smuggling could be true, which further lends support to this concept of a shadow market. However, without a 100% accountability of all nuclear and radiological material throughout the world, coupled with a periodic inventory, no one can state with any certainty that a shadow market exists.

Connection to TNCO

The purpose of this research to is understand and determine if there is a connection between TNCOs and the smuggling of nuclear and radiological material on behalf of a terrorist organization, or independently, in order to generate profit. The connection between nuclear and radiological material and TNCOs appears to be a minor one, at best. In the five cases that involved a TNCO, out of 156 total seizure cases, they represent a total of only 3%. From that, it would be difficult to say definitively that there is a connection with TNCOs. In every case presented during this time period, profit appears to be the one constant. The second constant is the prevalence of opportunists and criminals conducting the vast majority of the nuclear in radiological smuggling. Many authors and scholars have written about the concept of a "shadow market" and, perhaps, sensationalized organized crime and depicted this criminal element as being so sophisticated and so advanced in their smuggling that law-enforcement and intelligence agencies are oblivious to its existence. This research doesn't provide definitive proof that TNCOs are involved in a nuclear and radiological smuggling, but rather suggests that TNCOs are not involved with this type of smuggling based on two reasons. First, the amount of risk associated with this type of enterprise is far too great for any organization that has an established network of profit generating "businesses." And, secondly, the profit that could be potentially generated from the sale of HEU would, more than likely, be short lived. Meaning, it is doubtful that this type of market would last very long once the buyer, which is widely believed to be a terrorist group, had enough material to construct an IND or a RDD. Even if there were multiple buyers of this material, one of two things would occur:

1. The group who purchased the material would eventually use it and, as a result, suffer the consequences of retaliation from states; and
2. Depending upon the enrichment level, quantity, and asking price, few buyers could afford it.

Much of this research is predicated on the state of the TNCO. Meaning, the TNCO is generating profits elsewhere and there is no reason suddenly, or purposefully to migrate into smuggling this type of material. So, if it were a request to provide material to a customer (terrorist group) then the TNCO would have to weigh the risks versus the rewards for such an endeavor. Many different factors would have to be taken into account, such as:

1. Do they want to do business with this particular terrorist group?
2. Is the request even feasible?
3. Do they want to jeopardize their existing businesses for what could turn out to be a one-time transaction?

Those previous factors are indicative of a business that is doing well, but what if the TNCO's businesses are not doing well? It is reasonable to assume that their thought process, or decision-making matrix, would be different than it would be if their businesses were doing well. Conversely, when looking at this transaction from the buyer's perspective, if they have done their due diligence, they would know which TNCO to choose and, more than likely, they would choose the one that is the most successful.

Policy Implications

The statistics shown in table 2 demonstrate a positive trend that the United States and other countries should be pleased with (but not to the point of continuing with) the status quo. Countries need to continue to deter these individuals and/or groups by preventing access to, and properly account for, all material within their borders. While programs such as the DHS Container Security Initiative (CSI), the NNSA Megaports Initiative and Global Threat Reduction Initiative (GTRI), and the Department of State's (DOS) Proliferation Security Initiative (PSI) are additional layers of protection to the United States, the elements working in this market will

do everything they can to avoid and out-maneuver most methods of deterrence (i.e. physical) in order to achieve their original goal. However, this strategy need not be solely focused on the physical prevention and/or detection. What is more important, and prior to any deterrence strategy, is to dissuade TNCOs from becoming involved in the illegal trafficking of nuclear material.

At the very heart of this dissuasion is the removal of their motivation and intentions. In order to ensure that organized crime does not migrate into the smuggling of nuclear and radiological material, the United States, and its allies, must persuade these elements that these endeavors have significant consequences with regards to their physical and financial well being. A first step in dissuading a TNCO is that the United States should publicly declare that anyone trafficking nuclear or radiological material will be subject to all of its elements of national power, especially if there is any indication that they are assisting a terrorist group. This idea or statement needs to be inserted into the talking points of any government official that is discussing TNCO, organized crime, and/or terrorism. For example, when the President of the United States or his press secretary is answering routine questions concerning terrorism or crime, a point should be made to mention the consequences associated with these actions. Additionally, it is equally imperative that the first time this occurs, the United States must publicly follow through and ensure that any person and group with any connection to this case is either eradicated or tried. This response needs to be comprehensive and thorough. Meaning, a single action like the raiding of a warehouse or home is not enough to send the proper message. The correct level of response should be the raiding on every known or suspected home, hideout, business, front company, vacation homes, and smuggling routes regardless of the country. At a minimum, a good number of leaders and members should have been arrested or detained and those properties and goods within those properties would have been seized. The U.S. Department of Treasury (DOT), in concert with international partners, initiates the freezing of all accounts associated with this group, the DOS also initiates the requests for extradition for any known or suspected members, and all the while the U.S. Government (USG) dominates the information campaign by clearly demonstrating the crime that was committed, who committed the crime, why this is so important, and what the USG is doing about it. This

dissuasion strategy is, first and foremost, more cost effective than the existing deterrence programs currently in place. If a strategy of dissuasion is in effect, and being applied to terrorist groups as well, then all that is needed is for the USG to swiftly respond.

Notes

1. Type of Nuclear and Radiological Material being seized from 1977-2011, (Lawrence Livermore National Laboratory, *Open Source Reporting: Illicit Trafficking of Nuclear and Radiological Material*, (Livermore, CA, compiled by author, 2002-2011).

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