Nuclear Security and Nuclear Security Culture: An Overview

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ABSTRACT

The article attempts to define what nuclear security means and give a historical background about factors that have shaped the international nuclear security approach. Then, the article briefly touches upon various international mechanisms which are components of the nuclear security regime. Finally, the article highlights the importance of nuclear security culture, which requires all relevant stakeholders to take responsibility in relation to nuclear security.

Keywords: Nuclear security, Nuclear security culture, Nuclear terrorism, International Atomic Energy Agency

1. Introduction

Terrorism has been a part of human history, dating back to ancient times. However, it has evolved in time, becoming more destructive and attempting to kill as many people as possible with various methods. These multiple methods might even include using weapons of mass destruction (WMD). With the 9/11 attacks, terrorists have already proven their willingness and capabilities to use new techniques and cause mass casualties. In this vein, former US President Barrack Obama stated that terrorist groups seek nuclear materials and other radioactive materials to commit acts of nuclear terrorism while there are unsecured nuclear materials worldwide [1].

While there is a credible threat of nuclear terrorism, on the one hand, there are international efforts on the other hand, to minimize this threat and deny terrorist groups access to nuclear and radioactive materials, which is called nuclear security. According to the International Atomic Agency (IAEA) definition, nuclear security is "the prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities" [2].

Although nuclear technology can be traced back to the 1940s, nuclear security gained prominence in the 1970s as physical protection of nuclear facilities and materials from unauthorized acts. Nevertheless, it was a part of broader nuclear proliferation concerns under nuclear safeguards for the IAEA in the early years of its prominence. Then, the perception of the secondary role of nuclear security was transformed into a term that addresses concerns related to non-state actors with the collapse of the Soviet Union. Because the end of the Cold War brought loose nukes, unsecured nuclear materials, and other radioactive materials into the equation that non-state actors could access nuclear technology [3]. The threat became even clearer with numbers when the IAEA established the Incident and Trafficking Database (ITDB) in 1995. Even though states started international cooperation to address the increasing nuclear security threats throughout the 1990s, it was the 9/11 attacks that forced the US and the rest of the world to re-think the threat of nuclear terrorism because it was now clear that terrorists were capable of and willing to use new methods to inflict mass casualties. There were even official statements confirming that terrorists had shown interest in weapons of mass destruction, including nuclear ones [4].

In this vein, states concluded several agreements and launched various initiatives under the umbrella of developing nuclear security regime, hereafter referred to as "the regime." One of the critical elements of the regime is nuclear security culture, which is "the assembly of characteristics, attitudes, and behaviors of individuals, organizations, and institutions which serve as a means to support, enhance, and sustain nuclear security" [5]. In other words, effective implementation of nuclear security depends on the culture of the holistic approach to security, in which every stakeholder assumes an appropriate level of responsibility [6].

In an attempt to better analyze the importance of nuclear security and nuclear security culture, this article will explain the basic tenants of nuclear security, its historical evolution, and the need for adequate nuclear security in the first section. In the following section, the article will focus on nuclear security culture, highlighting the importance of the human factor in the security approach. In the last section, the article will focus on the synergy between nuclear security and the culture that leads to improving the safety of nuclear and other radioactive materials, associated facilities, and transportation of these materials.

2. Nuclear Security, Regime, and Culture

2.1 Nuclear Security

Nuclear security focuses on protecting nuclear materials, other radioactive materials, and related facilities to prevent negligent and/or malicious human actions. As it might sometimes be confused with nuclear safety, nuclear security focuses on protecting nuclear materials and facilities from unauthorized and malicious actions. On the other hand, nuclear safety focuses on proper operating conditions and preventing nuclear accidents to protect humans and the environment from possible radiation hazards. With this in mind, the idea of current nuclear security first appeared as the protection of nuclear material in the 1970s, and IAEA published a booklet called "Recommendations for the Physical Protection of Nuclear Material," which became a prominent guidance document in the following years. This booklet became the IAEA Document INFCIRC/225 in 1975 and has been revised five times per the changing requirements in 1977, 1989, 1993, 1997, and finally in 2011 [3]. The Nuclear Suppliers Group (NSG) also used INFCIRC/225 as a baseline for its physical protection guidelines for supplier and recipient states during usage, storage, or transit. In addition, the Convention on the Physical Protection of Nuclear Material (CPPNM) was opened for signature in 1980 after three years of negotiations. It created a legally binding framework for international cooperation regarding the physical protection and control of nuclear materials in international transport. In all official documents and international conventions, the responsibility for the physical protection of nuclear materials has remained under the sovereign authority of individual states while there were steps toward international cooperation during the 1980s.

Following the end of the Cold War, there have been increasing concerns about the smuggling and theft of nuclear materials from the former Soviet states. In order to increase international cooperation for timely response and mitigating misuse of nuclear materials, the IAEA established ITDB in 1995. This was an important step because ITDB came out of member states' commitment to combat illicit trafficking and physical protection of nuclear materials [3]. The ITDB started to keep a record of illicit trafficking incidents and share these with member states and relevant international organizations. It became evident that the data recorded in the ITDB was useful for analyzing and identifying trends in illicit trafficking incidents, including illegal possession, unauthorized disposal, smuggling, and sale.

The changing nature of terrorism and increased terror attacks in the 1990s resulted in negotiations in the United Nations (UN) in order to reinforce existing international commitments. As a part of this development, member states started negotiations for the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) in 1996. The negotiations were supported by both the US and Russia [7]. Because the US was concerned with the interest of radical terrorist groups in nuclear materials while Russia was concerned with the threat posed by Chechens' desire to use radioactive sources. The approach of both American and Russian sides to nuclear terrorism was reiterated in the Moscow Summit on Nuclear Safety and Security in 1996. Furthermore, there was a special focus on the physical protection of all nuclear materials, including nuclear weapons, which was called nuclear security in 1996 for the first time at the presidential level summit [3]. However, nuclear security was still considered in the context of a broader approach to nuclear non-proliferation, in other words, nuclear safeguards.

However, the 9/11 attacks in 2001 challenged states' approach to nuclear security, as it was clear that radical terrorist groups had capabilities and intentions to cause mass casualties that are beyond traditional responses to combat terrorism. The next attack would be a nuclear one because several groups had already declared their interest in nuclear terrorism. In response, immediately after the 9/11 attacks, the UN Security Council adopted Resolution 1373, which established the base for proactive international efforts to combat international terrorism, which seeks chemical, biological, radioactive, and nuclear materials to inflict mass casualties. Similarly, the IAEA established the Nuclear Security Fund (NSF) in 2002 to reinforce its nuclear security programs while its nuclear security budget was over 1 million USD for the first time. In addition, the IAEA set up an advisory group called Advisory Group on Nuclear Security (AdSec) in January 2002 to advise IAEA

Director General on nuclear security activities [3]. It could be stated that the 9/11 attacks resulted in increased attention to nuclear security, and it was acknowledged that nuclear security could not be any longer considered within the context of broader nuclear non-proliferation of arms control commitments.

2.2 Nuclear Security Regime

The global politics after the 9/11 attacks and the change in approach towards nuclear security intensified nuclear security efforts under the international nuclear security regime. The regime consists of international rules and laws, including resolutions, treaties, and conventions, such as UN Security Council Resolutions 1373 and 1540, the Convention on the Physical Protection of Nuclear Material (CPPNM), and its 2005 Amendment, Nuclear Terrorism Convention (ICSANT), and Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA Convention) and its 2005 Protocol.

The UN Security Council Resolutions 1373 and 1540 create legally binding responsibilities for states regarding non-state actors and their WMD acquisition. However, implementing these resolutions has some shortcomings due to political reasons and the capacity to implement them effectively. On the other hand, the 2005 Amendment to CPPNM eliminates shortcomings in the original Convention by expanding its scope to ensure the protection of nuclear materials and nuclear facilities, both domestic and international. Furthermore, Nuclear Terrorism Convention creates an international legal framework for criminalizing acts of nuclear terrorism and reinforces international cooperation. In the same vein, SUA Convention and 2005 protocol play a key role in preventing illicit trafficking of nuclear materials. All these official documents reinforce nuclear security as an international norm [8].

Additionally, the regime includes initiatives and summits, such as Proliferation Security Initiative (PSI) and Global Initiative to Combat Nuclear Terrorism (GICNT), and Nuclear Security Summits (NSS). While PSI offers a voluntary partnership, it has a proven success history in regard to coordinating international activities for addressing the threat of WMD proliferation, including the interception of the BBC China, which was carrying centrifuge parts as a part of the A.Q. Khan Network. Similarly, as GICNT is a voluntary partnership, it allows states to integrate existing resources to reinforce global efforts to mitigate the threat of nuclear terrorism. In the same vein, NSSs promoted nuclear security efforts at the highest political level with a commitment to reduce the amount and use of highly enriched uranium (HEU) and plutonium. The summits also accelerated the ratification process of the Amendment to the CPPNM, thus reinforcing nuclear security in general [8].

Moreover, the regime has been strengthened with non-governmental organizations (NGOs) and civil society efforts, which are key to developing, implementing, and sustaining norms and nuclear security culture. In this regard, established in 2008, the World Institute for Nuclear Security (WINS) is "an international forum for those accountable for nuclear security to share and promote the implementation of best security practices" [9]. Working closely with IAEA, WINS plays a key role in training the next generation of nuclear security professionals through various courses, workshops, and webinars. Like WINS' activities, the IAEA established the International Nuclear Security Education Network (INSEN) in 2010 to coordinate and support nuclear security education globally. Cooperating with various stakeholders, the Nuclear Threat Initiative (NTI) increases the awareness of threats and focuses on providing solutions to mitigate those risks. Furthermore, providing a platform for sharing experiences among members, the International Nuclear Security Forum (INSF) reinforces nuclear security efforts by creating opportunities for cooperation [8].

All these efforts show that nuclear security has been on the international agenda, even at the presidential level. This is important because international rules and laws, groups, norms, awareness, and leadership play a critical role in sustaining the global nuclear security regime. Nevertheless, one key aspect of implementing nuclear security efficiently is the need for strong nuclear security culture. The next section will focus on culture accordingly.

2.3 Nuclear Security Culture

The nuclear security regime, which has various elements explained above, depends on the human factor that develops, implements, and sustains nuclear security efforts. As a result, effective nuclear security requires a strong nuclear security culture. The IAEA defines nuclear security culture as "the assembly of characteristics, attitudes and behavior of individuals, organizations and institutions which serves as a means to support and enhance nuclear security"[5]. Similarly, according to the WINS definition, it refers to practices, understandings, and beliefs that are brought together in an organization by people at all levels [10].

Nuclear security culture has been given growing importance since the late 1990s. However, the cultural aspect in nuclear dates back to earlier periods with nuclear safety culture, which was intensified due to the Three Mile Island and Chernobyl nuclear accidents. Because in both cases, human errors were found to be a key causal factor resulting in substantial nuclear accidents [6]. Increasing attention to nuclear security led to cultural concepts taken into consideration for nuclear security, as well. Consequently, the 2005 Amendment to the CPPNM included nuclear security culture as a

fundamental principle, while the IAEA published a guidance document in 2008, recognizing the relation between nuclear security incidents and human factors [5, 6].

The importance of nuclear security culture has also been highlighted in other cases. For example, General Eugene Habiger, former commander of US strategic nuclear forces, stated that "good security is 20% equipment and 80% culture" [10]. This demonstrates how effective nuclear security efforts would be, depending on the level of security culture. In any state or organization with a strong nuclear security culture, stakeholders would be committed, including individuals from members of the board of governors to daily workers to security arrangements. These arrangements would be practiced as an indispensable part of daily work.

On the other hand, in any state or organization with a weak nuclear security culture, security arrangements would be assumed as the responsibility of only security forces and security departments. The remaining stakeholders ignore or hesitate to report security concerns, which would lead to unwanted consequences [10]. Thus, nuclear security culture plays a key role in having or not achieving security goals within a state or organization.

In order to promote and guide states toward an effective nuclear security regime, the IAEA developed guidance to have effective and strong nuclear security culture by illustrating the responsibilities of all stakeholders and the main characteristics of nuclear security culture. These responsibilities are attached to states, organizations, the public, and the international community, as well as to individuals like managers and personnel, see Fig.1 Universal features of nuclear security culture [5].

Offering thirty-seven characteristics under beliefs and attitudes, principles, leadership and personnel behavior, and management systems, the IAEA provides a good framework to develop, implement and sustain effective nuclear security culture, see Fig.2 [5]. There is also a guiding document published by the IAEA in 2017 about the self-assessment of nuclear security culture [11], while there is also an ongoing process for a guidance document by the IAEA on how to enhance nuclear security culture [6].

3. Conclusion

Nuclear security has gained prominence as a result of increasing threats to nuclear materials and facilities. Although security of nuclear materials and nuclear facilities falls within the responsibility of each individual sovereign states, nuclear security have been reinforced at international level with various resolutions, conventions, initiatives as well as NGOs and civil society efforts.
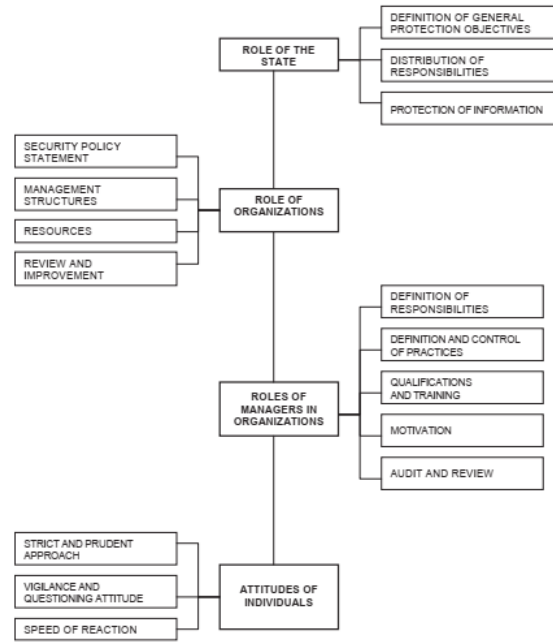

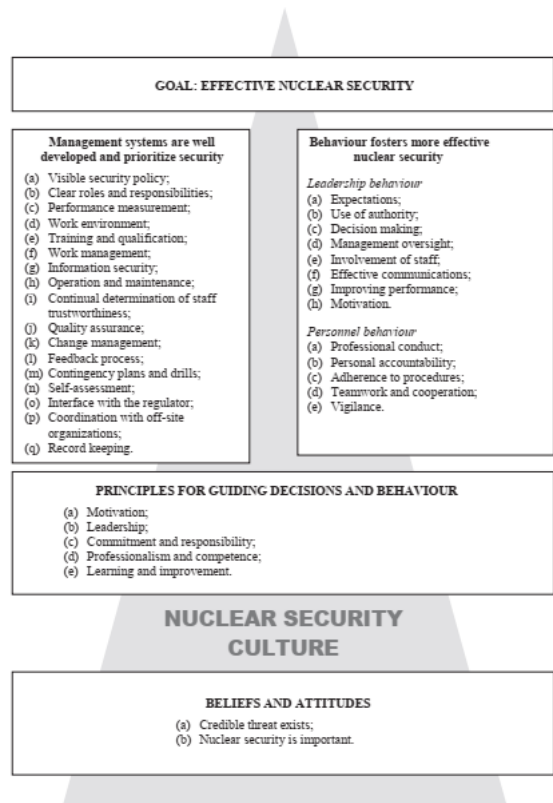**Fig.1** *Universal features of nuclear security culture [4].*

Fig.2 *Characteristics of nuclear security culture [4].*

Nuclear security culture has also gained prominence as it is well acknowledged that only with a strong security culture, there could be an effective nuclear security regime. In this vein, there has been considerable attention both to nuclear security and security culture in last two decades. Thanks to intensive efforts under the leadership of the IAEA, the international nuclear security regime is more robust than what it used to be. Because only with a strong nuclear security culture and a well-established nuclear security approach, we can enjoy the benefits of nuclear energy securely.

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Conflict of Interest

The author has no conflict of interest.

References

[1] IAEA, "Objective and Essential Elements of a State's Nuclear Security Regime", Nuclear Security Series No. 20 (2013).

[2] A. S. Gill, "Nuclear Security Summits: A History", Palgrave Macmillan, Cham, (2020).

[3] M. A. Alkış, "Threat of Nuclear Terrorism: Towards an Effective Nuclear Security Regime", Master's Thesis, Hacettepe University, Ankara, (2017).

[4] IAEA, "Nuclear Security Culture", Nuclear Security Series No. 7 (2008).

[5] K. Dewey, G. Foster, C. Hobbs, D. Salisbury, "Nuclear Security Culture in Practice: A Handbook of UK Case Studies", Centre for Science and Security Studies, London, (2021).

[6] Nuclear Threat Initiative, 2022. International Convention on the Suppression of Acts of Nuclear Terrorism. Available from https://live-nuclear-threat-initiative.pantheonsite.io/education-center/treaties-and-regimes/international-convention-suppression-acts-nuclear-terrorism/, Accessed date: 10 June 2022.

[7] M. A. Alkış, "Threat of Nuclear Terrorism: The Developing Nuclear Security Regime", Int. J. Nucl. Secur. 7, 1–16 (2022).

[8] WINS, "Governing Statute of the World Institute for Nuclear Security", World Institute for Nuclear Security, (2018).

[9] WINS, "Nuclear Security Culture", WINS International Best Practice Guide, (2016).

[10] IAEA, "Self-assessment of Nuclear Security Culture in Facilities and Activities", Nuclear Security Series No. 28-T (2017).