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The Human Dimension of Nuclear Security: Legacy of the Nuclear Security Summit

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Abstract

The “human dimension” of nuclear security is a fundamental component of a robust and sustainable nuclear security regime and is based on adequate human resources, international cooperation, networks, and on a strong nuclear security culture. The Nuclear Security Summit (NSS) process, through the Communiqués, Work Plan, and Action Plans, together with a series of commitments in the form of “house gifts” and “gift baskets,” has played a key role in ensuring the development of the human dimension. The achievements of the Nuclear Security Summits have the potential to be the cornerstone for the consolidation and the sustainability of the many capacity-building initiatives generated by the NSS process.

I. The Human Dimension and Nuclear Security Summit Process

A deeply rooted nuclear security culture and adequate human resources at all levels – involving regulators, law enforcement agencies, academia, and industry – are universally recognized as the prerequisites of a robust and sustainable nuclear security regime, both national and global. International cooperation and networks are fundamental elements in ensuring the development and sustainability of what may be called the “human dimension” of nuclear security, and the Nuclear Security Summit (NSS) process has played a fundamental role in their consolidation. Since the first Nuclear Security Summit in Washington, D.C. in 2010, the human dimension has attracted increasing attention as shown in the official documents of the NSS process (Communiqués, Work Plans, and five Action Plans) and in the further commitments made at the four Summits by States or groups of States (known as “house gifts” and “gift baskets”).

A. The NSS Process

The NSS process was launched in President Obama’s speech in Prague in 2009, with the view of working towards securing “a world without nuclear weapons.” [1] He then convened the first Nuclear Security Summit in Washington, D.C. on April 12-13, 2010 with 47 countries with the United Nations (UN), the IAEA, and the European Union as observers. The achievements were outstanding: for the first time, 43 leaders, through a joint Communiqué and Work Plan [2, 3], recognized the seriousness of the threat to

international security posed by nuclear terrorism, and they made a commitment to take concrete steps to secure key nuclear material within four years and to prevent its illicit trafficking. Moreover, while reaffirming the principle that nuclear security is entirely the responsibility of States, the Communiqué recognizes the importance of international cooperation. The second NSS in Seoul on March 26-27, 2012 took place in a period of international tension that was still strongly affected by the Fukushima Daiichi accident. The leaders of the 53 participating countries plus the observers (including Interpol this time) confirmed in the Communiqué [4] the 2010 commitments, while also focusing on the threat posed by radioactive sources and more generally by radioactive material as well as, for the first time, considering nuclear safety and its interface with nuclear security. The third Nuclear Security Summit was held on March 24-25, 2014 in The Hague, NL, with the participation of leaders from 53 countries and observers. With respect to Seoul, the Communiqué [5] was stronger in reaffirming the need to strengthen the security of radioactive materials, reflecting the growing concern for “dirty bombs,” and, in dealing with the interface between safety and security, highlighted for the first time the importance of a common approach to emergency response. However, the strongest message of this Summit was the need for a global nuclear security architecture based on the international instruments, accompanied by voluntary actions to assure the international community of the effectiveness of their implementation at the national level, and strengthened by the role of the UN and other international organizations, particularly (but not exclusively) the IAEA. The last Summit on March 31-April 1, 2016 was again hosted in Washington, D.C. and took stock of the enhancements in the global nuclear security framework in the previous six years. Citing President Obama in the closing press conference: *“More specifically, as a result of these summits, every single one of the more than 50 nations represented here have taken concrete steps to enhance security at their nuclear facilities and storage sites. And that includes improved physical security, stronger regulations, abiding by international guidelines, greater transparency, and that includes international peer reviews. Fifteen new centers have been created around the world to promote nuclear security technologies and training, to share best practices. And as part of our work today, we agreed to keep strengthening our nuclear facilities’ defenses against cyber-attacks. We’ve bolstered international efforts to disrupt nuclear smuggling”* [6]. With a view to maintain momentum beyond the NSS process, the Communiqué [7] was accompanied by five Action Plans for the major international bodies and institutions contributing to the nuclear security: the UN [8], IAEA [9], Interpol [10], Global Partnership Working Group (GPWG) [11], and the Global Initiative to Combat Nuclear Terrorism (GICNT) [12].

In addition to the four Communiqués, the Work Plan, and five Action Plans, at each Summit, several States made further commitments known as “house gifts” and “gift baskets,” individually and collectively, on nuclear security implementation at the national, regional, and international levels. After the conclusion of the Summit process, a number of these gift baskets have been translated into IAEA INFCIRC, thus becoming open to all IAEA members. So far, there are nine of them (see <http://www.nscontactgroup.org/iaea-info-circulars.php>), in particular INFCIRC-869 [13] on “Strengthening Nuclear Security Implementation” and INFCIRC-899 [14] on the Nuclear Security Contact Group (NSCG), which was established at the 2016 Nuclear Security Summit through the “Joint Statement on Sustaining Action to Strengthen Global Nuclear Security” [15] to maintain the momentum on nuclear security.

B. The Human Dimension and the Products of the NSS Process

Capacity building has been one the major recurrent themes in the NSS process and its documents. The 2010 Washington, D.C. Summit *“elevated the significance of the human factor to the top of the nuclear security agenda”* [16], and the 2012 NSS Communiqué in Seoul further reinforced this message, recognizing the importance of investing in, promoting, and sustaining a strong nuclear security culture and human resource development through education and training, a message that was further stressed at

the 2014 The Hague NSS. At the 2016 Summit in Washington, D.C., the concept was implied in the text of the Communiqué and emphasized in all five Action Plans, whose implementation in their respective programs of work is thus pivotal for ensuring this important legacy from the NSS process. Table 1 shows the most significant paragraphs in the 2010-2016 Communiqué, 2010 Work Plan, and 2016 Action Plans for the UN, IAEA, Interpol, GPWP, and GICNT.

Table 1. Excerpt on Human Dimension from the Four NSS Communiqués and Accompanying Documents

<p>2010 Nuclear Security Summit – Washington, D.C. COMMUNIQUÉ [2] “8. Acknowledge the need for capacity building for nuclear security and cooperation at bilateral, regional and multilateral levels for the promotion of nuclear security culture through technology development, human resource development, education, and training; and stress the importance of optimizing international cooperation and coordination of assistance;” “10. Recognize the continuing role of nuclear industry, including the private sector, in nuclear security and will work with industry to ensure the necessary priority of physical protection, material accountancy and security culture;” WORK PLAN [3] “• Participating states will work... to promote and sustain strong nuclear security culture and corporate commitments to implement robust security practices “• Participating states encourage nuclear operators and architect/engineering firms to take into account and incorporate, where appropriate, effective measures of physical protection and security culture into the planning, construction, and operation of civilian nuclear facilities “• Emphasizing the importance of the human dimension of nuclear security, the need to enhance security culture, and the need to maintain a well-trained cadre of technical experts”</p>
<p>2012 Nuclear Security Summit - Seoul COMMUNIQUÉ [4] Nuclear Security Culture “11. Recognizing that investment in human capacity building is fundamental to promoting and sustaining a strong nuclear security culture, we encourage States to share best practices and build national capabilities, including through bilateral and multilateral cooperation. At the national level, we encourage all stakeholders, including the government, regulatory bodies, industry, academia, non- governmental organizations and the media, to fully commit to enhancing security culture and to maintain robust communication and coordination of activities. We also encourage States to promote human resource development through education and training. In this regard, we welcome the establishment of Centers of Excellence and other nuclear security training and support centers since the Washington Summit, and encourage the establishment of new centers. Furthermore, we welcome the effort by the IAEA to promote networking among such centers to share experience and lessons learned and to optimize available resources. We also note the holding of the Nuclear Industry Summit and the Nuclear Security Symposium on the eve of the Seoul Nuclear Security Summit.”</p>
<p>2014 Nuclear Security Summit – The Hague COMMUNIQUÉ [5] International cooperation “5. At the same time, we emphasise the need to further strengthen and coordinate international cooperation in the field of nuclear security. Much can be done through the International Atomic Energy Agency (IAEA) and other intergovernmental organisations and initiatives, and through bilateral and regional cooperation. “6. International cooperation fosters the capacity of States to build and sustain a strong nuclear security culture and effectively combat nuclear terrorism or other criminal threats. We encourage States, regulatory bodies, research and technical support organisations, the nuclear industry and other relevant</p>

stakeholders, within their respective responsibilities, to build such a security culture and share good practices and lessons learned at national, regional and international level.

“7. We support stronger international and regional cooperation with regard to education, awareness raising and training, including through nuclear security centres of excellence and support. We therefore welcome the expansion of nuclear security networks for education, and for training and support, by the IAEA and other international organisations.”

Nuclear industry

“27. Nuclear operators have the primary responsibility to secure their nuclear material and as such have an important role to play in maintaining and strengthening nuclear security. Operators’ security systems should be effective and place a strong emphasis on an effective security culture, physical protection and material accountancy. This needs to be demonstrated nationally by regular routine tests and evaluations, including performance testing and self-evaluation where appropriate. We take note of the emerging interest in using performance-based regulations where appropriate. We support a more intensive dialogue between operators and government bodies, including the national regulator, which should be functionally independent, with a view to improving nuclear security regulations and regulatory effectiveness.”

2016 Nuclear Security Summit – Washington

UN Action Plan [8]

Actions

“B. ASSISTANCE

1. For those in a position to do so, support the provision of adequate assistance, including contributions in kind, to requesting States for implementing UNSCR 1540, ICSANT and relevant UN resolutions and instruments, which could include:
 - (*excerpts*)
 - funding support, where applicable, for regional/sub-regional capacity building events including those sponsored by regional organizations;
 - funding and/or training of national Points of Contact and regional/sub-regional coordinators on UNSCR 1540;
 - providing assistance to strengthen customs and border control of nuclear and other radioactive material; and
 - providing assistance to improve nuclear security culture.”

IAEA Action Plan [9]

Actions

“B. COORDINATION ROLE OF THE IAEA

3. Advocate for the IAEA to coordinate the cooperation and complementary activities between Centres of Excellence (COEs) and other relevant centres, including through the Nuclear Security Support Centre (NSSC) and International Nuclear Security Education Networks, to promote their sustainability.
4. Advocate for the IAEA to develop for COEs/NSSCs a process for sharing good practices, requesting peer review and harmonizing of their course content on the basis of the Nuclear Security Series.
5. Support regional networks on nuclear security in conjunction with the IAEA.”

“J. NUCLEAR AND OTHER RADIOACTIVE MATERIAL OUT OF REGULATORY CONTROL

1. Advocate for the IAEA to strengthen national nuclear detection capabilities and architectures by developing guidance, training, workshops and exercises, facilitating the exchange of good practices and providing a forum for discussion and cooperation.

“K. NUCLEAR SECURITY CULTURE

1. Enhance the practice of nuclear security culture such that it is infused into all elements of national nuclear security regimes.

2. Advocate for the IAEA to increase its assistance to States to develop and foster nuclear security culture, including through published guidance and related self- assessment and training materials.”

“G. TRANSPORT

1. Advocate for the IAEA to increase attention given to the security of nuclear and other radioactive material in transport, including by:
 - producing guidance documents and facilitating associated exercises, training and capacity building activities; and
 - organizing the sharing of good practices and lessons learned from transporting nuclear and other radioactive material, among Member States, relevant industries and COEs/NSSCs, while protecting sensitive information.

“H. RESPONSE TO NUCLEAR SECURITY EVENTS

1. Advocate for the IAEA to increase attention given to the response to nuclear security events by:
 - producing guidance documents and facilitating associated exercises, training and capacity building activities;
 - organizing the sharing of good practices and lessons learned, while protecting sensitive information.”

“E. IAEA SERVICES FOR STATES

1. Use the IAEA’s extensive nuclear security services and to make available experts to the IAEA to carry out these services, including the International Physical Protection Advisory Service, International Nuclear Security Advisory Service, nuclear security training, exercises, education and workshops. Furthermore, Participating States advocate for the IAEA to:”

“M. COMPUTER AND INFORMATION SECURITY

1. Work with the IAEA to raise awareness of the threat of cyber-attacks with potential impacts on nuclear security and promote computer and information security with regard to nuclear and other radioactive material and associated facilities.
2. Advocate for the IAEA to produce guidance and training, to address information security and the threat of cyber-attacks against nuclear and other radioactive material and associated facilities.”

INTERPOL Action Plan [10]

Actions

“C. CAPACITY BUILDING

1. Support INTERPOL’s building of multidisciplinary and cross agency capacity through training and exercises to prevent and respond to the terrorist and other criminal offences involving nuclear or other radioactive material, including by developing and providing training resources and good practice guidance to the law enforcement community.
2. Advocate for INTERPOL to develop and provide capacity building activities to national law enforcement agencies with regard to the illegal acquisition, possession, trafficking or other illicit use of nuclear or other radioactive material.
3. Advocate for INTERPOL to work with the IAEA and when suitable, other relevant institutions, on assisting States to develop comprehensive national plans for responding to terrorist and other criminal offences involving nuclear or other radioactive material, and to organize field simulations and exercises.
4. Advocate for INTERPOL to hold workshops and conferences to raise awareness of the threat of illicit trafficking of nuclear and other radioactive material and promote stronger interagency and international cooperation to respond to terrorist and other criminal offences involving nuclear and other radioactive material.
5. Advocate for INTERPOL to develop and execute joint operations with relevant national government agencies to detect and deter illicit trafficking of nuclear or other radioactive material.
6. Advocate for INTERPOL to work with Member Countries to regularly assess the existing INTERPOL guidelines² in the field of preventing and combating terrorism and other criminal offences involving

nuclear or other radioactive material, identify possible gaps and promote good practices through non-binding recommendations.

7. Advocate for INTERPOL to document and share case studies that demonstrate good practices for successful investigations, seizures, arrests, and prosecutions of radiological and nuclear material trafficking cases, taking into account the different national standards for investigations and prosecutions across the spectrum of INTERPOL Member Countries.
8. Advocate for INTERPOL to develop and leverage existing e-learning modules to enable widely accessible law enforcement training for nuclear security.
9. Advocate for INTERPOL to publish from a law enforcement perspective a comprehensive study of scams and hoaxes involving illicit trafficking of purported nuclear or radioactive material to help inform Member Countries and provide lessons learned, including to provide a more measured response to such events in the interest of preserving limited response assets and capabilities.”

GP Action Plan [11]

Actions

“A. FOCUSED AREAS OF COORDINATION AND FUNDING IN NUCLEAR AND RADIOLOGICAL SECURITY

ENHANCEMENT OF NATIONAL NUCLEAR SECURITY REGIMES

1. Provide assistance to and coordinate programs and activities on the development of Nuclear Security Culture and Personnel Reliability Programs.
6. Provide assistance to and coordinate programs and activities on training centers / COEs and in doing so, work collaboratively with the IAEA International Network for Nuclear Security Training and Support Centres.
7. Provide assistance to and coordinate programs and activities that implement the actions of the Gift Basket on Nuclear Security Training and Support Centres / COEs.
9. Provide assistance to and coordinate programs and activities on the development of awareness training and exercise efforts for countering nuclear smuggling focused on interior law enforcement and emergency management personnel. Such assistance would also address sharing information and new technologies to enhance enforcement capacity of customs and border personnel, collaborating with INTERPOL.

NUCLEAR FORENSICS

10. Provide assistance to and coordinate programs and activities on strengthening nuclear forensics capacities by ways of, inter alia, exchange of experts and support for upgrading capacities of nuclear forensics, collaborating with other international initiatives such as the Global Initiative to Combat Nuclear Terrorism (GICNT).”

GICNT Action Plan [12]

Actions

“A. CAPACITY BUILDING

1. Advocate for GICNT activities that promote capacity building across the spectrum of nuclear security challenges to further promote the ability of partner nations to work together to prevent, deter, detect, and respond to nuclear terrorism events.
2. Increase technical capacity of GICNT partner nations by promoting understanding of critical technical concepts and sharing models for practical implementation of important nuclear security concepts, encouraging and assisting States to undertake measures consistent with relevant legal instruments, national legal frameworks, and IAEA Nuclear Security Series guidance documents.
3. Build awareness of international resources that are available to partners interested in seeking additional support.
4. Host exercises, workshops, expert discussions, and other activities that seek to build national capacity of GICNT partners in nuclear security, particularly in the three current focus areas of GICNT: nuclear detection, nuclear forensics, and response and mitigation.

5. Convene expert meetings to discuss issues and develop GICNT activities in other technical subjects or on cross-disciplinary issues consistent with the GICNT Statement of Principles.
6. Sponsor GICNT activities that provide a forum for partners to exchange information and deepen understanding of a specific technical topic.
7. Ensure that GICNT activities continue to uplift the dialogue between the technical community and decision-makers.”

“C. SCENARIO-BASED DISCUSSIONS, TABLETOP EXERCISES, AND FIELD EXERCISES

1. Host activities under the auspices of GICNT that promote experiential (scenario-based) practice of nuclear security principles and guidance documents through expert-level scenario-based discussions, tabletop exercises, and field exercises.
2. Host and support GICNT activities that promote the cross-disciplinary exchange of expertise and practices among key communities of nuclear security experts (e.g., detection, forensics, law enforcement, and response experts).
3. Convene groups of technical experts, policy experts and decision-makers for in-depth analysis of issues and discussions of practical implementation of International Atomic Energy Agency (IAEA) Nuclear Security Series guidance documents and scenario-based practice through tabletop exercises and field training exercises.
4. Host cross-disciplinary tabletop exercises, under the coordination of the GICNT’s Implementation and Assessment Group that encourage the exchange of experiences and expertise among the key communities of nuclear security experts.
5. Host exercises in coordination with partner nations to examine and demonstrate mechanisms for bilateral coordination.
6. Invite other nations and official observers to observe national exercises and report on national exercises to the GICNT partners.
7. Participate in GICNT activities that intentionally build partners’ capacity to develop and implement national-level exercises.
8. Build GICNT activities and exercises to increase level of technical depth or otherwise ensuring such activities become progressively more challenging and informative for partner nations.
9. Leverage important lessons learned and conclusions from each exercise or workshop to enhance subsequent events and the overall strategic plan of the GICNT.

“D. COORDINATION AND COLLABORATION

1. Promote coordination and collaboration between GICNT and relevant international institutions and initiatives to support nuclear security capacity building.
3. Incorporate the IAEA nuclear security guidance and highlight applicable training resources and other tools within GICNT activities and workshops.”

C. The Human Dimension and Further Commitments at the NSS

From the analysis of the National Progress Reports at the 2016 NSS, over 40 countries reported that they were engaged in capacity-building either through training, Centers of Excellence (CoEs), or exercises. Several commitments on capacity building were actually made through “house gifts” and “gift baskets” starting from the very first Summit, supporting increased awareness, nuclear security culture, and capacity-building through the creation and promotion of Schools, CoEs, or Nuclear Security Training and Support Centers (NSSCs). These constitute one of the most significant outcomes of the NSS process, and at present, four years after the end of the NSS process, they continue to be key assets in the development of a sustainable nuclear security architecture.

For example, Italy announced at the Washington, D.C. Summit in 2010 the creation of a Joint IAEA/ICTP International School on Nuclear Security at the International Centre for Theoretical Physics in Trieste, which launched the first annual two-week courses in 2011 and has since been supported by the Italian Government. The School, mainly tailored to early-career professionals (from regulatory bodies, universities, research institutes, government ministries, and law enforcement agencies), has been a successful initiative followed in recent years by similar IAEA Schools at the regional level, with the aim of supporting developing countries to design and implement robust and sustainable national nuclear security frameworks.

Several countries announced at the 2010 and ensuing Summits the creation of CoEs or NSSCs: the first was Japan that, following its announcement in 2010, established an Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) in December of the same year. Several Centers are now operating in different regions and cover a variety of topics, in some cases at the regional level. The Japanese ISCN, together with the Korean International Nuclear Nonproliferation and Security Academy (INSA) and the Chinese State Nuclear Security Technology Center/Center of Excellence on Nuclear Security (SNSTC/COE), were the first to consider joining forces to create a regional network, the Asia Regional Network (ARN).

In order to promote the creation of the CoE/NSSC and networking between these Centers, at the 2012, 2014 and 2016 Summits, they become the object of Gift Baskets named “Nuclear Security and Support Centres/Centres of Excellence (NSSC/CoE)” the last two sponsored by Italy [17, 18]. The 2016 Joint Statement was signed by 28 States and two International Organizations, recognizing the contribution of NSSC/CoEs in the development and sustainability of capacity-building and nuclear security culture and their role in meeting domestic nuclear security needs, ultimately strengthening nuclear security globally. The commitments highlighted five topics [18]: (1) Strengthening the IAEA Networks for education and training (i.e. the International Network for Nuclear Security Training and Support Centres (NSSC Network) and the International Nuclear Security Education Network (INSEN)), (2) Establishing regional networks, (3) Strengthening nuclear security training and technical support programs, (4) Sustainability, and (5) Cooperation.

Another Gift Basket, presented by Canada, on “Certified Training for Nuclear Security Management” [19], supports the certification of NSSC training programs and endorses the need for demonstrably competent nuclear security personnel. This Gift Basket was later transformed into the IAEA INFCIRC/901 [20].

II. Beyond the NSS Process

International momentum following the conclusion of the NSS process helped, and continues to help, to support initiatives on the development of nuclear security culture and capacity-building. The NSCG, initially created at the last Summit and later transformed into an IAEA INFCIRC sustained by a larger membership, is an important instrument to facilitate cooperation and sustain activities on nuclear security. One of its major roles is to support the implementation of the NSS Action Plans with particular relevance to capacity-building and nuclear security culture and the role of the IAEA. Within the IAEA framework, some initiatives that were launched at the onset of the NSS process have grown significantly since then, such as the NSSC Network, INSEN, and the Global Nuclear Safety and Security Network (GNSSN). At the same time, INTERPOL and the GICNT have increased and focused their efforts in this direction on the basis of the respective Action Plans. Several initiatives set up by NGOs are also in place in several parts of the world, in many cases at the regional level, such as the Nuclear Threat Initiative (NTI) and the World Institute for Nuclear Security (WINS). In particular, for several years WINS has been championing the need to ensure that personnel are demonstrably competent and working closely with the IAEA and other organizations to promote it.

A. NSSC Network

As already noted, the NSSCs and COEs are one the most significant outcomes of the NSS process: their number has steadily increased since the first NSS. At the time of writing (as of 28 January 2020), the NSSC Network includes 62 Members (71 Institutions) and 7 Observers with 38 operational Centres, 22 at the planning stage, and 11 without national NSSC/COEs: the detailed status and activities are to be found on the IAEA Nuclear Security Information Portal (NUSEC) (<https://www.iaea.org/resources/databases/nusec>). The NSSC Network is proving to be a highly effective platform for sharing experiences and developing concepts, materials, and tools that could benefit all countries, including those that are not planning to develop NSSC/COEs. The Network is becoming an increasingly important resource for States every year, with an Annual Meeting to review the status of the Network and further promote collaborative efforts. The Annual Meetings, initially held in Vienna, are now being held also in other countries with NSSC/COEs: Pakistan in 2016, Japan in 2018, and China in 2019. The Network activities are organized through three Working Groups: WGA-Coordination and Collaboration, WGB-Best Practices, and WGC-Information Sharing, Promotion, and Outreach.

B. INSEN

The increased awareness derived from the NSS process on the need to strengthen and sustain capacities for the safe and secure use of nuclear technologies, the protection of nuclear and radiological material and facilities, and the fight against illicit trafficking have also contributed to the success of the International Nuclear Security Education Network (INSEN). INSEN was established in April 2010 to support the development of education programs in nuclear security starting with only a select group of universities; now, it can count on 65 members and 192 institutions. Until recently, only a small number of universities offered courses in nuclear security, and in general, the level of awareness in the academic community was insufficient. In recent years, with the contribution of INSEN, several institutions and universities have established academic courses, including master's programs, on nuclear security culture and matters relevant to nuclear security, in some cases with regional emphasis and the contribution of other INSEN members. INSEN is structured in three working groups: (1) Exchange of information and development of teaching materials for nuclear security education, (2) Faculty development and cooperation among universities, and (3) Promotion of nuclear security education and of INSEN. The experience and feedback from the INSEN community has also contributed to the revision of the IAEA Nuclear Security Series Technical Guidance NSS-12 "Model Academic Curriculum in Nuclear Security," [21] first published in 2010, with a revised version in press. This revision is long awaited by all of the INSEN community as knowledge and topics on nuclear security have grown significantly in recent years.

C. Regional Approaches

Fostering regional approaches to capacity building and nuclear security culture has been another by-product of the NSS process. Following the successful example of the Asia Regional Network (China, Japan, ROK), more NSSC/CoEs are cooperating and sharing their experience and also considering regional approaches to pooling resources, from which several countries - within or outside the region and with or without NSSC/COEs - can benefit. China, for instance, at the SNSTC/COE, co-hosted with the US in April 2018 a Workshop on Regional Capacity-Building and Cooperation in Beijing, which intended to identify challenges faced in different regions and focus on national experiences and regional arrangements.

As offshoots of the joint IAEA/ICTP International School on Nuclear Security in Trieste, a number of regional Schools have also been implemented and are now being offered in several IAEA official languages.

The European Union (EU) Chemical, Biological, Radiological and Nuclear (CBRN) Risk Mitigation Centres of Excellence (CoE) Initiative (https://europa.eu/cbrn-risk-mitigation/index_en) was launched in

2010 and, through its regional approach, is complementary and synergic to the IAEA NSSC Network and INSEN. The concept was developed to boost local ownership on the part of national, regional, and international partnerships, an integrated approach and a methodology for the assessment of CBRN threats. It is based on national and regional CBRN capabilities that are complemented where necessary by expertise from the EU Member States and international and regional organizations, such as the IAEA, the Organisation for the Prohibition of Chemical Weapons (OPCW), the United Nations Office for Disarmament Affairs (UNODA), the Biological Weapons Convention Implementation Support Unit (BWC-ISU), the World Health Organization (WHO), the INTERPOL, the EUROPOL, the UN SC 1540 Committee, the Arab League, the African Union, the Association of Southeast Asian Nations (ASEAN), the International Science and Technology Center (ISTC), and the GPWG. So far, it has funded around 80 projects, mainly on capacity-building and nuclear security culture.

D. Coordination Among Nuclear Security Education, Training, and Technical Support Programs

The existence of networks, and of networks of networks, has clearly played a beneficial role in coordinating efforts and limiting duplications, but it is undeniable that a risk of overlapping exists. Though a certain amount of overlapping is unavoidable and not necessarily negative, efforts are underway among the principal stakeholders to share information and products. Several activities are being carried out by the IAEA and Member States, which are regularly reported in the NSSC Network and INSEN meetings and highlighted in international capacity-building-related events. Modules, tools, exercises, and documents are now available to NSSC/COEs, academia, and institutions on several platforms and networks, mainly the IAEA, including the IAEA GNSSN, the EU CBRN COE Initiative, and the GICNT.

E. Cooperation

Several initiatives are or have been carried out to foster cooperation among relevant stakeholders from educational to research institutions, industry, and, in general, the scientific community. At the international level, the collaboration of the relevant IAEA tools and networks, INTERPOL, GPWG, the EU CBRN COE Initiative, the UN 1540 Committee, the GICNT, and several NGOs is actively pursued, and the legacy of the NSS is still a phenomenal means to facilitate this task, which is by no means easy. Bilateral or multilateral initiatives for capacity-building are in place, particularly in specific countries and regions all over the world, and there is an increased attempt to promote synergy and complementarity of initiatives: the IAEA, GP, and NSCG are among the fora where information is shared. An interesting example is the collaboration between WINS, the IAEA, Mexico, and Canada, following the INFCIRC/901 [20] supporting the certification of NSSC training programs, which resulted in supporting the establishment of an ISO 29990 certified NSSC in Mexico [22].

F. Sustainability

Sustainability remains one of the most critical aspects of a robust global nuclear security framework, and capacity-building is one of its essential elements. The NSS process was characterized by a growing attention to sustainability challenges, in particular beyond the momentum created by the NSS process itself. At present, greater attention to this subject is recommended in planning new NSSC/CoEs, Schools, and other initiatives. For instance, the Technical Document “Establishing a National Nuclear Security Support Centre” (IAEA-TECDOC-1734, in press) [23] has been recently revised in an effort to promote the sustainability of NSSCs/COEs, incorporating the lessons learned by the Members of the NSSC Network.

Sustainable capacity-building depends on several concurrent factors. As the host of the Gift Baskets on NSSC/CoEs and promoter of the IAEA-ICTP Nuclear Security School in Trieste, Italy has always been highly aware of the challenge and has held a number of events starting from the High-level Event on “Nuclear Security Summit 2016 and beyond: the role of training and support centres and Centres of

Excellence” (Bologna, May 7-8, 2015) organized by the Italian Ministry of Foreign Affairs and International Cooperation (MAECI) and ENEA, in cooperation with IAEA and the European Commission [24]. Based on the conclusions of this event, the concept was further elaborated at the “International Workshop on Sustaining Capacity-Building for Nuclear Safety and Security,” [25] an initiative of the Italian Presidency of the G7 Nuclear Safety and Security Group (Rome, October 11, 2017), with the participation of International Organizations, Regional Bodies, NGOs, and educational and training networks.

A number of specific elements toward a sustained capacity-building framework were highlighted, including:

- Variety of needs and initiatives: There is a variety of capacity-building needs, differing from country to country, from region to region, and for countries within the same region. Also, their spectrum is wide (e.g. Regulatory Bodies, TSOs, operators, research, and higher education). To meet these needs, several initiatives are in place and a certain amount of duplication exists, but there are also numerous examples of fruitful collaboration among countries, organizations, and initiatives. For examples at the international level: the G7 coordination with the European Bank for Reconstruction and Development for the Chernobyl Remediation Programme, the Border Monitoring Working Group for nuclear security, and the Coordination Group for Uranium Legacy Sites for environmental remediation activities in Central Asia (CGULS). With regard to the existing knowledge, the IAEA has a major role in maintaining and developing the knowledge base systematically with standards and guidelines.
- Cooperation and coordination: Coordination, as experience and past shortcomings have shown, is essential for sound management, better use of limited resources, and the avoidance of unnecessary duplication. Collaborative regional efforts, fora, and networks are effective means for cooperation and sharing. Sharing platforms are also important, e.g. the IAEA Global Nuclear Safety and Security Network (GNSSN) platform. At present, setting up new initiatives is not considered a priority, but rather, there is a need to use and rationalize the existing ones, identifying gaps and striving for complementarity; good examples of complementarity already exist (e.g. Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO) and IAEA activities). However, an effective coordination mechanism is necessary. Mechanisms among countries, organizations, and initiatives, also from NGOs, are currently in place and operational (e.g. IAEA Nuclear Security Information Exchange Meetings, GPWG), but more should be done with the IAEA playing a leading role.
- Specifically, on sustainability:
 - Ownership by the recipient institution/country is an essential element for sustaining national capacity-building: engagement and institutional commitment are crucial.
 - Complementarity is one of the major keys for the sustainability of initiatives.
 - Training centers/CoEs and knowledge and education networks play a key role in sustaining capacity-building, but without cooperation and coordination, they might face a problem of sustainability: a positive example is the Asia Regional Network, created under the IAEA NSSC Network in China, Japan, and ROK.
 - The importance of an awareness of local cultural beliefs and customs and the full involvement of the recipients should never be underestimated for ensuring a long-lasting impact of capacity-building initiatives.
 - Impact assessments and indicators are important tools to monitor sustainability.

III. Conclusion

Capacity-building - encompassing education and training human resources, knowledge management and networks - is essential for a strong nuclear safety and security culture: providing support for capacity-

building is therefore fundamental for the sustainability of a national, and ultimately global, nuclear safety and security framework. The NSS process, through the Communiqués, Work Plan, and Actions Plans, together with the commitments in the “house gifts” and “gift baskets,” played a key role in elevating the “*significance of the human factor*” [16] for nuclear security. Notably, its legacy is still playing a significant role, particularly through the implementation of the relevant parts in the Action Plans, the related INFCIRCs, and the continued support for initiatives mainly developed around the Process, such as training centers, CoEs, Schools, Education initiatives, and their networking, in particular the IAEA NSSC Network and INSEN. Although some of the initiatives promoting nuclear security culture and capacity-building, including the IAEA NSSC Network and INSEN, existed at some level even before, it was undoubtedly the NSS process that boosted their development and encouraged the support at a national and international level contributing to their present success. This success, however, now raises concerns about the coordination and sustainability in the long term of these initiatives, particularly at a time of growing needs and diminishing resources. The events in Bologna and Rome referred to above addressed these issues, and there is a substantial consensus in relation to their outcomes. In particular, two key factors, initially not taken into consideration enough, are crucial. The first is the ownership by the recipient institution/country: without engagement and institutional commitment, it is difficult to ensure the long-term sustainability of initiatives that require continuity of resources over the time. The second factor, strictly linked to the first one, is a thorough and unbiased analysis of what a country really needs: for instance, not all need an NSSC or COE, and their establishment should be dictated only by real needs and come with a clear set of goals and indicators to monitor their fulfilment. Consolidation is the pathway.

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