

The Application, Development and
Possibilities of Nuclear Forensics in
International Cooperation on Nuclear
Security Emergence of Technological

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The communiqué of the Nuclear Security Summit held in Seoul in 2012 articulated that, “Nuclear forensics can be an effective tool in determining the origin of detected nuclear and other radioactive materials and in providing evidence for the prosecution of acts of illicit trafficking and malicious uses.”¹ This statement reminds us of the potential nuclear forensics has in facilitating nuclear security concerns. Porous borders and globalization have created a world where mismanaged or lost nuclear materials pose grave security risks if left unchecked. In the 21st century especially, no state can effectively combat the illicit trafficking of nuclear, radiological, or other hazardous materials in isolation, even on a local scale, without international cooperation.² While barriers still impede the full potential of international nuclear forensics cooperation, the development of nuclear forensics provides new opportunities for states to better strengthen technical infrastructure, legal and regulatory framework, and human capital.

Technical infrastructure in nuclear forensics is highly dependent upon continuous and frequent visits of regional and international technical experts to other countries.³ As such, countries should create joint projects where nuclear experts brief other experts on proper forensic procedures and techniques. These ventures enable a greater transfer of expertise which will allow for a more secure nuclear security environment. One example of these ventures is the European Commission's Joint Research Centre, Institute for Transuranium Elements (ITU) and the US National Nuclear Security Administration's (NNSA) collaborative cooperation with ASEAN

¹ Nuclear Security Summit Seoul 2012, *Seoul Communiqué: 2012 Seoul Nuclear Security Summit*, <https://2009-2017.state.gov/documents/organization/236996.pdf>.

² Institute for Foreign Policy Analysis, executive summary to *A Comprehensive Approach to Combating Illicit Trafficking* (Cambridge, MA: IFPA, 2010), ix, <https://www.sipri.org/sites/default/files/United-States-4-IFPA-GCSPTraffickingReport.pdf>.

³ Klaus Mayer et al., "From Awareness Raising to Capacity Building in Nuclear Forensics in South East Asia," presented at the International Conference on Advances in Nuclear Forensics: Countering the Evolving Threat of Nuclear and Other Radioactive Material out of Regulatory Control," Vienna, Austria, 2014.

states. In this venture, experts exchanged knowledge and experiences in response planning, the issue of illicit nuclear trafficking, and methods to expand nuclear forensic capabilities in the region.⁴ Such cooperation could be used as a future model for international nuclear forensics training and cooperation.

Moreover, the knowledge that a state has a robust nuclear forensics program may provide a strong deterrent to groups seeking to illicitly traffic nuclear or radiological material. Nuclear forensics' future as a potential deterrent relies on its implementation and success in facilitating investigations and the legal proceedings that follow it.⁵

How nuclear forensics is defined is also an area that can see improvement. The IAEA currently understands nuclear forensics as the “Examination of nuclear and other radioactive material, or of other evidence that is contaminated with radionuclides, in the context of legal proceedings.”⁶ Since forensics is understood in specialized literature as “the application of science to law,”⁷ it can be interpreted that nuclear forensics could play an active role in the formation and drafting of policies. If this reading is taken even further, perhaps the field can be interpreted as including international law, regulations, and treaties.⁸ This reinterpretation would enable nuclear

⁴ Mayer et al., "From Awareness Raising to Capacity Building in Nuclear Forensics in South East Asia," presented at the International Conference on Advances in Nuclear Forensics: Countering the Evolving Threat of Nuclear and Other Radioactive Material out of Regulatory Control." https://conferences.iaea.org/indico/event/16/contributions/7245/attachments/3120/3741/Capacity_Building_in_Nuclear_Forensics_paper.doc.

⁵ *Implementing Guide: Nuclear Forensics in Support of Investigations*, IAEA Nuclear Security Series No. 2-G (Rev.1) (Vienna, Austria: IAEA, 2015), 6, <https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1687web-74206224.pdf>.

⁶ International Atomic Energy Agency, “Development of a National Nuclear Forensics Library: A System for the Identification of Nuclear or Other Radioactive Material out of Regulatory Control,” Vienna, Austria: IAEA, 2018, <https://www-pub.iaea.org/MTCD/Publications/PDF/TDL009web.pdf>.

⁷ Laura G. Pettler, “Forensic Science,” in *The Encyclopedia of Criminology and Criminal Justice*, ed. by Jay S. Albanese (New York, NY: John Wiley & Sons, Inc, 2014), 1, doi:10.1002/9781118517383.wbecj102.

⁸ Vitaly Fedchenko, “Nuclear Forensics as Nuclear Material Analysis for Security Purposes,” *Non-Proliferation Papers* 60 (2017): 1-15, https://www.sipri.org/sites/default/files/2017-07/eunpc_no_60.pdf.

forensics to materialize as a unique multi-disciplined field that is capable of addressing the needs of contemporary nuclear security and policy.

It is also important to stress the continued development of the nuclear forensics workforce with a focus on students. Besides being less politically sensitive than technical exchanges between government laboratories, bilateral training sessions, workshops, and advice from professionals provide students with the necessary skills and expertise to develop a stronger sense of the international importance of nuclear forensics.⁹ These joint sessions also provide a common area of understanding that stands to deepen bilateral commitments to nuclear security in areas of mutually beneficial cooperation. The need to cultivate a new generation of nuclear forensics will only grow in importance as the current workforce ages. These forms of cooperation present distinct opportunities to enhance bilateral relations, the development of future nuclear forensics, and the potential for a more uniform and standardized understanding of nuclear forensics among professionals.

Nuclear forensics has the potential to redefine how states maintain and ensure nuclear security, but there are still substantial bilateral and multilateral barriers that prevent proper cooperation in nuclear forensics between countries. One such problem is a general unwillingness for some states to divulge information crucial to forensic investigations. Potential solutions to this problem include finding methods of sharing information that does not divulge sensitive or classified information, and that sharing information would be in the states' best interest. Another problem area for forensic cooperation is the unfounded myth that legal factors in other countries will inevitably impede forensic cooperation. There are typically few legal barriers that impede

⁹ Marie C. Kierkegaard, "Potential Areas for Renewed U.S.-Russian Collaboration to Advance Nuclear Forensics," in *On the Horizon: A Collection of Papers from the Next Generation*, ed. by Sarah M. Asrar (Lanham, MA: Rowman and Littlefield, 2019), 82-83, <https://books.google.com/books?id=j52KDwAAQBAJ>.

upon forensic cooperation in other countries.¹⁰ Work should be done to dispel this myth. It would also be in states' interests to participate or establish regional or bilateral agreements that have the proper legal framework for states to more effectively share information or facilities relevant to nuclear forensic-related occurrences. One well-known example of this approach is Georgia, Ukraine, Azerbaijan, and Moldova (GUAM) Organization for Democracy and Economic Development's regional collaboration in nuclear forensics. A network of nuclear laboratories in the GUAM countries are designed to be able to share their analysis capabilities, thereby avoiding the need to duplicate those facilities in each country.¹¹ These are general actions or goals that should be accomplished to break down barriers to bilateral and multilateral information sharing in nuclear forensics.

The second greatest barrier to the proper use of nuclear forensics at a national and international level is the lack of capacity within certain states to properly address the pressing needs of nuclear forensics and security. States with a more developed nuclear security apparatus should focus on cooperating with interested states on capacity building and improving information sharing. These barriers may be circumvented with the development of strong technical infrastructure.

Maria Wallenius, a research scientist at the European Commission's Joint Research Center, claims that "We have come a long way since the 1990's... With the IAEA's assistance, the international community has improved nuclear forensic science analytical techniques and enacted

¹⁰ Richard Gill, "Study on Obstacles to Cooperation and Information-Sharing Among Forensic Science Laboratories and Other Relevant Bodies of Different Member States and Between These and Counterparts in Third Countries," 140, http://enfsi.eu/wp-content/uploads/2016/09/report_project_terrorism_0.pdf.

¹¹ Vitaly Fedchenko and Ian Anthony, "Nuclear Security in the Black Sea Region: Contested Spaces, National Capacities and Multinational Potential," *SIPRI Policy Paper* 49 (2018): 1-37, https://www.sipri.org/sites/default/files/2018-12/sipripp49_nuclear_security_black_sea.pdf.

tougher and more precise laws for prosecuting the perpetrators.”¹² Nuclear forensics stands capable of becoming a potent tool in international nuclear security, but reforms and improvements should and must be made. This paper recommends that the Nuclear Security Plan 2022-2025 adopt provisions that encourage the development of the capacity building and multilateral and bilateral cooperation in nuclear forensics.

¹² Inna Pletukhina, “Connecting Experts and Institutions to Increase the Effectiveness of Nuclear Forensics,” IAEA, April 17th, 2019, <https://www.iaea.org/newscenter/news/connecting-experts-and-institutions-to-increase-the-effectiveness-of-nuclear-forensics>.

Bibliography

- Fedchenko, Vitaly. "Nuclear Forensics as Nuclear Material Analysis for Security Purposes." *Non-Proliferation Papers* 60 (2017): 1-15. <https://www.nonproliferation.eu/nuclear-forensics-as-nuclear-material-analysis-for-security-purposes/>.
- Fedchenko, Vitaly and Anthony, Ian. "Nuclear Security in the Black Sea Region: Contested Spaces, National Capacities and Multinational Potential." *SIPRI Policy Paper* 49 (2018): 1-37. https://www.sipri.org/sites/default/files/2018-12/sipripp49_nuclear_security_black_sea.pdf.
- Gill, Richard. "Study on Obstacles to Cooperation and Information-Sharing Among Forensic Science Laboratories and Other Relevant Bodies of Different Member States and Between These and Counterparts in Third Countries." http://enfsi.eu/wp-content/uploads/2016/09/report_project_terrorism_0.pdf.
- IAEA. "Development of a National Nuclear Forensics Library: A System for the Identification of Nuclear or Other Radioactive Material out of Regulatory Control." Vienna, Austria: IAEA, 2018. <https://www-pub.iaea.org/MTCD/Publications/PDF/TDL009web.pdf>.
- IFPA. Executive summary to *A Comprehensive Approach to Combating Illicit Trafficking*. Cambridge, MA: IFPA, 2010. <https://www.sipri.org/sites/default/files/United-States-4-IFPA-GCSPTraffickingReport.pdf>.
- Implementing Guide: Nuclear Forensics in Support of Investigations*. IAEA Nuclear Security Series No. 2-G (Rev.1). Vienna, Austria: IAEA, 2015. <https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1687web-74206224.pdf>.
- Kierkegaard, Marie C. "Potential Areas for Renewed U.S.-Russian Collaboration to Advance Nuclear Forensics." In *On the Horizon: A Collection of Papers from the Next Generation*, ed. by Sarah M. Asrar, 72-87. Lanham, MA: Rowman and Littlefield, 2019. <https://books.google.com/books?id=j52KDwAAQBAJ>.
- Mayer, Klaus, Galy, Jean, Mei, Wayne, Dion, Heather, Smith, Donna, Fei, Ed, Alfonso, Paula, and Winterfield, Annie. "From Awareness Raising to Capacity Building in Nuclear Forensics in South East Asia." Presented at the International Conference on Advances in Nuclear Forensics: Countering the Evolving Threat of Nuclear and Other Radioactive Material out of Regulatory Control. Vienna, Austria, 2014. https://conferences.iaea.org/indico/event/16/contributions/7245/attachments/3120/3741/Capacity_Building_in_Nuclear_Forensics_paper.doc.
- Nuclear Security Summit Seoul 2012. *Seoul Communiqué: 2012 Seoul Nuclear Security Summit*. <https://2009-2017.state.gov/documents/organization/236996.pdf>.
- Pettler, Laura G. "Forensic Science." In *The Encyclopedia of Criminology and Criminal*

Justice, Edited by Jay S. Albanese, 1-7. New York, NY: John Wiley & Sons, Inc, 2014.
doi:10.1002/9781118517383.wbeccj102.

Pletukhina, Inna. “Connecting Experts and Institutions to Increase the Effectiveness of Nuclear Forensics ” IAEA, April 17th, 2019. <https://www.iaea.org/newscenter/news/connecting-experts-and-institutions-to-increase-the-effectiveness-of-nuclear-forensics>.