The contribution of international initiatives for the enhancement of nuclear forensics as a fundamental component of the international nuclear architecture

Dr. Azzeddine **FARHANE**
Director of the United Nations and International Organizations Departement
Ministry of Foreign Affairs and Cooperation, Morocco

Abstract. During the last decade, and in the context of the G8 meetings, several international initiatives in the field of Nuclear Security have emerged, representing an opportunity to announce the establishment of voluntary coalitions, in the light of 11 September 2011 terrorist attacks on the United States. These 'plurilateral' initiatives are intended to strengthen international cooperation, *inter alia,* a number of forensics guidance documents and out-reach materials, in order to fill in the gaps left out by operational deficiencies in international nuclear instruments. Such initiatives include, namely the Nuclear Forensics International Technical Working Group (ITWG), the Global Initiative to Combat Nuclear Terrorism (GICNT), and the Nuclear Security Summits process (NSS).

1. General Context

The array of initiatives identified by states to contribute to the enhancement of nuclear forensics are functionally interdependent and complement one another in terms of providing various forms of assistance, including enhancement of awareness, guidance and training in the field of nuclear forensics.

In this regard, it is needless to recall that these contributions recognize explicitly the role of nuclear forensics as a real support tool in the field of response and mitigation to nuclear and radiological malicious acts.

The present research paper will attempt to address the evolution of the challenges to international security from the conventional treaty instruments' approach to novel voluntary approaches that bring in scientific methods into the realm of nuclear security.

In doing so, the present paper will try to provide answers to the following questions:

1. To what extent have these international initiatives been successful in contributing to the enhancement of nuclear forensics and in reducing the threat of nuclear terrorism?
2. What is the new strategic orientation that these international initiatives should follow to efficiently meet countries' expectations in terms implementing IAEA's nuclear forensics recommendations, by undertaking more action-oriented activities?
3. To what extent does the implementation of the upcoming IAEA Nuclear Security Action Plan 2014-2017, and the nuclear forensics GICNT working group (NFWG) guidance documents contribute to strengthening the international nuclear security regime?

The international legal framework for international security provides the base role for governments, legislators, experts, lawyers as well as diplomats. Treaties and conventions embracing an array of security challenges pertaining to specific areas have been adopted to respond to the immediate and specific needs of states in a particular environment. However, a growing and yet compelling awareness of the new challenges facing the international security system raised the alarm about the threat that these new challenges lay down for international security.

2. International Initiatives for non-proliferation: a substantial operational framework for the enhancement of international forensics

Since the early nineties, efforts have been made to develop nuclear forensics as an instrument to categorise and characterise nuclear materials and relate them to a possible source. The international instrument track proved inadequate to face this growing challenge. Hence, the need for voluntary, non-binding and flexible frameworks is highly required.

Whereas international instruments laid the ground for the legal framework in terms of nuclear security, international initiatives[1] provided key answers through nuclear forensics to the evolving nature of nuclear threats and contributed to facing the new challenges.

Many of the challenges that nuclear forensics address, converge with the issues addressed by investigators and responders. The three-pillars of nuclear security architecture which are: detection, investigation and response are brought together in assessing the threat induced by potential terrorist attacks, involving nuclear or radioactive materials, loss or theft of nuclear/radioactive substances, or illegal trafficking and transportation of nuclear/radioactive substances.

2.1. The Nuclear Forensics International Technical Working Group (ITWG): setting the stage and reaching out to a broader community

The ITWG represents a kick start in the realm of nuclear forensics. It has since its inception in 1996, upon the initiative of the Group of eight governments (G8), considered nuclear forensics as an essential component of national and international nuclear security.
The ITWG plays an important role in contributing to the assessment of threats through providing insights to the history and origin of nuclear material, the point of diversion, and the identity of the perpetrators. The group collaborates closely with international partner organizations, including the International Atomic Energy Agency (IAEA), EURATOM, INTERPOL, EUROPOL, and the United Nations Interregional Crime and Justice Research Institute (UNICRI).

As an open framework for all states, the (ITWG) endeavours to advance the scientific discipline of nuclear forensics by devising effective technical solutions to competent national or international authorities upon request. It encourages states to build upon best practices in nuclear forensics by conducting operational activities between and among partner states. Outreach is a primary goal of the ITWG. The working group disseminates recent progress in nuclear forensic analysis and interpretation with the broader community of technical and security professionals who can benefit from these advancements.

2.2. The Global Initiative for Combating Nuclear Terrorism (GICNT): interoperability and hands-on practices

Jointly announced by Presidents George W. Bush and Vladimir Putin on the occasion of the G8 summit that was held on July 15th, 2006, in St. Petersburg[2], GICNT aims at strengthening the global capacity to prevent, detect, and respond to nuclear terrorism. The Initiative operates through three main working groups: the Nuclear Detection Working Group (NDWG) led by the Netherlands, the Nuclear Forensic Working Group (NFWG) led by Australia and the Response and Mitigation Working Group (RMWG) led by Morocco.

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[1] The International Initiatives include, inter alia, the Nuclear Security Summits process (NSS), the Proliferation Security Initiative (PSI), the Global Initiative to Combat Nuclear Terrorism (GICNT), The Financial Action Task Force (FATF)

[2] http://www.nti.org/e_research/e3_global_initiatives.html

Established in 2010, the GICNT-NFWG is tasked with raising awareness of nuclear forensics relevant to international nuclear security among policy-makers through the following measures, keeping in mind that the bottom line is to foster interoperability of partner nations:

a- Assisting in the development of core capabilities
b- Fostering intergovernmental relationships
c- Conducting joint exercises and sharing best practices.

The NFWG also seeks to encourage collaboration with existing nuclear forensics efforts undertaken by the International Atomic Energy Agency (IAEA), the European Union, and the Nuclear Forensics International Technical Working Group (ITWG) in order to synchronize efforts and avoid duplication and overlapping.

2.3. The Nuclear Security Summits Process: Fostering the political support

The process of Nuclear Security Summits is the expression of the political will of states to advance nuclear forensics as the most appropriate means to address the ever-increasing threats to international security. In fact, the 2012 Seoul Summit recognized 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*," and called upon states "*to develop and enhance nuclear forensics capabilities, undertake research and share information and best practices, as appropriate.*" The summit communiqué "*underscored the importance of international cooperation both in technology and human resource development to advance nuclear forensics"*[3]

Similarly, the 2014 Hague Summit stressed that "*the need to further develop innovative forensic methods and tools for investigating incidents involving nuclear and other radioactive materials"*. Leaders of more than 50 countries vowed to "*encourage further international cooperation, within the IAEA and other relevant international organisations, aimed at connecting and enhancing traditional and nuclear forensics capabilities, where feasible, and establishing national nuclear forensics databases to enable better determination of the origin of material"*.[4]

The NSS process has so far contributed to ensuring an ongoing dynamic between partner States by encouraging them to work together through relevant forensic institutions to enhance best practices joint actions in nuclear forensics. The gift basket[5] initiated and submitted to the Hague NSS by the Netherlands Forensic Institute (NFI), together with the Netherlands Ministry of Foreign Affairs, is significant in this regard. In 2011, the Netherlands submitted a white paper on "Nuclear Forensics" which aims at strengthening the links between traditional and nuclear forensics through developing a common set of definitions and standards, undertaking research, and sharing information and best practices.

In fact, the white paper to which many countries voluntarily subscribed as a gift basket to the NSS, represents a set of deliverables for the NSS, which would take developments in nuclear forensics a step further. It also contributed to a knowledge platform to enhance the discussion and commitment amongst experts and policymakers of partner states.

3. International initiatives and the IAEA doctrine on nuclear forensics: collaborative approach for advancing nuclear forensics

3.1. The IAEA doctrine on nuclear forensics

As a leading international organization committed to assisting Member States in development of effective nuclear security measures, the IAEA provides guidance in the conduct of a nuclear forensics investigation, trains experts in nuclear forensic methodologies, coordinates research and development, and works to improve nuclear forensic interpretation through

3 The Seoul Communiqué, Nuclear Security Summit, (March 26-27th, 2012) paragraph 10, page.5
4 The Hague Communiqué, Nuclear Security Summit, (March 24-25th, 2014) paragraph 33,page.6
5 Netherlands Gift Basket on Nuclear Forensics, submitted to the NSS Summit, (The Hague 24-25th, 2014)

preparation of technical recommendations. The IAEA Office of Nuclear Security also partners with technical specialists from around the world to support countries, upon their request, that want to develop their own nuclear forensics capacity.

The IAEA Nuclear Security Plan (2014-2017)[6]is a commendable effort towards achieving effective security wherever nuclear and other radioactive material is in use, storage and/or transport, and associated facilities by supporting States, upon request, in their efforts to meet their national responsibilities and international obligations, to reduce risks and to respond appropriately to threats.

Through the nuclear security Plan, the IAEA seeks to further strengthen international cooperation and coordinate nuclear security assistance given through regional and bilateral programmes and other international initiatives and to enhance global nuclear security efforts by completing international guidance in the Nuclear Security Series and, upon request, supporting its implementation by States

3.2. GICNT: an operational framework for advancing nuclear forensics

The GICNT statement of principles clearly states that countries should endeavour to: "*Improve capabilities of participants for response, mitigation, and investigation, in cases of terrorist attacks involving the use of nuclear and other radioactive materials and substances, including the development of technical means to identify nuclear and other radioactive materials and substances that are, or may be, involved in the incident*"[7]. Therefore, more action oriented is taken through organizing workshops and table-top exercises among partner states to assess countries capabilities to interact and operate in crises situations and draw lessons from their interaction.

Tiger Reef[8], a GICNT workshop and table top-exercise held and conducted in Kuala Lumpur earlier this year (February 2014) highlighted the crucial importance of mutual understanding between the tasks assigned to the investigation community and those of the responders' community. Knowledge, although basic of each others competences, is a key to mitigating nuclear and radiological risks.

International initiatives have therefore developed means and ways to address the overlapping concerns in terms of detection, investigation and response, and continue to raise awareness among the three respective pillars by:

- Encouraging the practice of information-sharing and best practices
- Organizing and conducting table-top exercises either individually or jointly
- Creating synergies among first responders and investigators and with relevant international organisations

4. GICNT working group on nuclear forensics: an important step for advancing nuclear forensics

4.1. NFWG: pragmatic support for the enhancement of nuclear forensics capabilities

The 6th GICNT Abu Dubai Plenary (June 29th, 2010) endorsed nuclear forensics as a priority focus area. The NFWG led by Australia continues to prepare, develop and compile documents that raise awareness of nuclear forensics among policymakers, assist in the development of core capabilities, foster intergovernmental relationships, conduct joint exercises, and share best practices.

4.2. GICNT and IAEA action plan: synergies, complementarities and dynamics

6 http://www-ns.iaea.org/downloads/security/nuclear-security-plan2014-2017.pdf

7 GICNT statement of principles n° : 7

8 Tiger Reef was held in Kuala Lumpur, Malaysia February 2014. TG addressed issues relating to interaction between responders and investigators and highlighted the challenges of the interaction between the two communities in responding to a malevolent act using an RDD.

While conducting its work, the NFWG strives to collaborate with nuclear forensics efforts that are already underway by the International Atomic Energy Agency (IAEA), the European Union, and the Nuclear Forensics International Technical Working Group (ITWG), in order to reinforce dynamics by synchronizing efforts and preventing duplication. This ensures that endorsing nations are receiving new, vital information in developing and enhancing their nuclear forensics capabilities.

4.3. Nuclear forensics: Challenges and the way forward

Successful development of nuclear forensic capabilities, and an understanding of international nuclear forensic science assistance opportunities before a nuclear or radiological incident occurs, enhances a State's ability to effectively and efficiently respond, cooperate, and ensure nuclear material security.

As a set of capabilities, nuclear forensic science enhances a State's ability to assess and establish linkages between nuclear and radioactive materials, and those who have attempted to transport, possess, or use it without legitimate State control. Nuclear forensic capabilities accomplish this through the development and application of human talents, technologies, and international arrangements. A range of techniques and capabilities can be developed based on a State's assessment of its needs and exposure to nuclear and radiological threats.

In deciding to develop nuclear forensic capabilities, States can turn to other States and international organizations that have already begun such investments. Through bi-lateral or multi-lateral cooperation, States can draw on international nuclear forensic laboratories, foreign talent of scientists and specialists, and on tools such as National Nuclear Forensics Libraries. This level of cooperation will also ensure the maximum benefit to any State's response effort and security; increasing the deterrent effects that possession of such capabilities brings, as well as contributing to the success of investigations and prosecutions.

Therefore, relevant nuclear forensic authorities as well as policy-makers ought to fully consider the role forensics can play particularly in terms of investigating the capabilities that already exist around the world, but the main questions are: Who has those capabilities and how can they be applied to ensure nuclear security and mitigate nuclear threats?

Similarly, an updated common lexicon is a key to setting common and agreed upon standards for investigation methods and interpreting results to fill gaps left out by cultural-specific practices peculiar to some countries and regions. The online platform launched by the Netherlands Forensic Institute is a good practice for sharing knowledge and information on how to reduce threats of nuclear and radiological incidents.

4. Conclusion

To sum up, the non-proliferation international initiatives, launched during the last decade, have proven their relevancy in strengthening nuclear security regime, particularly in raising awareness, creating a dynamic in updating nuclear forensics national database and harmonising the States domestic nuclear law.

Such initiatives contributed mainly to developing nuclear forensics as a tool in mitigating illicit trafficking of nuclear and radioactive materials. This dynamic should be maintained and further enhanced, in a time the World is facing a real continuing threat of nuclear terrorism. The strong political momentum built up since the 2010 Washington Summit, reiterated in the 2012 Seoul Summit and confirmed in the Hague Summit 2014, represent yet another strong impetus for the success of the International Conference on Advances in Nuclear Forensics which will undoubtedly contribute to further strengthen the nuclear forensics pillar of the international nuclear security architecture.