



VCDNP Task Force on Peaceful Uses of Nuclear Science and Technology

Report and Recommendations

Edited by
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Chair's Note

The set of recommendations presented by the Task Force on Peaceful Uses of Nuclear Science and Technology (hereafter “peaceful uses”), convened by the Vienna Center for Nuclear Disarmament and Non-Proliferation, distils the ideas, discussions, and contributions of a group of multilateralists from diplomacy, global civil service, academia, industry, and civil society representing all regions and many cultures (political, professional, and vocational).

The Task Force endeavoured to contribute to a successful Tenth NPT Review Conference, pointing to the so-called “third pillar” of the Treaty, covering peaceful uses but not — as some may suspect — as a counterbalance to paltry progress (if any) in the disarmament pillar but to affinities and synergies allying the philosophy underpinning atoms for peace and the larger development agenda, as operationalised in the Sustainable Development Goals (SDGs).


While no philosophical claim is advanced in our recommendations, I am convinced that such an approach rests — at least intuitively — in a Human Security understanding of the multidisciplinary, cross cutting nature of current and future global challenges.

Any serious discussion of peaceful uses in the context of the NPT’s grand bargain needs to understand the fact that Article IV recognises a pre-existing, inalienable right. And as an economic and social activity, peaceful uses will outlast nuclear disarmament.

Through extensive study and discussion, the Task Force confirmed that mere belief in the past achievements and enormous potential of atoms for peace are insufficient to transfigure peaceful uses into the powerful human security instrument it really is. Public and institutional awareness about such potential appear as a key requisite for success. Awareness shall lead to the resources needed to unleash such potential, and our recommendations deal with the need for concerted action to remove widespread misperceptions about nuclear energy and nuclear applications and focus on their benefits instead.

In his recent Report, aptly titled “Our Common Agenda”, intended to guide the multilateral system through the turbulent, current global juncture, UN Secretary General Antonio Guterres demands to end the “infodemic” plaguing our world by defending a common, empirically backed consensus around facts, science and knowledge. In the same vein it is important that the contribution of nuclear science and technology to achieving Human Security be better understood. Climate change and the increasingly heavy toll it is imposing on every nation should inject a sober, objective re-appraisal of nuclear energy in all its applications. Fossil fuels — coal in particular — remain in high demand, raising questions about decarbonisation goals recently proclaimed.

Nuclear science and technology can contribute significantly to achieve crucial SDGs today, particularly on SDGs 3, 6, 7, 9 and 13. But the magnitude and importance of the task require the joint effort of all concerned public and private stakeholders. The UN Secretary General has announced a “Summit for the Future,” to forge a new global consensus... We believe that atoms for peace and development are a necessary part of that consensus and our common future.



That is why, in the view of the Task Force, the United Nations Secretary General and the IAEA Director General ought to unleash their leadership by convening a high-level event to raise the global profile of peaceful uses as a powerful tool for Human Security.

And that recommendation serves as an appropriate, uplifting “coda” to this document.

I convey my gratitude and admiration to all the colleagues participating in this common effort, nurtured and sustained under the wings of the VCDNP. I remember vividly the ceremony of the Center’s launching at the Austrian Ministry of European and International Affairs a decade ago. Then, a megaphone served as a symbolic instrument for dissemination and advocacy. Today we offer our recommendations, no less vibrant and compelling.

Alfredo Labbé

Santiago, Chile

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Ambassador Marjolijn van Deelen, in her former role as Chair of Main Committee III of the Tenth Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons.

VCDNP Task Force on Peaceful Uses of Nuclear Science and Technology

Executive Summary

Since its creation in 1957, the International Atomic Energy Agency (IAEA) has inter alia facilitated the availability and transfer of nuclear science and technology for peaceful purposes. These activities span generating electricity and improving human health, including fighting cancer, and developing isotopes for use in food and agriculture applications, in industry and in many other areas in support of its Member States. Not only does the IAEA develop and make peaceful uses of nuclear technology available in cooperation with its Member States; it also applies internationally accepted safeguards, develops safety standards and security guidance and supports its Member States in building their capacity to use nuclear technology responsibly and sustainably in a safe, secure and safeguarded manner. Indeed, nuclear technology and related techniques have helped to improve the health and prosperity of millions of people worldwide.

Peaceful uses of nuclear energy, science and technology (hereafter referred to as peaceful uses), legally identified as an inalienable right and one of the three pillars of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), have broad support among States whether or not they are parties to the NPT. The tenth NPT review cycle has seen a more active discussion of peaceful uses as NPT parties sought to make better use of the review process to further advance nuclear technology for development. To confront the current global challenges of climate change, poverty, hunger, and disease, humankind will need to mobilize all resources at its disposal.

The risks associated with nuclear power following accidents at the Fukushima Daiichi and the Chernobyl nuclear power plants and the association of nuclear technology with weapons of mass destruction have made the public and policymakers wary of nuclear science and technology. More information about the benefits of peaceful uses and what is being done to ensure the safe and secure application of these technologies, especially non-power applications, is essential to addressing these concerns.

Within this context, the Vienna Center for Disarmament and Non-Proliferation (VCDNP) established a Task Force in late 2020 to examine and provide recommendations for approaches that could lead to increased access to nuclear science and technology for peaceful uses and contribute to achieving the sustainable development goals, while maintaining non-proliferation and nuclear security objectives. The Task Force examined these issues in the contexts of the NPT review process and of the IAEA's mandate.

The VCDNP Task Force assembled a diverse group of high-level technical and policy experts that met periodically. To their meetings, the Task force invited senior officials and technical and policy experts from the IAEA and its Member States, and also specialists from industry and academia, in order to incorporate a diversity of perspectives on peaceful uses. The Task Force also considered documents prepared for this purpose¹ and took advantage of various IAEA documents² in its review and discussions.

The Task Force did not attempt to address all peaceful uses and all aspects of their use and applications, focusing its deliberations and recommendations instead on well-recognized technologies and challenges in their wider use.

Most of the Task Force recommendations are focused on the IAEA, recognizing the key and integral part the IAEA plays in the promotion, facilitation of access to peaceful uses and in the relevant assistance it provides to its Member States. The support provided by the IAEA is, however, fundamentally driven by the needs and requests of its Member States, who are encouraged to use resources and invest in peaceful uses policy and implementation on national and regional levels in order to ensure that the full potential of peaceful uses for development is realized. Also, recommendations for industry are included in recognition of the importance of industry in expanding access to peaceful uses.

One of the assumptions underlying all recommendations of the Task Force is that expanding access to peaceful uses will require increased promotion of their benefits, mobilization of additional resources, and cooperation between various national and international stakeholders, government departments and other partners with impact on the ground, such as aid agencies, international financial institutions, the private sector and civil society. In this context, it is vital that development agencies, global financial institutions, private donors and the public view nuclear science and technology as a valuable and viable contribution to achieving the UN Sustainable Development Goals (SDGs), especially post-COVID 19.

More active stakeholder engagement and cooperation with civil society organizations are also essential to address concerns these stakeholders may have and to improve their awareness about the benefit of peaceful nuclear applications.

The Task Force drafted a number of high-level recommendations that could lead to improved deployment of and increased access to peaceful uses and contribute to the sustainable development goals, all while maintaining non-proliferation and nuclear security objectives.

1 The Critical Balance: Development, Security and Non-Proliferation by Ingrid Kirsten, prepared for the Task Force and included as Annex II.

2 Strengthening the IAEA's activities related to nuclear science and technology: Report by the Director General, IAEA, GOV/2021/27-GC(65)/3, IAEA 2021; General Conference resolution: Strengthening the IAEA's activities related to nuclear science, technology and applications, IAEA 2020, GC64)/RES/12. View at: <https://www.iaea.org/sites/default/files/gc/gc64-res12.pdf>

These key recommendations and cross-cutting themes highlight the need for the IAEA, its Member States and other stakeholders to invest in:

- Promoting clear linkages between peaceful uses and development, particularly with the UN Sustainable Development Goals;
- Raising awareness of the benefits of peaceful uses and mobilizing additional resources to expand access to and improve their deployment;
- Promoting nuclear technology and applications that have one or more of the following benefits: proven success and cost effectiveness; environment-smart; the only viable technology available; new and innovative approaches to addressing global challenges; and building regulatory and research and development capacity in developing and least developed countries;
- Promoting a multi-stakeholder approach (States, regional and international organizations, industry, non-governmental organizations, youth and women) and improving and expanding partnerships with development aid organizations, international and regional financial institutions, across the UN family and other agencies;
- Achieving the highest level of safety, security and safeguards as essential requirements for the increased deployment of and sustained access to peaceful uses while ensuring that developing and least developed countries benefit from the full potential of peaceful uses; and
- Improving the sustainability of the use of and access to nuclear technology, which requires continued capacity building efforts and relevant infrastructure development and maintenance, public acceptance, government involvement, and increased cooperation and coordination at the national, regional, and international levels.

The Task Force also identified specific recommendations for consideration in advance of the upcoming Tenth NPT Review Conference by the NPT States Parties, scheduled for 4–28 January 2022. The overarching theme of these recommendations is that concerted efforts by Member States of the IAEA and NPT States Parties are needed, particularly by nuclear technology holders and developed countries, to mobilize additional resources and demonstrate their commitment to the peaceful uses pillar under the NPT. Key recommendations for NPT States Parties to consider during the upcoming Review Conference include:

- Reflecting the connection between peaceful uses and the UN Sustainable Development Goals in a final outcome document;
- Proposing and initiating a high-level event organized jointly by the UN Secretary General and the IAEA Director General on peaceful uses to raise the profile of peaceful uses in UN agencies, development organizations, Member States, and the public; and
- Proposing and committing to specific actions and contributions in support of peaceful uses that will improve and expand access to them, particularly in least developed countries.

Recommendations for the IAEA, its Member States and Industry

The recommendations are grouped according to corresponding themes that emerged when considering the challenges and opportunities related to improvement of deployment and expansion of access to peaceful uses. In grouping recommendations for its key audiences: (1) the Agency; (2) the Member States; and (3) industry; the Task Force sought to underscore that all stakeholders play a role and should be engaged in and contribute to progress in expanding the use of nuclear science and technology for development. The Task Force did not attempt to address all applications and programmes and focused on broader recommendations, citing some specific programmes or applications when it was necessary to highlight certain points or challenges.

Safety and security measures in line and in accordance with IAEA guidance and standards are an integral part of the peaceful uses of nuclear and other radioactive materials. In addition to recognizing the importance of safety, security and safeguards (3S), in relation to nuclear power and non-power applications, the Task Force also proposes the inclusion of a fourth S: Sustainability (4S).

Sustainability of peaceful uses should be considered in all aspects of the application of nuclear technology to realize its full potential. Peaceful uses should be mainstreamed into national policy and development frameworks to facilitate the sustainability of their deployment and use. The establishment and upkeep of relevant regulatory and legislative infrastructure also contributes to long-term sustainability. To improve access to peaceful uses, nuclear technology should be cost effective, efficient and user friendly for all countries, particularly developing countries. Another essential aspect of sustainability is the availability of skilled human resources, adequately educated and trained. Investment in training and education will prove rewarding, particularly when training opportunities correlate with the job opportunities in the nuclear sector of a given country. Additionally, for nuclear applications to meaningfully contribute to development goals, countries need to be vested in those applications through ownership and public acceptance.

Keeping all of the above in mind, the recommendations are grouped according to the following themes:

Awareness Raising: These recommendations highlight the efforts that the IAEA, its Member States and industry should undertake to improve communication on the benefits of peaceful uses vertically (between experts and policy makers), horizontally (between institutions and between policy makers across government departments) and with civil society.

Expanded and Improved Partnerships: These recommendations focus on bringing more partners to the table in order to increase and improve the human and financial resources required to realize the full potential of peaceful uses. This could be achieved, for example, through extensive engagement with development agencies and international and regional financial organizations and institutions or through strengthening existing partnerships such as between the World Health Organization (WHO) and the IAEA.

Safety, Security and Safeguards: These recommendations reflect the essential requirements of safety, security and safeguards for the application of nuclear power and non-power technologies while ensuring that these requirements, when implemented, facilitate and support access to peaceful uses for all. Also, the recommendations include the development of a voluntary, non-discriminatory and transparent mechanism to validate successful implementation of IAEA nuclear safety and security instruments, with a view to facilitating the enhanced access of developing and least developed countries to all peaceful uses of nuclear technology, while contributing to a stronger global culture of safety and security.

Sustainability and Access to Technology: These recommendations to improve the sustainability of use and access to nuclear technology include improving policy processes and coordination at the national level, multi-stakeholder involvement, investment in capacity-building and ownership of projects. To improve access to nuclear technology, the recommendations include taking steps to improve the transportation of radioactive sources and adapting non-isotopic and other alternative technologies to developing country conditions. Along with safety, security and safeguards (3S), sustainability should become an integral part of the approach to peaceful uses, and new and expanded projects should be considered through a 4S lens.

Awareness Raising

To truly realize the full benefits of peaceful uses, awareness should be raised across the board. Awareness of the benefits of peaceful uses, particularly of non-power applications, is limited to the scientists, engineers, doctors and other practitioners working with nuclear technology. On the policy implementation level, these applications are traditionally the purview of departments of energy, science and foreign affairs, while policy makers and experts in areas such as development, agriculture and environment are often unaware of them and the solutions they offer. The “siloing” of peaceful uses has been noted by the current and previous IAEA Directors General as a barrier to mainstreaming peaceful uses. Diplomats and experts from developed countries have acknowledged that there is often an instinctive dismissal of peaceful uses by the development community because peaceful uses are not well understood. Developing country experts have noted the lack of mainstreaming of peaceful uses in national policy frameworks as a barrier to realizing the full potential of these applications. This is often the case in countries that do not have an established nuclear infrastructure such as nuclear power plants or research reactors and are not used to the legislative and regulatory requirements peaceful uses entail.

All stakeholders — including government institutions, academia, private industry and the public — play a role and must be engaged in and contribute to expanding the use of nuclear science and technology for development. Raising awareness of the benefits of peaceful uses and their potential contribution to the SDGs among these stakeholders and the public is key to expanding peaceful uses and realizing their full potential.

In these efforts, it is also important to continuously promote the important work of the IAEA not only in terms of the development and transfer of nuclear technology and related

techniques but also the support it provides countries to apply them in a safe, secure, safeguarded and sustainable manner.

The support provided by the IAEA is driven by the needs of its Member States. The more awareness there is among Member States of the benefits of peaceful uses and of the support provided by the IAEA, the more momentum there will be for expanding access to peaceful uses. In this regard, the Task Force recommends that:

The International Atomic Energy Agency

- a) Better utilize and continue to hold regular high-level events on nuclear science and technology and technical cooperation. Utilise events such as the IAEA Ministerial Conference on Nuclear Science and Technology (2023) and organize high-level events in the regions (Africa, Asia, Europe, Latin America) in close cooperation with the regional organizations to raise the profile of peaceful uses and to facilitate vertical and horizontal communication on peaceful uses by increasing outreach beyond energy and foreign affairs ministries to policy makers and experts from sectors such as development, health, agriculture, water, science and technology, environment, education and finance, and other UN agencies and international organizations.
- b) Emphasize the versatility, cost effectiveness and reliability of nuclear applications that have demonstrated their benefits, effectiveness and economic advantages as compared to conventional non-nuclear technologies, for instance the use of radiation for cancer therapy and for food safety and medical sterilization.
- c) Promote cancer treatment and related programmes, potentially in collaboration with the World Health Organization, through a comprehensive array of highly visible policy and public events and campaigns with respected influencers, including heads of States and their spouses, spiritual leaders, and celebrities.
- d) Expand outreach to schools and higher education institutions through education programmes in Member States to encourage young people to consider careers in nuclear applications, but also to foster a better understanding of the benefits of nuclear science and technology and the role of the IAEA.
- e) Further increase and enhance the Agency's outreach efforts by:
 - i. Providing virtual and in-person tours for potential IAEA partners of the Seibersdorf and Monaco laboratories to demonstrate nuclear applications and capabilities; and
 - ii. Showcasing success stories of the impact of peaceful uses³ over the past 50 years at the NPT Review Conference and at international conferences and meetings that focus on development. The purpose would be to raise awareness of the benefits of peaceful uses, but also to provide an impetus for replicating these successes and accelerating and enlarging the contribution of peaceful uses to the SDGs.

3 Examples of the positive impact of peaceful uses in health and agriculture are provided on pages 2 and 3 of the paper "Critical Balance: Development, Security and Non-Proliferation" annexed to this report.

Member States

- a) Include ministers and high-level government representatives and experts from departments such as development, health, agriculture, water, education, environment and finance in their delegations to IAEA high-level events related to nuclear applications, science and technology and technical cooperation, such as the IAEA Ministerial Conference on Nuclear Science and Technology (2023).
- b) Promote the role and efforts of the IAEA in the development, facilitation, capacity building and other aspects of peaceful uses among national decision makers and the general public.
- c) Mainstream peaceful uses in national development plans and regional development agendas at the:
 - i. National level through the establishment of intragovernmental interagency bodies/committees on peaceful uses for cross-sector engagement and information sharing to identify areas where peaceful uses could contribute efficiently to development; and
 - ii. Regional level through the improvement of intergovernmental cooperation, agreements and coordination on peaceful uses.
- d) Donor and recipient States should actively align the application of peaceful uses with national and regional development goals and engage national development agencies and regional financial institutions, drawing on the information made available by the IAEA, regional organizations, research institutions and non-governmental organizations.
- e) Introduce early education on peaceful uses to encourage young people to consider careers in nuclear science and technology, and to foster a better understanding of the benefits of nuclear energy and technology and also of the role of the IAEA.
- f) Provide more information to the public on efforts made to ensure the safety and security of nuclear and radioactive materials and related nuclear facilities, to increase public confidence in these applications, including nuclear power, and in the work of the IAEA.

Industry

- a) Provide more information to the public on the benefits and achievements of the peaceful uses of nuclear technology, including those for medical, agricultural, industrial and other purposes, and highlight efforts made to ensure the safety and security of nuclear facilities, equipment, and nuclear and other radioactive materials in order to increase public confidence in nuclear power and non-power applications.
- b) Highlight success stories of how the safe and secure use of nuclear technology and nuclear energy for peaceful purposes has improved quality of life and contributed to development and the protection of the environment.

Expanding and Improving Partnerships

Significant progress in the deployment of peaceful uses will require mobilization of additional resources, promotion of the benefits of peaceful uses and cooperation with new partners such as aid agencies, international financial institutions, and the private sector. The IAEA should be supported in its efforts to bring more partners to the table and increase non-traditional funding opportunities as well as partnerships to realize the full potential of peaceful uses.

The COVID-19 pandemic has highlighted the importance of international cooperation and partnership in cases of regional or international emergencies and also the ability of the IAEA to respond effectively to emergencies.⁴ Regional collaboration and networks should be enhanced, also between regions, to act as a force multiplier for national capacity building efforts. This regional collaboration should include South-South cooperation.

Recognizing the importance of partnerships and collaboration with various partners and stakeholders in order to increase availability of human, financial and other resources for the deployment of and expanded access to peaceful uses, the Task Force recommends that:

The International Atomic Energy Agency

- a) The Director General of the IAEA engage more extensively with his counterparts in development agencies and international organizations, including the Organisation for Economic Co-operation and Development (OECD), the International Energy Agency (IEA), the relevant UN organizations, especially the United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), World Health Organization (WHO), UN-Water, UN Industrial Development Organization (UNIDO) as well as regional and international financial organizations and institutions, to discuss cooperation on expanding access to peaceful uses.
- b) Revitalize and strengthen the existing WHO-IAEA partnership through the establishment of a joint division with the WHO, similar to the Food and Agriculture Organization (FAO)/IAEA Joint Division (now Joint Centre), which assures that the technical capacities of the two organizations are fully utilised in joint and complementary projects with Member States.
- c) Assist Member States in preparing their requests for official development assistance (ODA) to define the areas where nuclear technology and the IAEA can play a role, and work with organizations that disburse ODA to draw attention to relevant nuclear applications.

⁴ Examples include the IAEA's delivery of support to over 120 countries and territories to use the nuclear-related RT-PCR technology for the detection of COVID-19 infections in the early months of the pandemic. Shipments included detection equipment, i.e. real time RT PCR and kits, together with reagents and laboratory consumables, and biosafety supplies such as personal protection equipment for the safe analysis of samples. Another example is the rapid development and piloting of the COVID-19 Nuclear Power Programme OPEX Network, to share information and experience on crisis response actions among operating organizations, technical support organizations, relevant international organizations and other stakeholders.

- d) Design joint programmes for non-power applications with relevant partners and Members States, which would promote ownership and transparency. Base these programmes on data collection and needs assessment that clearly define the nature of the problem, the contribution of the IAEA and the role of each partner.
- e) Include monitoring and evaluation mechanisms in all projects to enhance accountability and increase the potential for future funding.
- f) Facilitate cooperation, including twinning or mentorship arrangements between less resourced and better resourced countries, to support capacity development and the establishment of regulatory and legislative frameworks in those countries.
- g) Promote South-South cooperation by facilitating opportunities for regional organizations to share experiences and best practices with those in other regions on matters relating to capacity building, engagement of youth and women, improving public perception of nuclear technology, and improving access to and sustainable use of nuclear technology and equipment.

Member States

- a) Actively promote collaboration between the IAEA and development aid agencies and other international organizations, including the OECD, IEA, UNDP, UNEP, UNIDO, UN-Water, FAO, WHO and regional financial organizations and institutions in order to improve bilateral, regional and multilateral development efforts.
- b) Clearly define the areas where nuclear technology can play an efficient and cost-effective role when making requests to development partners for ODA support, particularly in health, agriculture, water and the environment. Highlight the cost efficiency and other benefits, for instance, of radiation for cancer therapy, or radiation for medical sterilization and for food safety as compared to the use of chemicals, to make a more compelling case for partners who are unfamiliar with these aspects of peaceful uses.
- c) Coordinate with the IAEA and among themselves, including coordination within the regional organizations, to prevent the duplication of initiatives and to optimize the use of human and financial resources. Consider multi-country peaceful use projects which can maximize the impact of the IAEA's technical cooperation, facilitate more efficient allocation of resources and increase the scope and scale of the projects.
- d) Identify, promote and support twinning and mentorship opportunities between institutions responsible for research, training and education, hospitals, atomic energy agencies and regulatory authorities to support capacity development and knowledge sharing and the establishment of regulatory and legislative frameworks.
- e) Support and provide regional organizations with the resources to fulfil their mandate on peaceful uses.
- f) Support youth and women's organizations and networks at the national, regional and international levels involved in peaceful uses.

- g) Strengthen regional organizations' mutual engagement to promote their sharing of best practices and success stories.

Industry

Partner with the IAEA and other stakeholders to support peaceful use projects that strengthen capacity and expand access to nuclear technology in developing and least developed countries.

Sustainability and Access to Nuclear Technology

For nuclear applications to provide solutions to national, regional and global challenges, countries need to be vested in nuclear applications through increased ownership, expanded capacity for utilization, and improved access to nuclear technology for peaceful uses.

The Task Force emphasized the importance of capacity building in Member States as an enabling factor for improving the use and access to nuclear technology. Substantial and ongoing investment in a skilled workforce to apply this technology and maintain the related equipment is essential to improving the use of and access to nuclear technologies.

The Task Force is cognizant of the negative impact of the potential unavailability of radioactive sources in the health, agriculture and industrial sectors, especially for developing countries.⁵

The Task Force recognizes that there are suitable non-isotopic alternatives to gamma technology, including X-ray technology for blood irradiation and e-beam and linear accelerator technology for cancer treatment. These technologies have security benefits and represent a sustainable alternative to radioactive sources if adequately adapted to developing country conditions.

Along with safety, security and safeguards (3S), sustainability should become an integral part of the approach to peaceful uses, and new and expanded projects should be considered through 4S lenses.

To enhance sustainability and access to nuclear technology, the Task Force recommends that:

The International Atomic Energy Agency

- a) Emphasize a comprehensive approach to individual Member States and cross-agency collaboration when implementing country-specific programmes and also increase the ownership of the programmes by individual Member States, including by:

⁵ The Task Force also took the IAEA Nuclear and Radiation Safety resolution GC64/RES/9, paragraph 81 into account regarding the denial and delay of shipment of radioactive cargo.

- i. Assisting countries to better identify areas where peaceful uses can cost-effectively contribute to achieving their development goals and highlight the assistance they require by using tools similar to the Integrated Nuclear Security Support Plan (INSSP) to strengthen the development of national country programme frameworks (CPFs) with Member States considering the UN Development Assistance Framework (UNDAF); and
 - ii. Promoting coordinated research projects (CRPs), including those that involve all aspects of peaceful uses and cross-agency collaboration, recognizing that CRPs are an effective tool to support research, development and practical use of atomic energy and its applications for peaceful purposes in Member States.
- b) Continue to invest and promote capacity building in Member States for peaceful uses through the development of educational and training programmes and fellowships such as the Marie Skłodowska-Curie Fellowship Programme, supporting the advancement of women working in nuclear.
- c) Provide information and recommendations on new and emerging technology for power and non-power applications, including alternative, non-isotopic technology, and help Member States to understand the requirements and benefits of these applications.
- d) Collaborate with research centres and laboratories that are developing non isotopic technology for specific medical, industrial, agricultural and research applications to ensure that the technology can be applied successfully and routinely in developing countries.
- e) Address the challenges related to the transportation of radioactive material that continue to affect the nuclear sector by increasing the cost of radioactive sources and making them harder to obtain. The impact of the potential unavailability of radioactive sources on the health, agriculture and industrial sectors, especially in developing and least developed countries, may negatively affect the ability of these countries to use these technologies. To address these challenges, it is recommended that the IAEA:
 - i. Provide Member States with specific support programmes to develop and update national legislation to reflect IAEA standards and best international practices and further assist Member States in building capacity to address gaps or potential shortcomings in the application of regulations to facilitate the transport of radioactive material;
 - ii. Promote a better understanding of the application of the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6 Rev.1.) among all stakeholders to facilitate the entry of the material into harbours and ports; and
 - iii. Improve communication about the transport of radiological material with regulators, carriers, handling agents, and others within the supply chain to facilitate the delivery of radioactive sources and radioisotopes required for peaceful uses. Promote the adoption and maintenance of best practices for securing the relevant materials in transport.

- f) Revitalize the IAEA/AGaRT forum (Advisory Group on increasing access to Radiotherapy Technology in low- and middle-income countries) established” moving the closing parenthesis after “countries” rather than after “Technology”.

Member States

- a) Improve national processes and coordination to better identify areas where peaceful uses can cost-effectively contribute to achieving national development goals and make better use of IAEA tools to identify assistance required and increase national ownership of peaceful use programmes, including:
 - i. Country programme framework (CPF): Improve national coordination and input to better reflect national development plans and priorities and their links to the SDGs. Measures to be considered could include institutionalization of the national liaison office and establishment of intragovernmental committees on peaceful uses for cross sector engagement and information sharing to identify areas where peaceful uses could contribute cost-effectively to development;
 - ii. IAEA coordinated research projects (CRPs): Make better use of CRPs to optimize the use of nuclear technology and related techniques as a tool for developing homegrown solutions.
- b) Increase investment for capacity building in peaceful uses by:
 - i. Taking full advantage of the IAEA’s educational and training programmes and scholarship funds such as the Marie Sklodowska-Curie Fellowship Programme;
 - ii. Ensuring that there are opportunities for students to apply their skills and expertise in their home countries;
 - iii. Promoting existing training centres/hospitals/universities that have a proven track record for skills training as regional centres of excellence to increase opportunities for training and education; and
 - iv. Contribute to and support regional networks on education and training in nuclear science and technology.
- c) Address the challenges related to the transportation of radioactive material which continue to plague the nuclear sector, increasing the cost of radioactive sources and making them harder to obtain. To address these challenges, it is recommended that regulators and policy makers:
 - i. Harmonize transport regulations between countries and improve national regulations and their implementation to facilitate the safe and secure transportation of radioactive cargo;
 - ii. Promote a better understanding and universal implementation of the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6 Rev.1.) among all national stakeholders; and
 - iii. Improve communication about the transport of radioactive material with the general public, carriers, handling agents, and others within the supply chain.

- d) Consider non-isotopic technologies that could provide a solution to security concerns and transport challenges related to gamma technology. However, the technologies and the related supply chains require further adaption to suit developing country conditions. It is therefore recommended that:
 - i. States consider using non-isotopic technology, where technically and economically feasible; and
 - ii. When promoting the use of alternative technology to replace gamma technology, States should take the operating conditions and local infrastructure into consideration and the needs in developing countries that may require the continued use of radioactive source-based technology until adequate alternative technologies are available.

Industry

- a) Develop high quality, robust, cost effective and affordable equipment for use in medical, agricultural, industrial and research applications in developing countries.
- b) Provide equipment that includes an agreement to repatriate disused sources and, in the case of alternative technology, includes maintenance and training to support the use of the equipment.
- c) Engage the transport industry actively with the IAEA and its Member States to find solutions to challenges related to the safe and secure transportation of radioactive cargo.

Fostering Cultures of Non-Proliferation, Safety and Security

Measures to enhance nuclear safety and security increase public confidence and promote international cooperation for peaceful uses. With a view to facilitating the wider application of nuclear power and non-power technology, States should endeavour to achieve the highest levels of nuclear safety and security, as well as the effective and full implementation of nuclear safeguards. The question is: how to foster these cultures while ensuring that developing and least developed countries benefit from the full potential of peaceful uses?

In this regard the IAEA, regional organizations, national governments, non-governmental organizations and other partners should provide support to countries in building the capacity and frameworks to apply internationally recognized standards and guidelines for ensuring high levels of safety and security as well as effective safeguards.

Cognizant of the importance of nuclear safety, security, and safeguards for the sustainable and peaceful use of power and non-power applications; and recognizing the challenges for States in achieving high levels of nuclear safety and security, as well as the effective implementation of safeguards in the peaceful uses of nuclear energy, the Task Force recommends that:

The International Atomic Energy Agency

- a) Consider developing, in consultation with Member States, a voluntary, non-discriminatory and transparent mechanism to validate successful implementation of IAEA nuclear safety and security instruments, norms and practices with a view to facilitating enhanced access of developing and least developed countries to all peaceful uses of nuclear technology. Such a mechanism would increase confidence in the responsible use of nuclear energy for peaceful purposes by all countries. The mechanism should be able to accommodate differences in relation to the technology implemented by individual countries (particularly in the case of non-power technology) and recognize gradual development of the relevant infrastructure and resources.
- b) Continue to provide support to Member States in the establishment of an appropriate and reliable nuclear security infrastructure. This should take into account that some developing countries and least developed countries may require customized approaches with allowances to compensate for human and financial resource constraints to support regulatory and legislative infrastructure. Such approaches should also allow for the organic/gradual development of the relevant infrastructure in tandem with the development of the needed technology.
- c) Identify, in cooperation with Member States, modes and specific areas and topics that could be included into information exchange by Member States about effective nuclear security measures while protecting the confidentiality of sensitive security-related information.
- d) Engage with the developers of advanced and small modular reactors (SMRs), and also with the Member States in which these industries reside, on the safety, security, and safeguards requirements, given the increased interest by Member States in SMRs and other advanced nuclear reactors and technology.

Member States

- a) Work towards the full implementation of the nuclear safety and security architecture including the universalization of various relevant legal instruments such as the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment, the Convention on Nuclear Safety (CNS), the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), the Convention on Early Notification of a Nuclear Accident (Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention).
- b) Provide the required support (funding and human resources) to establish or strengthen the mandate of the national regulatory authorities and allocate appropriate and necessary resources to consolidate public confidence in the safe and secure use of nuclear power and non-power applications.

- c) Promote information exchange⁶ recognizing that reporting and sharing information on nuclear security measures are possible without compromising confidential and sensitive nuclear security information and that such efforts are important to building confidence with neighbouring countries and the international community as well as strengthening the global security architecture. Member States should work with the IAEA to identify modes and specific areas and topics that could be included in information exchange by Member States about effective nuclear security measures while protecting the confidentiality of sensitive security-related information.
- d) In cooperation with the IAEA, consider the development of a voluntary, non-discriminatory, transparent mechanism to validate successful implementation of IAEA nuclear safety and security instruments, norms and practices with a view to facilitating enhanced access of developing and least developed countries to all peaceful uses of nuclear technology. Such a mechanism would increase confidence in the responsible use of nuclear energy for peaceful purposes by all countries. The mechanism should be able to accommodate differences in relation to the technology implemented by individual countries (particularly in the case of non-power technology) and recognize a gradual development of the relevant infrastructure and resources.
- e) Routinely use IAEA services for assessment, advisory and peer review missions to improve and develop nuclear safety and security infrastructures. This will contribute to fostering cultures of learning and improvement.
- f) In cooperation with the IAEA, work closely with local SMR and advanced reactor developers to promote better understanding of safety, security and safeguards considerations and concerns during the design and development phases of these reactors.

Industry

Require developers of advanced reactors and SMRs to work with the IAEA early in the development cycle to ensure their safeguardability, and also best practices in safety and security.

Recommendations for the Tenth NPT Review Conference

NPT Article IV recognizes States Parties' inalienable right to the peaceful use of nuclear energy consistent with safeguards obligations and requires them to facilitate the exchange of equipment, material, and scientific and technical information for peaceful uses. The Treaty also requires States Parties to cooperate mutually and with international organizations to further develop peaceful uses of nuclear energy, paying special attention to the needs of developing countries.

⁶ Through existing networks or through committing to the implementation of recommendations for strengthening nuclear security implementation, including information sharing, as contained in IAEA INFCIRC 869 IAEA INFCIRC/869.

In the context of the NPT review process, the tenth NPT review cycle has seen a more active discussion of peaceful uses and calls for the NPT State Parties to make better use of the review process to further advance the use of nuclear technology for development. Nuclear-weapon-free-zones (NWFZs) complement the NPT. These zones foster institutional regional cooperation in nuclear science and technology, thus adding to regional integration. Accordingly, instruments for inter-NWFZ cooperation on peaceful uses of nuclear energy for sustainable development should be explored in the framework of the NWFZs States Parties Conference, held in advance of the NPT Review Conference.⁷

Cognizant that peaceful uses are central to the grand bargain of the NPT, the Task Force recommends that States Parties:

- a) Make a clear connection between peaceful uses and the UN SDGs in a final outcome document of the Review Conference.
- b) Reaffirm support for cooperation on peaceful uses in a final outcome document, with special attention to the needs of developing countries and least developed countries, as called for in Article IV of the NPT, and pledge continued funding through the IAEA's Technical Cooperation Fund and through extrabudgetary means.
- c) Recalling the success of the Peaceful Uses Initiative which was launched at the 2010 Review Conference and has resulted in raising US \$170 million for peaceful use projects globally, undertake specific actions and pledges of contributions at the Review Conference to support and expand access to peaceful uses, particularly in least developed countries. These actions and contributions should support the work of the IAEA, regional organizations and networks to promote the benefits of peaceful uses; build capacity; develop regulatory frameworks; support policy development and coordination; and improve access to nuclear science and technology. An example of such an initiative could be supporting the provision of radiotherapy equipment to 20 least developed countries that do not have access to any equipment.
- d) In a final outcome document, encourage the inclusion of peaceful uses, particularly non-power applications, in their national development plans. All States contributing ODA funding should be encouraged to integrate peaceful uses into their development efforts and to provide support to the IAEA.
- e) In national reports and working papers, side events and other fora, highlight successes and contributions of peaceful uses over the past 50 years in order to raise awareness of their benefits, and to provide an impetus for replicating these successes and accelerating and enlarging the contribution of peaceful uses to the UN SDGs.

⁷ Provision for peaceful uses has been made in Art. 17 of the Tlatelolco Treaty, Preambular Paragraphs 10 and 11 and Article 8 of the Pelindaba Treaty and Article 7 of the Semipalatinsk Treaty. See also para. 106 of document NPT/CONF.2010/50 (Vol. I), Part One of the Final Document of the 2010 Review Conference.

- f) After the NPT Review Conference, communicate the outcomes/decisions of the conference pertaining to peaceful uses to the relevant national and international development agencies, highlighting the link to sustainable development. Follow-on events should be convened to ensure continued progress. ‘Horizontal outreach’ could broaden the awareness and understanding of the contribution of peaceful uses to sustainable development.

Convening a High-Level UN/IAEA Event to Raise the Profile of Peaceful Uses

There is an urgent need to raise the profile of peaceful uses and to create awareness among a wide range of stakeholders, beyond the NPT and the IAEA, of the contributions that nuclear science and technology have been making, and can continue to make, to enhance the quality of people’s lives and of the environment. Among the key audiences for these efforts are the UN family of organizations, regional and national decision-makers, financial and development organizations, the media and the public. Raising the profile of peaceful uses of nuclear science and technology could demonstrate the substantial benefits of the technology when applied in a safe, secure and sustainable manner.

Recognizing the need for such outreach and high-visibility awareness-raising, the Task Force recommends that:

Member States of the IAEA and NPT States Parties call on the UN Secretary-General to convene a high-level conference with the IAEA Director General on the peaceful uses of nuclear energy to raise the profile of peaceful uses among all stakeholders worldwide.

Annex: Discussion Paper Prepared for Task Force

The Critical Balance: Development, Security and Non-Proliferation

Ingrid Kirsten¹
January 2021

1. Introduction

The landscape of the International Atomic Energy Agency (IAEA) and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is marked by attempts to maintain a balance between non-proliferation, and nuclear safety and security measures on the one hand, and access to nuclear technology and its peaceful applications (hereafter referred to as peaceful uses) on the other.

The nuclear-weapon States are perceived to be unwilling to honour their disarmament commitments under the NPT. In the context of the IAEA developed countries are perceived to be more concerned about safeguards, safety and security than technical cooperation, which is the primary vehicle for the transfer of nuclear technology for peaceful purposes to developing countries. Lack of sufficient resources in the IAEA to meet the needs of all its Member States and divergence among Member States on funding priorities are a frequent source of tension between States. Given that the technology holders are by and large developed countries, the Group of 77(G77)/Non-Aligned Movement (NAM) operate on the assumption that there is an unequal partnership between developed and developing States on matters related to peaceful uses, non-proliferation and security.

Global challenges such as poverty, hunger, disease and climate change require that more be done to expand access to peaceful uses. The COVID-19 pandemic has significantly reduced the timeframe for action in this regard as it has derailed much of the progress on the 2030 sustainable development goals (SDGs) and triggered a global economic recession not experienced since World War II.² However, within these challenges, the seeds of opportunity are buried as achieving the SDGs will require the kind of innovation that nuclear science and technology can provide to fast-track development.

The VCDNP Task Force presents an opportunity for a diverse and multi-skilled group of high-level technical and policy experts to consider the key challenges that currently face the international community. The Task Force can identify potential solutions, and make recommendations to IAEA Member States, the Director General of the IAEA, the

1 Senior Research Associate at the Vienna Center for Disarmament and Non-Proliferation, previously a South African diplomat and a researcher on food and nutrition security policies at the New Partnership for Africa's Development (NEPAD).

2 World Bank Press Release, June 8, 2020. Available at: <https://www.worldbank.org/en/news/press-release/2020/06/08/covid-19-to-plunge-global-economy-into-worst-recession-since-world-war-ii>

10th NPT Review Conference and other relevant international and regional organizations and institutions. This paper identifies some of the key challenges and opportunities for expanding peaceful uses to contribute meaningfully to achieving sustainable development and climate goals and makes recommendations for the consideration of the Task Force.

The premise of this paper is that global peace and security require not only that we put measures in place that will eliminate nuclear weapons, reduce the risks posed by the proliferation of sensitive nuclear technology and material, and reduce the potential of nuclear terrorism. It also requires that we maintain a critical balance between these measures and development as fighting poverty is at the heart of our security system. In the words of Thabo Mbeki, a former President of South Africa: “A global human society based on poverty for many and prosperity for a few, characterized by islands of wealth, surrounded by a sea of poverty, is unsustainable”.³

2. Role of IAEA: more than Nuclear Watchdog

For more than 60 years the IAEA has been evolving to meet the needs of its Member States. It operates in accordance with Articles III and IV of the NPT, which guarantee States Parties the right to peaceful uses of nuclear energy provided those activities are placed under IAEA safeguards.

The IAEA assists countries that need nuclear technology the most to apply it in areas such as health and nutrition, food and agriculture, water and the environment, industry, and electricity production. In addition, the IAEA assists its Member States in developing and implementing a robust, necessary, and complementary nuclear safety and security infrastructure for the sustainable use of nuclear technology.

The following are examples of the contribution made by the application of nuclear technology to improving human health, ensuring food security and ending poverty.⁴ Not only are these examples of peaceful uses subject to security (where gamma sources are used) and proliferation concerns (in the case of nuclear power generation); they are also examples of areas where expansion of peaceful uses is required.

Cancer

Nuclear technology plays an essential role in the timely diagnosis and effective treatment of cancer. The IAEA works in collaboration with global partners such as the World Health Organization (WHO) to support developing countries to expand access to needed health equipment, build skills and raise funds to develop a comprehensive range of affordable and effective services for cancer patients. The IAEA established the Programme of Action for Cancer Therapy (PACT) in 2004, with the goal of ensuring the integration of

3 Society of Wealthy Islands Surrounded by Sea of Poverty Unsustainable, Says South Africa's President, Opening Johannesburg World Summit | Meetings Coverage And Press Releases. Available at: <https://www.un.org/press/en/2002/envdev669.doc.htm>

4 More information on these, and other applications are, available on the website of the IAEA <https://www.iaea.org/>

radiotherapy in comprehensive cancer control and of engaging with other international organizations. PACT provides assistance in the area of cancer through impACT Reviews, resource mobilization, and by supporting the development of strategic documents such as comprehensive national cancer control plans and bankable documents for fundraising. There is a growing need among the IAEA's developing and least developed Member States for this support. New cancer cases are expected to increase by 24 million per year by 2030 and cancer related deaths to 13 million. The greatest impact of this increase will fall on low- and middle-income countries. These are expected to suffer around 70 % of all cancer deaths by 2030. In Africa 28 countries do not have a single radiotherapy machine for treating cancer⁵.

Crop Improvement

Nuclear technology is used to improve a wide variety of crops through the irradiation of seeds and other plant material. The Joint FAO/IAEA Division has been at the forefront of developing this technology and has been supporting countries in the application of nuclear technology to improve the yield and quality of crops for more than 50 years. Bangladesh, one of the most densely populated countries in the world and one of the most vulnerable to the impacts of climate change, is using nuclear technology to increase the quality and productivity of its crops. Plant mutation breeding is credited with making Bangladesh the third largest rice producer in the world. New rice varieties developed by Bangladesh, using this technique, include climate-smart genetic traits such as resistance to high temperatures, drought, winds and high-salinity in the soil. The rice requires less irrigation and needs only 110 days to mature as compared to the usual 160 days. As a result, farmers can grow more crops in one season and harvest out of season. As the impact of climate change increasingly threatens crops and livelihoods globally, nuclear technology could become more important as radiation has the ability to produce mutations, create novel genetic diversity and pave the way to identifying genes contributing to specific traits.⁶

Insect Pest Control

Insect pests have a significant impact on agricultural production and food security. Plant pests, such as fruit flies, account for 40% of the world's pre- and post-harvest food losses, and livestock pests, which include screwworm and tsetse flies, have a substantial impact on livestock production. The sterile insect technique (SIT) is an environmentally friendly pest control that uses ionizing radiation to sterilize male insects in special rearing facilities. The sterilized males are released in infested areas to mate with wild females, which then cannot produce offspring. Mediterranean fruit fly-free and low-prevalence areas

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- 5 IAEA PACT. Available at:
<https://www.iaea.org/services/key-programmes/programme-of-action-for-cancer-therapy-pact>
- 6 For more information see The Contribution of Innovative Nuclear Technology to Sustainable Agriculture Development, A VCDNP Case Study, 2020. Available at:
https://vcdnp.org/wp-content/uploads/2020/11/Contribution-of-Innovative-Nuclear-Technology-to-Sustainable-Agriculture_final.pdf

established with this method in Guatemala contribute to the development of multibillion-dollar fruit, vegetable and horticulture industries in Guatemala, Mexico, Belize and the United States. In 2018, the United States livestock industry benefited by more than US \$900 million annually from screwworm eradication⁷. The tsetse fly, which is the cause of human and animal trypanosomiasis or sleeping sickness, was eradicated from Zanzibar by 1997⁸. As a result, milk production on the island has tripled, local beef production has doubled and the number of farmers who fertilize crops with manure has multiplied fivefold. Climate change is increasing the prevalence of insect pests that threaten crops and livestock production and, consequently, the demand for environmentally friendly solutions, such as the SIT.

Electricity Production

Nuclear power provides approximately one third of low-carbon energy in the world and can make an important contribution to solving the global energy crisis. According to the International Energy Agency (IEA) the number of people without access to electricity in sub-Saharan Africa increased in 2020. In 2019 approximately 580 million people in this region, three quarters of the global total, were living without access to electricity and some of the efforts to improve this situation faded in 2020.⁹ Currently there are 32 countries with nuclear power plants in the world and approximately 30 countries that are interested in or embarking on new nuclear power programmes.¹⁰ Some of these countries may ultimately not be able to construct traditional large nuclear power plants because of factors such as electrical grid limitations (capacity/reliability for nuclear power), financial resources (high capital costs) and human resources (limited qualified workforce). For these countries and others, small modular reactors (SMRs) offer a viable alternative to traditional large nuclear power plants. If SMRs live up to their promise, they would require lower up-front financing, fewer qualified staff, and be more compatible with existing electricity grids. The IAEA provides essential support to Member States interested in or embarking on nuclear power, including those wanting to install SMRs.¹¹

7 NAL Special Collections Exhibits, U.S. Department of Agriculture. Available at: <https://www.nal.usda.gov/exhibits/speccoll/exhibits/show/stop-screwworms--selections-fr/introduction>

8 IAEA Press Release 2002. <https://www.iaea.org/newscenter/pressreleases/campaign-launched-eliminate-tsetse-fly>

9 IEA World Energy Outlook 2020. Available at: <https://www.iea.org/reports/world-energy-outlook-2020>

10 Number of countries with nuclear power plants and those embarking or interested in embarking provide by IAEA experts.

11 For more information in this regard see: IAEA Launches Project to Help Countries Assess Viability of SMRs for Climate Action. Available at: <https://www.iaea.org/newscenter/news/iaea-launches-project-to-help-countries-assess-viability-of-smrs-for-climate-action>

Development and Climate Change Challenges in 2020 and Beyond

In 2007, the Director General of the IAEA Dr Mohamed ElBaradei, established an independent Commission of Eminent Persons to review the activities of the IAEA and to reflect upon the nature and scope of its programme up to 2020 and beyond. This Commission accurately predicted that there would be a greater need for the contribution of peaceful uses to address development challenges and to mitigate the impact of climate change. The Commission endorsed the idea that the IAEA was an “extraordinary bargain,” considering that it carried out its responsibilities of immense value to humanity at a very low cost. The Commission accurately concluded that “by 2020 and beyond, these responsibilities will increase dramatically as mankind and the Agency face new opportunities and challenges”.¹²

According to the IEA, the COVID-19 pandemic has caused more disruption to the energy sector than any other event in recent history. In its World Energy Outlook 2020, the IEA explores different pathways out of the COVID-19 crisis, with a particular focus on the crucial period between 2020 and 2030. The study concludes that the most sustainable pathway to reaching net zero carbon globally by 2050 would be to significantly increase the role of renewables and nuclear power in electricity production by 2030. This would also provide clean and affordable energy to the estimated 100 million people worldwide who, as a result of rise in poverty levels in 2020, would no longer be able to afford basic electricity services.¹³

In 2015, the IAEA General Conference recognized clear linkages between the SDGs and the IAEA’s work.¹⁴ However, the potential contribution of peaceful uses to the SDGs and climate change is still not widely recognized by the global community. This is largely due to a lack of awareness of the benefits of peaceful uses and the association of ‘nuclear’ with weapons of mass destruction and with accidents at nuclear power plants.

In 2018, at the IAEA Ministerial Conference on Nuclear Science and Technology: Addressing Current and Emerging Development Challenges, IAEA Director General Yukiya Amano called for the mainstreaming of peaceful nuclear technology at the highest level. He explained mainstreaming as raising public awareness about nuclear technology, incorporating it into national development plans, and stressing its importance to aid agencies and donors. He noted that awareness of the benefits of peaceful uses is limited to the scientists, engineers and doctors working in the field and that, as a result, the full potential of peaceful uses is not being realized.¹⁵

The first international meeting Rafael Grossi attended as the IAEA Director General was the UN Climate Change Conference (COP-25). There he promoted nuclear power as a source of low-carbon electricity to ensure the global transition to clean energy, including its use to back up variable renewable energy sources. He is also working with Member States to

12 Report of the Commission of Eminent Persons on the Future of the Agency, GOV/2008/22-GC(52)/INF/4, IAEA 2008.

13 World Energy Outlook 2020 – Analysis, IEA, 2020.

14 IAEA Conference Highlights Links with SDGs | News | SDG Knowledge Hub | IISD, 2015. Available at: <http://sdg.iisd.org/news/iaea-conference-highlights-links-with-sdgs/>

15 Amano calls for nuclear technology to go 'mainstream': Nuclear Policies - World Nuclear News (world-nuclear-news.org)

ensure that nuclear power is part of COP-26 and ultimately accepted as an important part of the climate change solution. Furthermore, he has undertaken to increase the visibility of the IAEA by better communicating the benefits of peaceful uses and to do more for developing countries. To increase funding for the IAEA's technical cooperation activities he intends to tap non-traditional sources of funding such as the private sector and regional development banks.¹⁶

There are those that would argue that the benefits of peaceful uses are widely known and need no further promotion. The 147 Member States receiving technical assistance from the IAEA that enables them to apply nuclear technology for the purpose of development, they would say, bear testament to this fact. However, the focus of the current DG and his predecessors on the need to raise awareness of peaceful uses and to expand its application in developing countries belies this assertion. Also, regional and national voices are calling for the promotion and expansion of peaceful uses, as this paper will illustrate. Indeed, the championing of peaceful uses is required at national, regional and international level if the potential of peaceful uses is to be realized.

Since early 2020, the COVID-19 pandemic has increased the urgency of finding innovative solutions to global development and climate challenges.¹⁷ However, within these challenges, the seeds of opportunity are buried as, now more than ever, achieving sustainable development and climate goals will require the kind of innovation that nuclear science and technology can provide. To this end, peaceful uses of nuclear energy must be promoted and expanded. The international community can no longer afford to discount their contribution to solving the challenges humanity faces.

3. Expanding Peaceful Uses: Challenges and Opportunities

Expanding the sustainable application of nuclear technology will require additional resources and support from the international community. To this end, it is crucial that policy makers and the public understand and embrace the contribution peaceful uses can make to achieving sustainable development and climate goals. It is also essential that nuclear technology and its related materials remain accessible to all countries.

Financing Activities

To ensure that peaceful uses can fulfil their potential of contributing meaningfully to sustainable development and to achieving climate goals, access to nuclear technology and its power and non-power applications will have to be expanded. The IAEA has the experience and expertise to transfer nuclear techniques to developing countries and to support the development of capacity for the application of nuclear technology in countries

16 Grossi sets out vision to 'recalibrate' the IAEA : Energy & Environment - World Nuclear News (world-nuclear-news.org)

17 The Secretary-General of the UN has called for coordinated, decisive, and innovative policy action to get the SDGs back on track see [sg_report_socio-economic_impact_of_covid19.pdf](#) (un.org)

that need it the most. The IAEA also supports countries in the safe, secure and sustainable application of this technology. It follows that efforts to expand access to peaceful uses must include the IAEA. To enable the IAEA to support the expansion of peaceful uses, funding for the IAEA will have to increase to enable it to keep pace with innovations in science and technology and to meet the needs of all its Member States, especially those of the middle- and low-income countries.

Regular Budget, Technical Cooperation Fund and Extrabudgetary Funds

The IAEA has been operating largely under the constraints of a zero real growth budget for several decades, which means the IAEA's budget cannot grow to match the increase in demand for its services. In 2019, the regular budget decreased in real terms. The IAEA carries out its work in two main areas: the regular programme and the technical cooperation (TC) programme. The regular budget consists of an operational and a capital component and comprises six major programmes (MPs).¹⁸ The IAEA's main sources of funding are the Regular Budget Fund and Extrabudgetary Programme Funds. These are mainly supplied by Member States and, in some cases, by other donors. Contributions to the extrabudgetary funds are voluntary.¹⁹

The TC programme is funded by the Technical Cooperation Fund (TCF), extrabudgetary contributions, government cost-sharing (funding where the recipient State also contributes to overall costs of the project) and in-kind contributions. The TCF is funded by annual voluntary contributions of Member States to their share of the TCF Target (established using UN assessment rates). The TCF Target is set by the IAEA Board of Governors following consultations with Member States. National participation costs (equivalent to 5% of the value of each national programme) also flow into the TCF. The TCF is used to implement national, regional and interregional technical cooperation projects proposed by IAEA Member States and approved by the IAEA Board of Governors. The management of the technical cooperation programme is funded through MP6 of the IAEA's regular budget.²⁰

The TC programme requires a two-year budget cycle to allow for the implementation of TC projects proposed, bi-annually, by countries in their Country Programme Notes, whereas the IAEA's regular budget runs on a one-year budget cycle.²¹ While the TCF is a voluntary fund, it is not an extrabudgetary fund. The contributions are not earmarked and do not have conditionalities attached to them as in the case of the extrabudgetary funds. Member States are strongly encouraged to contribute to the TCF and the overall attainment rate is estimated annually for planning purposes in the IAEA's programme and budget.

18 MP1 (Nuclear Power, Fuel Cycle and Nuclear Science); MP2 (Nuclear Techniques for Development and Environmental Protection); MP3 (Nuclear Safety and Security); MP4 Nuclear Verification); MP5 (Policy, Management and Administration Services); and MP6 (Management of Technical Cooperation for Development)

19 Budget | IAEA. Available at: <https://www.iaea.org/about/overview/budget>

20 Funding the programme | IAEA. Available at <https://www.iaea.org/topics/temporary/funding-the-programme>

21 Agency's Programme and Budget 2020-2021, GC(63)/2.

The two extrabudgetary funds that are relevant for the purpose of this paper are the Nuclear Security Fund (NSF), and the Peaceful Uses Initiative (PUI). Both these funds enable more flexibility than the regular budget and the TCF in that they can accommodate multi-year projects and funding is allocated to specific countries and projects.

The PUI was proposed by the delegation of the United States to the 2010 NPT Review Conference and was later established as a funding initiative to support IAEA projects on the peaceful uses of nuclear technology. As of 30 September 2020, 24 countries and the European Commission had donated through the PUI and provided €174 million in financial contributions. These contributions have supported over 300 projects benefitting more than 150 Member States.²² The funds for the TC programme and the regular budget are largely contributed through departments of energy or departments concerned with non-proliferation, such as defence and foreign affairs. Development assistance funding is not the source of funding for the TC programme and requires a funding mechanism that provides for larger, multi-year projects with more stringent monitoring and reporting than that of the TC programme.²³ Further explanation in this regard is provided later in the paper. The PUI also provides an opportunity for private sector funding of peaceful use projects. In 2017, funding to the PUI expanded to the private sector, and Shimadzu Corporation became the first company to contribute.²⁴

The IAEA's NSF was set up in 2002 and, according to the 2019 IAEA Annual Report, has 19 national donors.²⁵ At the conclusion of the IAEA's International Conference on Nuclear Security (ICONS): Sustaining and Strengthening Efforts in February 2020, countries confirmed a total of more than US \$20 million to the NSF.²⁶ In 2017, financial pledges to the NSF amounted to €44.1 million from 16 Member States and the European Commission. Extrabudgetary spending that year for nuclear security, mostly from the NSF, was approximately €26.5 million, meaning that the NSF is not being depleted and continues to grow.

These figures were taken from a 2019 paper by Trevor Findlay on the IAEA's role in nuclear security since 2016. He notes that Member State contributions to the NSF have grown annually since 2016, indicating strong support for the IAEA's nuclear security mandate. He argues that funding the nuclear security activities of the IAEA from an extrabudgetary fund is not a healthy practice and more of these activities should be funded from the regular budget. This is also the position of NSF donors. Furthermore, he argues that the NSF creates 'donor' and 'recipient' classes, which does not encourage long-term ownership of the nuclear security challenge and the sustainability of efforts to deal with them²⁷.

22 Ten Years of the IAEA Peaceful Uses Initiative | IAEA. Available at: <https://www.iaea.org/10-years-pui/ten-years-of-the-iaea-peaceful-uses-initiative>

23 Information provided by diplomats from donor countries

24 Ten Years of the IAEA Peaceful Uses Initiative | IAEA

25 IAEA Annual Report, IAEA, 2019

26 Countries to Provide US\$ 20 million to IAEA Nuclear Security Fund | IAEA. Available at: <https://www.iaea.org/newscenter/news/countries-to-provide-us-20-million-to-iaea-nuclear-security-fund>

27 The IAEA's role in Nuclear Security since 2016 by Trevor Findlay, February 2019. Available at: <https://www.belfercenter.org/publication/iaeas-role-nuclear-security-2016>

The NSF donors are concerned with their own ability to continue to provide extrabudgetary funding for nuclear security, citing donor fatigue as a potential risk. The IAEA Division for Nuclear Security and donors alike are concerned by the IAEA's ability to plan as the regular budget allocation for nuclear security is largely devoted to the management of the Division while its activities are funded exclusively by the NSF. The Division for Nuclear Security also complains that the funding from the NSF stipulates conditionalities which further complicate planning.

The G77 contends that funding nuclear security activities from the regular budget will reduce funding available for the promotional activities of the IAEA.²⁸ These concerns are reflected in the statements of the G77 to the IAEA Board of Governors going back to 2002 when the Board took the decision, after the September 2001 attacks on the United States, to expand its activities in support of physical protection of nuclear facilities and nuclear material to include the broader issues of nuclear security. As there is little prospect for the budget to grow in real terms, these concerns are well founded. Another question to consider is whether NSF donors would continue to fund the nuclear security activities of the IAEA at the same level if they are unable to earmark their contributions, which would be the case if these activities were funded through the regular budget.

At this point it would be easy to assume that there is little difference between the TCF and the NSF and that they should both be treated in the same way. It is, however, important to keep in mind that the IAEA's technical cooperation activities are its main statutory vehicles for transferring nuclear technology to developing countries for their socioeconomic development. The primary reason developing countries become members of the IAEA is to benefit from peaceful uses. Furthermore, it can be argued that nuclear security is not a statutory function of the IAEA. The G77 adopted this position in September 2009 in their statement to the Board of Governors included in their comments on the Nuclear Security Plan 2010–2013: "Nuclear security is not a core statutory function of the IAEA ... therefore, the Group believes that it is fully justifiable for the activities undertaken in the area of nuclear security to continue to be financed through voluntary and extrabudgetary resources."²⁹ The G77 abandoned this position several years later but still maintain the position regarding the funding of nuclear security activities.

It is interesting to note that the G77's position on the statutory nature of nuclear security was adopted in the wake of the 2007–2008 financial crises and corresponded with attempts by NSF donors to increase the funding for nuclear security from the regular budget. The G77 maintained this position until it was agreed that the Nuclear Security Summit process would be replaced by regular IAEA ministerial level conferences on nuclear security now known as the ICONS.³⁰ The point was that conflict between Member States over the

28 Promotional activities are those resorting under Major Programme (MP)1 (Nuclear Power, Fuel Cycle and Nuclear Science; MP2 (Nuclear Techniques for Development and Environmental Protection); and MP6 (Management of Technical Cooperation for Development).

29 Statement of the Group of 77 and China during the IAEA Board of Governors starting 7 September 2009. Available at: https://www.g77.org/vienna/wp-content/uploads/2019/03/IAEA_MattersBoard-of-Governors-Meeting-7-11-September-2009.pdf

30 The author participated in the G77 meeting when the decision was made to remove the reference to the statutory nature of nuclear security from G77 statements given that countries like South Africa, Egypt and Brazil had argued for replacing the exclusive NSS process with inclusive high-level deliberations on nuclear security under the auspices of the IAEA

budget can entrench positions on priorities and create greater divergence between these priorities, as has been the case repeatedly with peaceful uses and nuclear security.

The G77 also consistently calls for the TCF to be made sufficient, secure and predictable in view of the fact that it is drawn from voluntary contributions. However, the TCF is more predictable for planning purposes than the NSF given that the Board of Governors recommends an annual target for voluntary contributions to the TCF, and all Member States know what contribution is expected of them. Moreover, a key reason for not including the TCF in the regular budget is that the TC programme requires a two-year budget cycle to allow for the implementation of TC projects proposed by countries in their Country Programme Notes³¹.

Zero-Sum Game

That the allocation of scarce resources to divergent priorities can become a contentious issue between Member States of international organizations is a well-known fact. Within the context of the IAEA the ‘battle lines’ are drawn between promotional (TC, nuclear power and nuclear applications) and non-promotional (safeguards, security and safety) activities of the IAEA. In the wake of the 2007–2008 financial crisis when the strain on national budgets was reflected in the budget negotiations in 2009, the IAEA Director-General, Mohamed ElBaradei, made an emotional appeal to Member States in the June Board to accept his budget proposal, which he characterized as “credible instead of realistic.” He asked Member States to consider their needs and what it would cost to allow the IAEA to meet all of these needs, not only those related to safeguards, security and safety but also to fighting poverty. He said that “aside from being a statutory function, fighting poverty is absolutely at the heart of our security system.”³² In this appeal he echoed the concern of developing countries that budget negotiation was a zero-sum game.

NSF donors, when attempting to allay concerns that peaceful uses and nuclear security are a zero-sum game, often argue that funding for nuclear security and peaceful use activities are likely to come from different funding parcels in their governments (i.e. different parcels from within the departments that are mandated to fund the activities of the IAEA). However, funding nuclear security activities through the regular budget of the IAEA would require either an increase in contributions from all its Member States or a division of the existing budget between more priorities. Neither of these options are feasible. Most developing countries would find it challenging to increase their contribution to the regular budget, as would many developed countries — that zero real growth has been a characteristic of the IAEA’s budget for many years bears witness to this fact. Moreover, the process of reaching consensus on dividing the budget would be extremely divisive, sending Member States back to their respective corners to defend their priority areas.³³

31 The TC programme cycle | IAEA. Available at: <https://www.iaea.org/services/technical-cooperation-programme/cycle>

32 The Director General’s Intervention on Budget at the IAEA Board of Governors, June 2009. Available at: <https://www.iaea.org/newscenter/statements/director-generals-intervention-budget-iaea-board-governors>

Given the above, it could be concluded that extrabudgetary funds such as the PUI and the NSF provide the best vehicle for increasing funding to the IAEA and that attempting to fund the growing needs of Member States from the regular budget would be unrealistic. Finally, it is likely that a global financial crisis precipitated by the COVID-19 pandemic will reduce the access of developing countries to peaceful uses and increase divisions between Member States. Increasing funding for peaceful uses is, therefore, essential to meeting global development and climate challenges, and also to maintaining the critical balance between development, security and non-proliferation.

Recommendations for Task Force consideration:

- Highlight the importance of extrabudgetary funds as a vehicle for increasing funding to the IAEA's peaceful uses and nuclear security activities.
- Contributions to both these funds should be maintained and increased in order to expand access to peaceful uses.

Reframing Peaceful Uses within SDG Context

Increasing funding for peaceful uses requires changing the way the public and policy makers view nuclear technology. Promoting the benefits of peaceful uses within the context of the SDGs and climate goals could contribute significantly to changing perceptions of nuclear technology.

Championing Peaceful Uses

In February 2020, a workshop was convened in South Africa by Wilton Park³⁴ in association with the African Commission for Nuclear Energy (AFCON) and the Government of Canada, on Support of Africa's Agenda 2063: Pathways Forward for Expanding Peaceful Uses of Nuclear Energy and Nuclear Technology in Africa. African and international experts identified challenges to expanding peaceful uses in Africa and made recommendations to address these challenges. The agriculture, health, energy and environment experts identified the lack of awareness among African policy makers and their international counterparts of the benefits of peaceful uses as a significant obstacle to expanding peaceful uses in Africa. Another challenge identified by experts was the lack of integration of peaceful uses into national development agendas and policy frameworks. One of their key recommendations

33 In the experience of the author, the countries of the G77 are committed to the safe, secure and safeguarded use of nuclear material and technology and the WEOG countries value technical cooperation activities. The divergence of their priorities is an expression of the national priorities of the countries: whereas development challenges such as hunger, poverty and disease present a more immediate threat to developing countries, the immediate concerns of developed countries are the potential security and proliferation risks associated with nuclear technology and the related nuclear material.

34 As a part of the UK's Foreign, Commonwealth and Development Office (FCDO), we support British foreign policy priorities and are core to the UK's public diplomacy work.

for overcoming these challenges was that the contribution of peaceful uses to the SDGs be championed at the national, regional and international level.³⁵

In many developing countries, politicians and decision-makers have limited knowledge and understanding of the benefits of nuclear science and technology other than those of electricity generation. This is particularly true in countries that do not have nuclear power plants or research reactors. As a result, nuclear technology is often not included in policy frameworks, which can reduce the impact of peaceful use projects in these countries and encumber the development of nuclear regulatory infrastructure.³⁶

Nuclear accidents at power stations and concerns related to nuclear waste management and the long-term impact of this waste for future generations has made the public weary if not resistant to nuclear power applications. Concerted efforts to build public confidence in the safety of nuclear power are required. Promoting nuclear power as a source of low-carbon electricity to ensure the global transition to clean energy, including its use to back up variable renewable energy sources, could also contribute to making the public more amenable to nuclear power.

Recommendations for Task Force consideration:

- Consider ways in which IAEA Member States could mainstream peaceful uses in their national development plans and regional development agendas. Mechanisms to consider at a national level could include intragovernmental committees on peaceful uses for cross-sector engagement and information sharing to identify areas where peaceful uses could contribute to development. On a regional level, intergovernmental cooperation on peaceful uses could be considered. The Task Force could identify countries and regions where cross-sector cooperation and intragovernmental cooperation has been successful and identify ways in which to share such experience with other Member States.
- Recommend that the IAEA, governments, industry, NGOs and regional organizations highlight success stories of how the safe and secure use of nuclear technology and nuclear power for peaceful purposes has improved lives and contributed to the protection of the environment. To increase public confidence especially in nuclear power, governments and industry should provide more information to the public on efforts made to secure facilities and material.³⁷
- Suggest how and where the above-mentioned stakeholders could promote nuclear power as a source of low-carbon electricity to ensure the global transition to clean energy, including its use to back up variable renewable energy sources. An energy mix of renewables and nuclear power as a source of clean and affordable energy for all should also be promoted in line with the recommendations of the IEA World Energy Outlook, 2020.

35 In Support of Africa's Agenda 2063: Pathways Forward for Expanding Peaceful Uses of Nuclear Energy and Nuclear Technology in Africa. Wilton Park. 2020 . Available at: <https://www.wiltonpark.org.uk/wp-content/uploads/2020/09/WP1763-Report.pdf>

36 ibid

37 This was one of the recommendations from the Wilton Park meeting on The interface between nuclear security and peaceful uses of nuclear technology – how to achieve mutual reinforcement?, attended by government, NGO and industry representatives in 2019. The report is available at: <https://www.wiltonpark.org.uk/wp-content/uploads/2020/09/WP1687-Report.pdf>

Unlocking Non-Traditional Sources of Funding to Expand Peaceful Uses

Upon his appointment as Director General of the IAEA, Rafael Grossi noted that the needs of developing countries continued to grow and, as it was unrealistic to expect a significant increase in the budget of the IAEA in the coming years, he undertook to seek new and innovative sources of funding for the IAEA, which would require developing new partnerships.³⁸

The regular budget of the IAEA and the TCF are funded largely through national departments of energy, defence or foreign affairs as cooperation on peaceful uses fall within the remit of power production, non-proliferation and national security. This has a significant impact on the access to and sustainable use of nuclear technology. In developed countries, donor agencies fail to include nuclear technology in development assistance projects. In developing countries, as mentioned earlier, governments fail to integrate peaceful uses into their national development agendas and policy frameworks. In most countries there is often little awareness of the benefits of peaceful uses outside the implementing agencies mandated to engage with the IAEA.³⁹

Reframing peaceful uses within the context of SDGs and championing their benefits nationally, regionally and globally could result in peaceful uses being mainstreamed in national development plans and in the unlocking of non-traditional sources of funding, such as those earmarked for official development assistance (ODA)⁴⁰.

In a recent workshop on peaceful uses and nuclear security organized by the VCDNP,⁴¹ IAEA Member State representatives' discussions included the potential of increasing funding for the IAEA budget. It was noted that to access these funds, peaceful uses would have to be integrated into international development efforts. It was agreed that this would require more awareness of the benefits of peaceful uses in the development cooperation community and a diversification of IAEA partnerships within that community. A significant barrier in this regard was identified as being an instinctive dismissal of funding for nuclear related activities by communities managing large ODA budgets as the nuclear field is not well understood by these communities. Another barrier identified was that ODA processes do not lend themselves to funding smaller, short-term projects under the IAEA's TC programme. It was noted that extrabudgetary funds such as the PUI could, however, be used as a vehicle for such large-scale, multi-year projects.

38 Director General Designates Statement to Second Special Session of the IAEA General Conference | IAEA Available at: <https://www.iaea.org/newscenter/statements/director-general-designates-statement-to-second-special-session-of-the-iaea-general-conference>

39 Discussions with diplomats and technical experts in WEOG and G77 countries

40 ODA is defined by the OECD Development Assistance Committee (DAC) as government aid that promotes and specifically targets the economic development and welfare of developing countries. The DAC adopted ODA as the 'gold standard' of foreign aid in 1969 and it remains the main source of financing for development aid.

41 The Current Landscape of Peaceful Uses and Nuclear Security – Vienna Center for Disarmament and Non Proliferation VCDNP, December 2020. Available at: <https://vcdnp.org/the-current-landscape-of-peaceful-uses-and-nuclear-security/>

To overcome these barriers, it was recommended that Member States and the Agency raise awareness in the development community about the benefits of peaceful uses. Large-scale projects such as the IAEA's Zoonotic Disease Integrated Action (ZODIAC) initiative and PACT can raise the visibility of peaceful uses at the international level and change public perception about nuclear technology and the role of the IAEA as more than a nuclear watchdog.

Additional initiatives similar to PACT and ZODIAC should be pursued by the IAEA and its Member States. Large scale regional projects that expand the application of nuclear technology to improve agriculture development, and water and environment management to contribute to ending hunger and poverty should be developed by Member States and be promoted by the IAEA.

Rafael Grossi, president-designate of the 2020 10th NPT Review Conference, initiated a series of regional consultations on the NPT at the end of 2019 to mobilize support towards a successful conference outcome by highlighting the contribution made by the NPT to enabling access to peaceful uses. The Foreign and Commonwealth Office (FCO) of the United Kingdom, the United States State Department, the European Union, and Global Affairs Canada contributed to the ongoing process. Consideration was given to launching an initiative at the Review Conference linked to the NPT to support peaceful uses, especially to least developed countries (LDCs). The benefit of such an initiative could be to raise the profile of peaceful uses and mobilize more non-proliferation and non-traditional funds for peaceful uses in the spirit of strengthening pillar III (peaceful uses of nuclear energy) of the NPT.

Recommendations for Task Force consideration:

- Identify ways in which the IAEA can take the conversation on peaceful uses and the SDGs to the development community, including national development agencies and international organizations such as the United Nations Development Programme (UNDP), the Organisation for Economic Co-operation and Development (OECD) and development banks.
- Recommend the launching of a regional peaceful uses initiative at the 10th NPT Review Conference. As was the case with the PUI, launched by the United States at the 2010 Review Conference, it can be established after the 2022 Review Conference as a funding initiative to support IAEA projects on peaceful uses. As the majority of LDCs are in Africa, an African Fund could be considered, linking the areas of support with the SDGs and regional development goals:
 - Food and agriculture (SDG 1 & 2): To include food safety, water-, environment- and soil management and conservation, with emphasis on an integrated approach towards food security.
 - Health (SDG3): Focusing on cancer management and providing for an integrated approach on diagnosis, treatment and training.
 - Human capital development (SDG4 & 8): To build regulatory, scientific, technical, and other capacities and expertise.

While these regional consultations are useful to focus on needs and challenges related to peaceful uses, a focus on pillar III issues tends to be seen by the NAM as a diversion from the lack of progress on other pillars. NAM States argue that there has been good progress on peaceful uses and views a focus on pillar III issues as an attempt to mask the lack of progress on disarmament, in particular. While it is true that this pillar traditionally

enjoys the most consensus in the NPT, lack of progress on disarmament does not preclude meaningful progress on peaceful uses. Consideration by the Task Force on how to approach peaceful uses within the context of the NPT without it becoming prey to disagreement on disarmament could prove valuable.

Questions for Task Force consideration:

- Would raising the profile of peaceful uses at the NPT Review Conference contribute to reframing peaceful uses within the context of the SDGs or would this serve only to highlight the non-proliferation aspects of nuclear technology?
- Does the NPT Review Conference provide an opportunity to promote the benefits of peaceful uses to the broader non-proliferation community and to policy makers? Could this opportunity contribute to ultimately mainstreaming nuclear technology into national policy and development frameworks? If so, how can the most be made of this opportunity by NAM and donor States.
- How can States Parties approach peaceful uses within the context of the NPT without it becoming prey to disagreement on disarmament?

Ensuring Access to Technologies for Peaceful Application

To ensure the contribution of peaceful uses to the SDGs and to maintain the balance between development, nuclear security and non-proliferation, it is essential that all countries have access to nuclear technology and its peaceful applications.

Promise of Small Modular Reactors to Expand Access to Nuclear Power

Reliable access to electricity is a precondition to sustainable development. There are 32 countries with nuclear power plants in the world today and approximately 30 that are interested in or embarking on nuclear power. Given the financial and human resources required for traditional large-scale nuclear power plants, it is unlikely that the majority of these countries will be able to embark on nuclear power with large nuclear power plants. For these countries, SMRs and advanced reactors could provide a viable alternative.⁴² Experts generally agree that if SMRs live up to their promise, this technology will offer the potential to address fuel cycle and proliferation concerns, have inherent passive safety features and provide lower-cost production and operational flexibility.⁴³

From a security point of view, SMRs offer the potential to limit the risk of facility sabotage or attack and resulting radiation release concerns, as they are designed with characteristics that reduce the risk of dispersal of radioactivity. In terms of safeguards, the question is how can such reactors be safeguarded and at what cost? The general consensus is that

42 In Support of Africa's Agenda 2063: Pathways Forward for Expanding Peaceful Uses of Nuclear Energy and Nuclear Technology in Africa. Wilton Park. 2020 Available at: <https://www.wiltonpark.org.uk/wp-content/uploads/2020/09/WP1763-Report.pdf>

43 Advancing Nuclear Innovation: A report by the Global Nexus Initiative, 2019. Available at: http://globalnexusinitiative.org/wp-content/uploads/2019/05/PGS_ThoughtLeadership_Report_052419_FINAL_Pages.pdf

the IAEA will need to consider how best to accommodate the unique characteristics of SMRs (and other advanced reactor designs) for safeguards purposes.⁴⁴

The IEA in its 2020 report on the world energy outlook highlights SMRs as one of the technology innovations that would be needed to reach net zero globally by 2050 noting that “no part of the energy economy can lag behind, as it is unlikely that any other part would be able to move at an even faster rate to make up the difference”.⁴⁵

As SMR technology is as yet unproven, these discussions remain speculative. It is, therefore, important that the challenges related to safeguards, security and export controls for this technology be considered and recommendations be made that will assist in preventing undue limitation of access to this technology.

Ensuring Continued Access to Nuclear Technology for Non-Power Applications.

Radioactive sources have been the mainstay of nuclear applications for the past 60 years. Hardy, easy-to-maintain and inexpensive-to-use gamma sources containing cobalt-60 or caesium-137 isotopes are still in use in hospitals, research institutions and industries worldwide. Cobalt-60 and caesium-137 isotopes lose half of their radioactivity in 5 and 30 years respectively and could cause death, injury and wide-spread panic if used in a dirty bomb or left exposed in a public place. The security concerns related to the potential misuse of these sources by terrorists has seen a drive to replace them with non-isotopic alternative technology. Costs related to the protection, secure storage and end-of-life management of these sources are also factored into the decision to replace radioactive sources with alternative technology.

End users, nuclear experts and diplomats generally agree that both radioactive sources and alternative technology should be available and that countries should be able to choose the best option according to their needs.⁴⁶

Challenges Related to Continued Access of Radioactive Sources

After the 2001 terror attacks on the United States, concern that radioactive material and sources could be used for malicious purposes resulted in a global trend towards increased control, accounting and security of radioactive sources.⁴⁷ This concern and related measures resulted inadvertently in denial and delay of radioactive shipments, affecting the delivery of radioactive material and medical isotopes used in lifesaving applications for cancer diagnosis and treatment.

44 Ibid.

45 IEA World Energy Outlook 2020. Available at: <https://www.iea.org/reports/world-energy-outlook-2020>

46 Various panel discussions on peaceful uses and nuclear security have touched upon these issues as have workshops held at Wilton Park and the World Institute for Nuclear Security.

47 Security of Radioactive Sources, IAEA nuclear security series 11. Available at: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1387_web.pdf

Measures were taken by the IAEA and the International Maritime Organization to mitigate the crisis by 2013 when certain airlines committed to continuing transport of radioisotopes.⁴⁸ Lack of harmonization of transport regulations between countries, and perceptions by some carriers, seaports and airports of possible radioactive hazards rather than actual safety and security concerns, were identified by the IAEA as reasons for this crisis.⁴⁹

At a recent IAEA meeting on denial and delay of shipments of radioactive material the International Irradiation Association warned that, regardless of industry's compliance with national regulatory requirements and good transportation practices, fewer shipping companies would be willing to take the risk of transporting radioactive cargo. According to Paul Hinrichsen,⁵⁰ chair of the IAEA Transport Safety Standards Committee (TRANSCC), shipments of radioactive cargo are denied entry into ports for a number of reasons which include the mislabelling of cargo by packers; lack of knowledge of port officials about requirements for radioactive cargo; and national regulatory authorities requiring that shipping companies transporting radioactive material apply for permits for nuclear powered vessels.

As a result of these challenges, the transportation of radioactive cargo has become increasingly expensive. Valeriia Starovoitova,⁵¹ a radiation technology coordination officer at the IAEA, noted that medium-sized irradiation facilities in countries that did not produce their own gamma sources had recently approached the IAEA for support in replenishing their cobalt-60 sources, as the cost of these sources had become prohibitive and their availability limited. There are real concerns that radioactive sources may not be available to countries needing them in future.

Promise of Alternative Technology

Alternative non-isotopic technology that uses electricity to produce radiation has fewer security concerns than gamma technology and offers the same, if not superior, outcomes could ensure continued access to nuclear applications by developing countries. However, there are many challenges related to alternative technology that are not always taken into account when regulators and hospitals in developing countries replace cobalt-60 teletherapy machines with LINACs out of concern for the security risks related to cobalt-60.

A United States Department of Homeland Security multi-stakeholder report⁵² on the status of the development and voluntary adoption of technology with the potential to effectively replace risk-significant radioactive sources integral to industrial, medical, and research applications, succinctly explains these challenges. The most advanced and commercially viable alternatives to gamma technology are X-rays or electron beam radiation. Blood irradiators that use caesium-137 are being successfully replaced by X-ray

48 7th International Steering Committee on the Denial of Shipment of Radioactive Material Report. IAEA TM-42739, 2012.

49 IAEA Director General's Addresses the Board of Governors, May 2011. <http://vienna.io.gov.hu/iaea-director-general-addresses-board-of-governors>.

50 2020 Interview with Mr. Hinrichsen

51 2020 interview with Ms. Starovoitova

52 Non-Radioisotopic Alternative Technologies White Paper, US Department of Homeland Security 2019,. Available at: <https://armscontrolcenter.org/wp-content/uploads/2019/10/Non-Radioisotopic-Alternative-Technologies-White-Paper1491.pdf>

technology worldwide, but alternative technology applications for cancer treatment have a more complicated history. Medical linear accelerators (LINACs) use electricity to produce radiation but were designed for developed countries where reliable electricity and the expertise to maintain and operate these high-tech machines are in abundance. Although the LINAC delivers more precision treatment for cancer than cobalt-60 teletherapy, the technology has yet to be adequately adapted for developing country conditions. Cobalt-60 teletherapy machines are durable, easy to use, inexpensive to run, light on electricity and require minimal maintenance.⁵³ According to this report, the availability of alternative technology is limited in other nuclear applications such as insect sterilization and plant mutation breeding.

The FAO/IAEA Joint Division has played a central role in developing these applications and making them available to developing countries. The IAEA could play an important role in advancing research in the use of alternative technology. Some work has been done in this regard by the IAEA Plant Breeding and Genetics Laboratory. Cognizant of the challenges related to the transport and use of radioactive sources, the laboratory embarked on a series of investigations in 2016 aimed at optimizing X-rays for plant mutation breeding. The findings were published in a handbook at that time, which has recently been submitted to the FAO for publishing and it is hoped that the publication will ultimately find traction with the Member States of the IAEA and the FAO.⁵⁴

Recommendations for Task Force consideration:

- Make recommendations that would raise awareness at the level of regulators and national policy makers about challenges faced by shipping companies and the impact of the potential unavailability of radioactive sources for the health, agriculture and industrial sectors especially in developing countries and that would encourage them to: 1) Harmonize transport regulations between countries and improve national transport regulations to facilitate the transport of radioactive cargo; and 2) promote a better understanding of the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6 Rev.1.) among all stakeholders. The recommendations could include the revival of the IAEA Steering Committee on Denial of Shipment or a similar multi-stakeholder committee under the auspices of the IAEA.
- Make recommendations regarding the role and responsibility of the IAEA to conduct research into the development of non-isotopic alternatives that could be applied successfully as a routine technology in developing countries.
- Highlight the importance of SMR technology for development and to achieving climate goals. Consider and make recommendations as appropriate on the approach of industry and the IAEA to this technology to ensure that the technology lives up to its promise and can be accessed by developing countries.

53 A study supported by the IAEA, available at <http://globalrt.org/wp-content/uploads/2014/09/der-Giessen-et-al-green-journal-2004-multinational-costing-RT.pdf> compared the teletherapy delivery costs between cobalt-60 teletherapy machines and LINACs, in the field, in disparate countries from all regions and levels of development. The study measured factors such as cost of electricity, quality assurance, maintenance and machine downtime. The study found that the cost of delivering teletherapy by a LINAC was 50% more expensive than by a cobalt-60 teletherapy machine. Electricity costs for a LINAC were 11 times more; and downtime 14 times more than a cobalt-60 machine.

54 Interview with Ivan Engelbrecht Head of the Plant Breeding and Genetics Laboratory of the FAO/IAEA Joint Division, IAEA.

Confirming Approach to Peaceful Uses

To date, the approach to peaceful uses has been shaped by safety, security and non-proliferation concerns. The result was the establishment of an international legal framework that covers non-proliferation, security and safety. Concomitantly, over the course of the past 20 years, there has been an increasing inclination to reduce the use of nuclear and radioactive material, especially for medical purposes.⁵⁵ While recognizing the potential contribution to development of advanced nuclear technology and applications, there are growing concerns that certain technology holders will seek to unduly limit access by developing countries to SMRs and advanced technology by including conditions for supply and requirements that go beyond those already established by the Nuclear Suppliers Group and the IAEA.

Many developing countries feel overwhelmed by continually evolving nuclear security measures that do not match their risk profile or their level of nuclear activities. At this juncture, a more predictable and sustainable approach to peaceful uses is needed. Broad-based trust and acceptance is required by the international community that a) the non-proliferation architecture developed over the past 50 years and b) the international framework for nuclear security that has been established under the auspices of the IAEA over the past 20 years, will remain the foundation for all peaceful nuclear cooperation.

Recommendation for Task Force consideration:

- Identify the building blocks of non-proliferation and nuclear security that, when fulfilled, would engender the trust of the international community that existing non-proliferation and nuclear security requirements have been effectively implemented. In other words what kind of evidence (building blocks within the current non-proliferation regime) would be necessary to demonstrate credibility from a non-proliferation point of view when considering access to technology such as that for SMRs?; and how can States establish their nuclear security credentials?
- Identify ways to obtain broad recognition by the non-proliferation and nuclear security communities (governments and NGOs) that these building blocks create the foundation for a predictable and sustainable regime to underpin the expansion of peaceful uses.
- Recommend messaging to these communities, and internationally, that will promote the expansion of peaceful uses of nuclear technology and its application for the achievement of the sustainable development and climate goals.
- Promote the full implementation of the nuclear security architecture and the universalisation of various instruments such as the Convention on the Physical Protection of Nuclear Material and its amendment.

53 UNSCEAR booklet: Radiation: Effects and Sources p. 33 Available at: <https://www.unscear.org/unscear/en/publications/booklet.html>

4. Conclusion

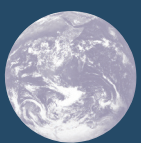
Meeting sustainable development and climate goals will require that more countries have access to nuclear technology and its peaceful applications and that these are applied safely, securely and sustainably. To this end, policy makers must recognize their importance and mainstream them in their national development plans and regional development agendas and also champion their benefits regionally and internationally.

Concomitantly, all Member States must make every effort to fully implement the safety and security requirements and guidance developed by the IAEA and remain in full compliance with their safeguards obligations. All technology holders should trust the established international legal framework for nuclear safety, security and safeguards and ensure access to technology and material as provided for within this framework.

Expanding access to peaceful uses will contribute to establishing and maintaining a balance between development, security and non-proliferation. Global peace and security relies on this critical balance.



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