Chapter 11

Safeguards for the Future

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Abstract Safeguards have evolved as a result of new circumstances, institutions, technologies and practices, including cultural phenomena. This chapter examines safeguards from a historical perspective as the product of a political process that resulted in the negotiation of safeguards instruments. In particular, the chapter addresses the IAEA safeguards from the perspective that adaptation of the legal framework for safeguards is necessary and often difficult. Major change will only occur through a political process, not a legal one, involving Member States of the IAEA. The change will be facilitated through the IAEA Secretariat's role in strengthening safeguards implementation using the power and responsibilities afforded to it; the advancement of technology and techniques as a vital element of this process; and the non-technological aspects of safeguards, particularly the human element.

Keywords Treaty on the Non-Proliferation of Nuclear Weapons (NPT) • IAEA safeguards system • IAEA statute • Comprehensive safeguards agreements • Small quantities protocol • Additional protocol • Safeguards training

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11.1 Introduction

The nuclear safeguards system operated by the International Atomic Energy Agency (IAEA) counts as one of the crowning achievements of international law. Designed to deter through early detection the diversion of nuclear materials from peaceful to military purposes, nuclear safeguards are an unprecedented attempt to prevent the proliferation of nuclear weapons to States which do not have them. With its safeguards system the IAEA has pioneered intrusive international on-site inspection, monitoring and reporting that have since been replicated in other fields.

Safeguards are, naturally, the product of a political process that results in the negotiation of treaty law, with all the imperfections that compromises, creative ambiguity and material constraints produce. Nuclear safeguards also suffer, like most legal arrangements, from the passage of time. New circumstances, institutions, technologies and practices, including cultural phenomena, arise that were not foreseen. Adaptation is necessary and often difficult. This chapter examines IAEA nuclear safeguards from this perspective, bearing in mind that major change will only occur through a political process, not a legal one, involving Member States of the IAEA. In the meantime, the IAEA Secretariat can and should strengthen safeguards implementation using the complete range of power and responsibilities afforded to it. While the advancement of technology and techniques is a vital element of this process, this chapter focuses on the non-technological aspects of safeguards, particularly the human element.

11.2 The Current Status of IAEA Safeguards

Nuclear safeguards are based on two primary international legal foundations, the 1957 IAEA Statute and the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT).¹ The Statute mandates the IAEA to “establish and administer safeguards designed to ensure that fissionable and other materials, services, equipment, facilities, and information” are not used “to further any military purpose”.² Safeguards may be applied either to the IAEA’s materials and activities or to bilateral or multilateral arrangements at the request of the parties. Pursuant to Article III of the NPT, IAEA Member States agreed to a system of mandatory, legally binding, comprehensive safeguards agreements (CSAs) applicable to non-nuclear weapon States (NNWSs) that are party to the treaty.³ Prior to the NPT, only item specific safeguards had been applied, voluntarily, to discrete amounts of nuclear material or facilities.⁴ CSAs would now cover all of a State’s declared nuclear material and facilities. To help

¹IAEA 1989; Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature 1 July 1968, entered into force 5 March 1970 (NPT).

²IAEA 1989, Article III.5.

³IAEA 1972.

⁴IAEA 1965 (as provisionally extended in 1966 and 1968).

assuage concerns that nuclear weapon States (NWSs) party to the NPT would not be subject to any constraints on their peaceful nuclear industries, voluntary offer agreements (VOAs) were negotiated that impose limited safeguards on each of them.⁵ In addition, a series of regional nuclear-weapon-free zone treaties has been negotiated which oblige States Parties to adopt IAEA nuclear safeguards. For NNWSs with no or little nuclear material, a small quantities protocol (SQP) to CSAs was adopted in 1971, allowing them to indefinitely suspend most of their safeguards obligations.⁶

The discovery in 1991 of Iraq's violation of its safeguards agreement and the NPT—an undeclared nuclear establishment had been built parallel to its declared one—resulted in a 'revolution' in IAEA safeguards that is still playing out today. It led the IAEA to reform the system through two legal processes: identifying and utilizing legal authorities that it already possessed, but which remained underutilized; and negotiating a voluntary addendum to CSAs that came to be known as the Additional Protocol (AP).⁷ The AP, which States began adopting in 1997, obliges them to provide greatly expanded information on their nuclear activities and holdings. It also gives the IAEA greater data gathering and inspection powers, notably complementary access to locations of concern.

11.3 The Quest for Universality

From a legal perspective one of the continuing challenges is to induce all NNWSs parties to the NPT to bring a CSA into force. None of the current holdouts have known nuclear capabilities or ambitions and, except for Somalia, are small developing countries.⁸ But they remain non-compliant with the NPT. Many States with little or no nuclear activity, while acquiring a CSA, also adopted an SQP, which holds in abeyance most of the reporting and verification requirements of the CSA. This is now regarded as little better than having no CSA at all.

In 2005, an amended SQP was introduced that increases the number of safeguards obligations that an SQP State is obliged to fulfil, even if it has not yet acquired significant nuclear capabilities.⁹ This includes regular reporting, early notification of the intention to build a nuclear facility (rather than 180 days of notice before nuclear material is introduced into a facility) and the possibility of ad hoc and special inspections. The new SQP is a significant closing of a legal lacuna, since under the old agreement quite advanced States could avoid safeguards until they were well on the way to acquiring large amounts of nuclear material and had built a nuclear facility. SQP States have increasingly adopted the new version. But among the 31 still holding

⁵<https://www.iaea.org/topics/safeguards-legal-framework/more-on-safeguards-agreements>. Accessed 30 September 2021.

⁶Ibid.

⁷IAEA 1997.

⁸IAEA 2021a.

⁹IAEA 2006.

out are the not inconsequential States of Kyrgyzstan, Mongolia, Myanmar, Namibia, Saudi Arabia, Sierra Leone, Suriname and Zambia.¹⁰ IAEA Director General Rafael Mariano Grossi wrote to all 31 States in September 2020 asking them to adopt an amended SQP and warning that the IAEA's ability to draw a credible and soundly based annual safeguards conclusion for those States was becoming "increasingly challenging".¹¹ So far Maldives and Sudan are the only two to have heeded his call.¹² But in addition, three States, Lithuania, the Syrian Arab Republic and the United Arab Emirates, have indicated they wish to rescind their SQPs altogether.

An even more daunting challenge is achieving universality of the AP. There has been a continuous slow uptake of APs since 1997, with 137 States, plus EURATOM, with an AP in force. Yet almost a quarter of a century after it was inaugurated and despite talk of the AP becoming the safeguards 'gold standard', there are still several significant outliers, with either existing nuclear infrastructure (Argentina, Brazil, Democratic People's Republic of Korea (DPRK) and the Syrian Arab Republic) or plans to acquire it (Egypt, Malaysia and Saudi Arabia).¹³ The Islamic Republic of Iran is a special case, having agreed voluntarily to implement its AP without formally adopting it (although currently not fully complying with all aspects).¹⁴ Argentina and Brazil, which have a bilateral safeguards arrangement and a dedicated verification body, the Argentine–Brazil Agency for Accountancy and Control (ABACC),¹⁵ plead special circumstances. But this does not relieve them of their obligation as responsible members of the international community to lead by example.

An action plan to persuade more States to assume their safeguards obligations was adopted by the Secretariat in 2001 and has been periodically renewed, most recently in 2018.¹⁶ The IAEA's External Auditor in 2019 commended the Secretariat on the significant progress made and the intensifying outreach efforts, but could offer no suggestions on how to proceed other than to 'carry on'.¹⁷ Non-IAEA Member States, where there are no working level relations with IAEA staff and little or no experience with the IAEA's mandated activities, represented a special challenge. In the past, regional workshops have been successful in convincing some States to act, but as the numbers dwindle such events may be too humiliating for the holdouts (often a lack of understanding or capacity is the problem) and a more tailored, albeit resource intensive, approach involving personal contact with relevant national authorities is needed. The IAEA Secretariat's leverage is of course limited. Committed Member

¹⁰IAEA 2021a.

¹¹<https://www.iaea.org/newscenter/pressreleases/iaea-director-general-steps-up-efforts-to-strengthen-safeguards-implementation>. Accessed 30 September 2021.

¹²IAEA 2021b.

¹³IAEA 2021c.

¹⁴<https://www.iaea.org/iaea-director-generals-introductory-statement-to-the-board-of-governors-7-june-2021>. Accessed 15 June 2021.

¹⁵Agencia Brasileño–Argentina de Contabilidad y Control de Materiales Nucleares Verificando el uso pacífico de la energía nuclear en Argentina y Brasil (ABACC).

¹⁶IAEA 2020a.

¹⁷IAEA 2020b.

States, the United Nations Security Council and the Nuclear Suppliers Group (NSG) should add their weight to the campaign.

11.4 Further Strengthening of Safeguards

The safeguards system has been a work-in-progress since its inception, not only through the adoption of new legal instruments, but also through modification of processes and practices by the IAEA Secretariat. Some of these have been specifically approved or acquiesced to by the Board of Governors, while others fell under the Secretariat's mandate to establish and run the safeguards system. Various factors combine to press the IAEA to improve the effectiveness and efficiency of safeguards. One is the generic characteristic of all arms control and disarmament verification regimes: 100% verification of compliance is unachievable without a degree of intrusiveness and expense that all States would find unacceptable. Instead, within such constraints, verification must produce an acceptable level of assurance and confidence that compliance is occurring and that violations will be caught early enough to permit international action to deal with them.

A second factor, which especially drives the quest for greater efficiency, is the increasing number of States under safeguards and the growth in the amount of nuclear material and number of facilities to which safeguards are applied—all at a time of continuing budgetary constraints that show no sign of abating. In addition, new types of facilities require safeguarding: new nuclear power generation technologies (such as small and medium reactors, floating reactors, fast breeder reactors and fusion reactors); high level radioactive waste and spent fuel storage facilities; decommissioned plants; and potentially new enrichment and reprocessing technologies (such as laser and pyro-processing). The IAEA is also periodically (and randomly) requested to take on additional significant verification tasks for ad hoc agreements, as in the cases of Iraq, the DPRK and the Islamic Republic of Iran. These episodes divert key personnel and resources away from their normal purposes, sometimes without adequate compensatory funding.

A third factor is pressure on the Secretariat from Member States facing financial difficulties, as in all organizations in the United Nations family, to adopt best management practices, including strategic planning and enhanced recruitment, training, budget and finance. These apply as much to the Department of Safeguards as to any other part of the IAEA.

While the constant drive to strengthen safeguards implementation implies gradually tightening constraints on Member States, in reality some improvements to safeguards result in decreasing the safeguards burden for fully compliant States. This has been the experience with 'integrated safeguards', adopted since the advent of the AP. For a fully compliant State this rationalizes duplicative safeguards activities imposed over the years, resulting in a streamlined, targeted and more effective and efficient safeguards arrangement with the IAEA. It is in this spirit that further

improvements to safeguards should be pursued in order to bring all Member States on board.

Periodically, there have been calls for the negotiation of additional legal documents to enhance safeguards, sometimes referred to as 'AP Plus'. The last effort in the Board of Governors, the Committee on Safeguards and Verification (Committee 25), established in 2004, achieved little in this direction (or any other) and was wound up in 2007. Members of Committee 25 were not only divided over whether new measures were warranted, but even States keen on such measures failed to produce workable ideas. After almost a decade and a half since, it could be argued that it is time to revisit the effort. However, one of the issues that derailed the committee, the non-compliance case of the Islamic Republic of Iran, is still alive and would presumably scuttle a new Board initiative, at least until the fate of the 2015 Joint Comprehensive Plan of Action (JCPOA) is settled.

The Standing Advisory Group on Safeguards Implementation (SAGSI), established in 1975, has made considerable contributions to safeguards reform. However, SAGSI's recommendations only go to the Director General, its members (appointed by the Director General) have been drawn from a limited number of Member States (mostly retired ambassadors or senior safeguards personnel) and it does not operate transparently. Its reports are not made public and even its agenda is unpublished. It has, arguably, not made cutting-edge recommendations since contributing to the conceptualization of the AP. SAGSI could be transformed into a more dynamic, creative and open body by broadening its membership, seeking input from external contributors and publishing its results.

During meetings of Committee 25, the Secretariat proposed numerous ideas to strengthen existing safeguards operations, rather than pushing for new authorities, which suggests that it saw sufficient possibilities for improvements short of legal remedies.¹⁸ Since then, the Department of Safeguards has moved ahead on its own initiative, in seeking greater effectiveness and efficiency where such measures lie within its authority, notably in strategic planning, management, technology (especially IT) and personnel development.

11.5 Management of Safeguards

The Department of Safeguards is embedded in a United Nations-style international organization that determines its bureaucratic hierarchy and procedures, staff recruitment and appointment rules, funding arrangements and, not least, organizational culture. Nonetheless, within these constraints the Department has made valiant efforts in recent years to improve the management of safeguards. Gone are the days when inspectors' reports were written on scraps of paper that may or may not have been read and were indifferently filed. Also gone are the days when Member States nominated candidates for automatic recruitment and training was minimal. Even more

¹⁸Boureston and Ferguson 2005.

significantly, gone is the accountancy mentality and focus on declared materials and facilities that pervaded early safeguards culture.

Today, the Department is better managed than ever before. This is partly due to IAEA-wide reforms, such as a results-based management approach to programme planning, monitoring, and reporting. The Agency-wide Information System for Programme Support (AIPS) reportedly continues to produce efficiencies through automation of processes more than a decade after it was introduced.¹⁹ Financial management has improved with adoption in 2011 of the United Nations-wide International Public Sector Accounting Standards (IPSAS), which “provide[s] greater insight into the actual assets, liabilities, revenues and expenses of the Agency.”²⁰ Both AIPS and IPSAS, the Secretariat reports, “continue to require fine-tuning, adjustments, improvements and enhancements.”²¹ An accountability framework is currently being ‘operationalized’ across the Agency.²²

The Department of Safeguards, in addition, has taken its own steps towards greater effectiveness and efficiency. A pathbreaking initiative, not only organizationally but substantively, is its Long-Term Strategic Plan (2012–2023), the only one of its kind at the Agency.²³ Drafted in-house after consultations with staff, this plan sets out a vision for the Department and systematically attempts to identify future non-proliferation challenges. Although only available publicly in summary form, the document is revealing. It says the IAEA should aspire to be the “pre-eminent international nuclear verification agency” and achieve the “confidence and support of the international community”.²⁴ It also emphasizes the need for continuous improvement in safeguards and for effectiveness and efficiency. On the substantive side is its novel admonition that it is “vital ...to detect and report early any *potential* [emphasis added] misuse of nuclear material and activities”.²⁵ Traditionally, safeguards were premised on the idea that they could only detect activities of concern after the event.

The Long-Term Strategic Plan is meant to be a living document that is reviewed and updated every two years. This occurred most recently in 2018. A public version of the revised document, even in summary form, is unfortunately not available. The Department should ensure that at least a summary is available publicly to provide continuing reassurance about its strategic direction. As part of its strategic planning, the Department also develops a biennial Development and Implementation Support (D&IS) Programme for Nuclear Verification and has formulated a Long-Term R&D Plan, 2012–2023, both of which are publicly available.²⁶

¹⁹IAEA 2019b.

²⁰IAEA 2020b, p. 141.

²¹IAEA 2019b, p. 142.

²²IAEA 2020c, p. 19.

²³IAEA 2011, p. 2.

²⁴This is not as ambitious as it sounds since there is only one other at present, the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and it is still in preparatory mode.

²⁵IAEA 2011, p. 4.

²⁶IAEA 2020d, 2013.

Another welcome trend in improving the management of safeguards is the Department's quality management system (QMS) that has been operating since 2004.²⁷ In August 2018, the Deputy Director General (DDG) for Safeguards, Massimo Aparo, issued the latest iteration of the Department's quality policy, first issued in 2004, including the following admonition: "Quality is about building trust and confidence in our safeguards conclusions."²⁸ The Department's quality management principles, essentially the same ones identified in 2004, are: leadership; engagement of people; process approach; evidence based decision making; improvement (although for some reason no longer 'continuous' as in the 2004 version); customer focus; and relationship management. Two quality objectives were specified in support of the policy: "Promoting a quality culture and encouraging ownership of quality responsibilities and accountabilities" and "Implementing our quality policy and following our quality management principles in the way we work."

Despite these worthwhile aspirations, the Department has struggled with implementing the QMS, as evidenced by the Director General's annual account of efforts to improve it.²⁹ To be fair, this is because, by its very nature, quality management involves a never ending process of review, evaluation and reform. Member States recognize the continuing challenges, as indicated by their Support Programme for 2020–2021. It includes a project to "strengthen and mature the Department's Quality Management System and monitor and report on its effectiveness", drawing on a 2017 internal self-assessment of its 'maturity'.³⁰

More specific to safeguards, the Department has also initiated State-level Effectiveness Evaluation Reviews (SEER), carried out by a dedicated departmental State-level Effectiveness Evaluation Reviews Team (SEERT). Bringing together cross-cutting Departmental expertise, SEERT reviews the planning, development, implementation and conclusion of safeguards activities. It aims to give the DDG an additional level of assurance on the correctness of safeguards conclusions.³¹ In 2019, the external auditor undertook a special assessment of the extent to which the Department had truly established "an Effective Quality Control to support the Implementation of SG [safeguards]".³² It observed various responses to the SEERT among Departmental staff: "Some support it and consider it an important aspect of effectiveness evaluation, and some others find it as a duplication of work and an extra burden to their current job, particularly when it comes to the resources."³³ The auditor criticized the lack of proper action plans that would capture key activities, dates and milestones in implementing SEERT recommendations.³⁴ The IAEA agreed with the auditor's recommendations.

²⁷IAEA 2019b, p. 130.

²⁸IAEA 2020d, p. 96.

²⁹Ibid., pp. 43–48.

³⁰Ibid., pp. 90–96.

³¹IAEA 2020b, p. 180.

³²Ibid., p. 179.

³³Ibid., p. 181.

³⁴Ibid., p. 180.

A somewhat different approach to safeguards quality control has been suggested by Australian safeguards expert John Carlson. He proposes a safeguards audit, conducted by a small group of trusted experts, presumably external to the Department, reporting to the Director General, who could review safeguards decisions and, where appropriate, make recommendations on process.³⁵ Carlson understands that such an arrangement operated in the 1980s and says, “it could have a useful role today where states are looking for assurance on the directions in which safeguards practice is evolving.”

As for technological improvements for safeguards, a €41 million Modernization of Safeguards Information Technology (MOSAIC) project, launched in 2015 was completed in 2018. Employing 150 in-house professionals, the project developed more than 20 unique software applications designed to make safeguards more effective, efficient and secure. The Department recently established a Collaborative Analysis Platform (CAP) that integrates big data collection and analysis tools into safeguards work. Also contributing greatly to safeguards effectiveness has been the Enhancing Capabilities of the Safeguards Analytical Services (ECAS) project, a multi-year endeavour to design and construct new laboratory facilities for the Safeguards Analytical Laboratories at Seibersdorf, comprising the Nuclear Material Laboratory (NML) and the Environmental Sample Laboratory (ESL).³⁶ The redesigned NML, described as the ‘workhorse’ of the IAEA’s sample analysis, increased capacity by over 50%. The project, funded by voluntary Member State contributions, was completed in 2015 within budget and on schedule. Such is the constant advance of science and technology, however, that the IAEA will need to continuously ensure that its laboratories remain state of the art if they are to meet future nuclear proliferation challenges.

A recent new focus of Departmental concern has been organizational resilience, particularly due to the COVID-19 pandemic, which threatened to have a significant impact on safeguards implementation. Not only did Headquarters staff need to adjust to working from home, with particular complications owing to the confidentiality of safeguards derived information, but inspectors had to go to extraordinary lengths to carry out their on-site activities and maintain the continuity of verification. Director General Grossi declared that “Safeguards implementation did not stop for a single minute.”³⁷ Creative ways were found to enable both Headquarters and in-field tasks to continue unabated, despite travel and quarantine restrictions. Thanks to Member State support, the IAEA was able, for the first time, to hire dedicated aircraft when necessary to transport inspectors to their destinations. Overall, the IAEA has, to date, demonstrated a reassuring degree of organizational robustness in coping with the effects of COVID-19. To identify vulnerabilities to safeguards operations from

³⁵Carlson 2018.

³⁶<https://www.iaea.org/newscenter/news/iaea-safeguards-labs-more-efficient-and-accurate-thanks-to-recent-upgrades>. Accessed 12 July 2021.

³⁷<https://www.iaea.org/newscenter/news/iaea-nuclear-verification-continued-during-the-covid-19-pandemic-safeguards-statement-2020>. Accessed 30 September 2021.

future global emergencies the IAEA completed a Business Impact Analysis (BIA).³⁸ The risk management approach to IAEA operations is to be applauded.

11.6 Transparency and Openness

Debates about the lack of transparency at the IAEA often conflate three different challenges: internal transparency within the Secretariat; transparency between the Secretariat and Member States; and public-facing transparency. Each requires different approaches. During his tenure, Director General Mohamed ElBaradei launched his ‘One House’ campaign to break down the internal informational stovepipes for which the Secretariat was notorious and to induce all departments of the Agency to pull in the same direction. In 2020, Director General Grossi, in introducing the Policy, Management and Administration part of his first Programme and Budget, was still contending that achieving the objectives of Member States required “effective coordination to ensure a one house approach”.³⁹ He then listed almost all of the IAEA’s activities as needing this approach, including “the management of information within the Secretariat, between the Secretariat and Member States, and for the benefit of the general public and the media.” All these aspects are relevant to safeguards implementation.

Yet, as the repository of most of the confidential information held by the IAEA, the Department of Safeguards has over the years understandably struggled with embracing the one house ideal more than other departments. Indeed, the confidentiality principle set out in safeguards agreements is explicitly designed to guard against information sharing by the Department. The confidentiality mantra, unusual for an international organization, is now so firmly embedded in IAEA safeguards culture that it has contributed to a general culture of opacity about all safeguards matters and a lack of transparency at the IAEA generally.

Transparency within the Department of Safeguards has in recent years improved as a by-product of the State-level concept (SLC), which demands intensive collaboration between managers, analysts and inspectors in State Evaluation Groups (SEG) to draw up safeguards conclusions for each State, based on multiple sources of information. Nonetheless, this has clearly not been sufficient as efforts are continuing, with Member State support, to implement the Department’s 2013 Strategic Internal Communication Plan to “enhance senior leadership and departmental staff member communication capabilities.”⁴⁰

As for transparency between the Secretariat and Member States, there have long been calls for a better explanation of evolving safeguards approaches by the Safeguards Department. A particular issue arose in 2012 when some Member States criticized the lack of information and analysis from officials about the State-level concept. Although some of the reaction was political point-scoring, there was

³⁸IAEA 2020e, p. 15.

³⁹IAEA 2019b, p. 141.

⁴⁰IAEA 2020d, pp. 16–17, 43–48.

also genuine concern among some Member States about this latest example of safeguards obtuseness.⁴¹

A longer-running debate has ensued over the impenetrability of the annual Safeguards Implementation Report (SIR). Since its introduction in 1977, it has become, in Roger Howsley's memorable words "data rich and information poor".⁴² For example, the 2019 Safeguards Statement, the public, bowdlerized version of the SIR, revealed, helpfully, that one State had lost its broader conclusion. In typical fashion, however, it was not announced directly and the State concerned, Libya, was not named. This was only apparent from the drop in the number of States with the broader conclusion from 71 to 70. This was the perfect opportunity to nudge the SIR towards increased transparency, as Libya was mired in a civil war and could hardly be blamed for its safeguards lapse. Similar safeguards challenges occurred after the accident at the Fukushima Daiichi nuclear power plant and due to the inability of the Agency to access certain locations in Ukraine. In all these cases, the reissuing of the broader conclusion "did not reflect the technical facts on the ground".⁴³ As Australia remarked to the Board, "the SIR should contain enough detail to enable Member States to understand the operation of the Agency's safeguards system and assess the effectiveness of safeguards implementation."⁴⁴

Others have argued that the SIR should "identify when problems are attributable to the IAEA, whether due to equipment failures, staff issues or administrative challenges."⁴⁵ At present, Member States and the public are left guessing, which contributes to amnesia about the problems facing safeguards: no one appears responsible. The External Auditor recommended in 2020 that the late submission of State declarations and its impact on drawing safeguards conclusions should be highlighted in the SIR, including information on utilization (or not) of the State Declarations Portal (SDP), a secure, web-based application that supports data exchange between the IAEA and Member States.⁴⁶ Former DDG for Safeguards Olli Heinonen argues that the SIR should also highlight emerging problems in safeguards, which should also be covered in technical briefings to the Board of Governors.⁴⁷ He has also suggested that the Secretariat should issue stand-alone reports on problematic countries, presumably not just after they have been revealed to have been in non-compliance, as is currently the practice.

The 2020 SIR had some welcome new elements. The 2020 Annual Meeting of the Institute of Nuclear Materials Management (INMM) and the European Safeguards Research and Development Association (ESARDA) heard that there was "a lot more, meaningful rich data in the SIR" (Carrie Mathews, Chair), including new trends and new graphics, and "a new fancy cover" (DDG Aparo). Aparo also announced the

⁴¹Mayhew 2020.

⁴²Howsley 2011.

⁴³Otto 2021.

⁴⁴<https://austria.embassy.gov.au/vien/AEIASIRJune2021.html>. Accessed 30 September 2021.

⁴⁵Rockwood et al. 2019, p. 29.

⁴⁶IAEA 2020b, pp. 177–178.

⁴⁷Heinonen 2013.

Director General's intention to provide additional information to Member States on "how we are doing our business", including data derived from the SLA, but cautioned against rendering the SIR "unreadable".⁴⁸

As for external or public-facing transparency, this can likely only be changed with an organization-wide cultural shift. Greater openness by the IAEA about its strategic goals, budget and finance, organizational restructuring, and performance measurement would embolden the Safeguards Department to be more open about the effectiveness of safeguards, emerging proliferation challenges, and generic concerns about non-compliance by Member States. As a start, Heinonen advocates making the entire SIR public, to highlight implementation and compliance problems to all stakeholders, including researchers and whistle-blowers, who could use it to publicize and help further expose State malfeasance.⁴⁹ The Secretariat itself has supported such a move, but is inhibited by some Member States' qualms.

A further difficulty is the Secretariat's reluctance to publicly answer the IAEA's critics, leaving the Safeguards Department undefended and vulnerable to misunderstanding and further criticism. The previous Director General, Yukiya Amano, noting that it was sometimes difficult for Member States and the public to understand what the IAEA was doing, conceded that "It can also be frustrating for us when we see inaccurate information under discussion in the public domain."⁵⁰ The answer is plainly greater transparency. Writing for the Vienna Center for Disarmament and Non-Proliferation (VCDNP), Laura Rockwood and her colleagues have recommended that "False assertions regarding the IAEA's legal authority should be challenged by Member States and by the Secretariat."⁵¹ They suggest that "Challenges to the IAEA's authority stemming from States' mistrust of the Secretariat can be ameliorated with transparency, consultations and messaging that underscores a safeguards relationship characterized by partnership rather than contestation." They also propose giving SAGSI a public-facing role to help challenge false statements about safeguards and to offer independent opinions on safeguards issues to the public and to the Board of Governors.

The non-proliferation community is largely supportive of the IAEA and its mission and should be regarded as 'force multipliers' in spreading the word about its accomplishments and challenges, especially given the doleful lack of support from some Member States. Director General Grossi appears more open to sharing information and is more outspoken in his public pronouncements, including making spontaneous rather than scripted responses. But he also needs to repair the IAEA's relationships with the media, academia and civil society, which have become frayed in recent years. Encouragingly, since becoming Director General, he has argued that forging inclusive partnerships—not only with Member States but also by reaching out to

⁴⁸Mathews and Aparo 2020.

⁴⁹Heinonen 2013, p. 5.

⁵⁰<https://www.iaea.org/newscenter/statements/challenges-in-nuclear-verification>. Accessed 30 September 2021.

⁵¹Rockwood et al. 2019, p. 26.

non-governmental and international organizations, industry and civil society—can help the IAEA maximize its ability to ensure a better future for all.⁵²

11.7 Safeguards Training

The Safeguards Department has taken significant steps to improve training in recent years. Its Training Section (CTR) is responsible for designing and delivering safeguards training for both IAEA personnel and those from State or regional authorities (SRAs).⁵³ The latter role helps impart IAEA safeguards practice and culture to national nuclear authorities, in addition to allowing the Secretariat to detect dysfunctional safeguards practice and cultures in such institutions.

Training for new inspectors begins with an Introductory Course on Agency Safeguards (ICAS) lasting three to four months. Modules cover the necessary technical topics, including non-destructive assay techniques, containment and surveillance, radiation protection and design information verification. Training increasingly also involves soft skills, including observation, negotiation, communication and interviewing techniques. Trainees are familiarized with the history of safeguards, including past non-compliance cases, and the background to safeguards treaties and agreements. The introductory course concludes with a comprehensive inspection exercise at a light water reactor and presentation of a case study.

The new ‘completeness and correctness’ mantra embodied in the strengthened safeguards system since the Iraq case is now being embedded in the culture through training. Inspectors are being trained to be more inquisitive, more investigatory, more questioning of their facility or government hosts, and more willing to take initiative in the field rather than automatically requesting authorization from Vienna. An experienced inspector who conducts part of the introductory training course has claimed that the new approach is working: “But in addition to measuring nuclear material, reviewing accountancy and auditing the books, we’re always looking for signs or indications of potentially undeclared nuclear materials and activities”.⁵⁴ The aim is to teach inspectors to think not as physicists, chemists or engineers, which the majority are, but as investigators.⁵⁵ Essentially, inspectors must learn to be whistle-blowers. This involves not just being prepared to uncover evidence of non-compliance, but also being confident enough to make the case for a violation to a potentially sceptical senior IAEA supervisor.

In addition to training new staff, the CTR also offers courses for continuing safeguards staff, covering the range of safeguards activities at facilities and Headquarters

⁵²Grossi 2021, pp. 13–14.

⁵³IAEA 2020d, p. 97.

⁵⁴<https://www.iaea.org/newscenter/news/training-iaea-inspectors>. Accessed 10 February 2015.

⁵⁵<https://www.iaea.org/newscenter/news/a-day-in-the-life-of-a-safeguards-inspector>. Accessed 30 September 2021.

and aiming to develop both ‘technical and behavioural skills’.⁵⁶ Quality management training for all safeguards staff, including inspectors, has recently intensified.⁵⁷ Given the prominence of the State-level approach, it is especially important that all safeguards personnel be trained in the systematic use of new analytical techniques, including critical thinking and ‘structure analysis’.⁵⁸ Analytical skills training is designed to help analysts and inspectors avoid ‘group think’; employ competing hypothesis analysis, which can reportedly be remarkably effective; and remove individual bias as much as possible. Participants are taught that there are three levels of analysis: objective analysis, with which they are all comfortable; subjective analysis, where some degree of subjectivity is required to draw a conclusion on the evidence; and the political level, where they should not venture. The CTR is conducting a series of one-day workshops to teach participants in State Evaluation Groups how to work as teams.⁵⁹

Although training is seeking to change safeguards culture to accommodate the new espoused values of strengthened safeguards, there is no conscious mention of safeguards culture in safeguards training documentation or plans. This contrasts sharply with global practice in nuclear safety and security, where no respectable introductory course would be complete without reference to culture and at least a class on what it is and how to enhance it. This lacuna should be rectified. It is increasingly being recognized that there is a need to transmit ‘tacit knowledge’ which is not in handbooks or instructions, but which is in large part cultural. Senior inspectors are key to mentoring new staff and passing on safeguards culture, especially in helping them know how far they can go in being proactive and assertive. The IAEA has undertaken knowledge management efforts since 2007 to support supervisors in identifying the retention of critical job-related knowledge from staff members retiring or otherwise leaving the Department.⁶⁰

As to preparing for future non-proliferation challenges, the IAEA claims that it now continuously updates its training programme to match the evolution of safeguards implementation.⁶¹ For instance, additional training was provided at short notice to address verification challenges at the Fukushima Daiichi site in Japan after the 2011 accident and after 2015 to support verification in the Islamic Republic of Iran after the conclusion of the JCPOA.⁶² Training is also continuing for possible resumption of inspections in the DPRK.⁶³ The CTR is also cognizant of the need for training for the arrival of new technologies, whether verification technologies employed by the IAEA itself or new technologies in the nuclear industry.⁶⁴

⁵⁶<https://www.iaea.org/newscenter/news/training-iaea-inspectors>. Accessed 10 February 2015.

⁵⁷IAEA 2007, p. 6.

⁵⁸IAEA 2020d, p. 104.

⁵⁹Ibid., p. 107.

⁶⁰IAEA 2007.

⁶¹IAEA 2014a.

⁶²IAEA 2017.

⁶³Project SGCP-102, see IAEA 2020d, p. 98.

⁶⁴Ibid., pp. 100–101.

The most recent challenge to effective safeguards training has been the COVID-19 pandemic. In-person learning has been largely replaced by e-learning, requiring the re-imagining of teaching techniques and expected outcomes. CTR believes the experience may have long-lasting effects on training, shifting the emphasis from traditional instruction methods (lectures and Q&A) to ‘student centred learning’, with enhanced interactivity, instant student feedback, a greater focus on goals and methods to achieve pedagogical objectives and the use of simultaneous translation for trainees who do not speak English.⁶⁵ Safeguards training in a multicultural environment has always faced challenges and the pandemic may have hastened the consideration of significant reforms.

Obviously, no training programme can be perfect. A 2019 report commissioned by the Swedish Radiation Safety Authority pointed to alarming examples of inspectors “who are unaware of or non-compliant with the requirements of safety and security in a facility, who are not fully informed of the legal framework (including constraints on the IAEA) or who simply misbehave or engage in combative behaviour with the operator or the State.”⁶⁶ It concluded that while “luckily, the examples are few”, they “warrant attention.” The Organisation for Economic Co-operation and Development (OECD) suggests that regulatory-type organizations follow the International Organization for Standardization (ISO) standards for inspections and seek accreditation.⁶⁷ The IAEA has already done this for its Safeguards Analytical Laboratory. Given the IAEA’s perception that its safeguards system is unique, it may be unwilling to subject itself to such an accreditation process, although it could learn from the widely accepted standards themselves.

The CTR concedes that its work is complicated by budget constraints, staff turnover, reliance on external trainers (60%), increased restrictions on facility access for on-site training, and the need to update management and training tools.⁶⁸ Extra-budgetary support from Member States (mostly Western) is required for most training courses and course travel, as well as for cost-free experts to teach some courses.⁶⁹ Reliance on voluntary funding not only complicates planning but unfortunately perpetuates the misleading idea that nuclear safeguards are a Western project far removed from the priorities of the developing world. Ideally, the sources of funding and cost-free training staff should be broadened to signal that safeguards are a universal concern, although this is challenging given current financial constraints. This may be an area where public–private partnerships are possible.

⁶⁵Stevens et al. 2021.

⁶⁶Rockwood et al. 2019, p. 29.

⁶⁷OECD 2014; ISO 2017.

⁶⁸Project SGCP-102, see IAEA 2020d.

⁶⁹Ibid.

11.8 Further Enhancing the Safeguards Workforce

A safeguards workforce that is highly motivated, dedicated, adaptable and ready to meet current and future verification challenges should be a high priority for the IAEA. Despite laudable efforts to improve recruitment and training, the organization faces institutional legacies that stand in the way of optimal outcomes. One is the United Nations staff ‘rotation’ system that the IAEA employs. Designed to preclude the emergence of a permanent Secretariat career, it subjects inspectors and other professional safeguards staff to a maximum tenure of seven years (usually an initial three year contract followed by two extensions of two years each). After seven years most are required to leave but may reapply for rehiring after a year’s absence. At the Director General’s discretion, a contract can be extended indefinitely, considering the limited availability of candidates with safeguards expertise, the need to maximize the IAEA’s return on investment in inspector training (up to €240,000 over five years per individual) and the increasingly sophisticated and specialized technical requirements of safeguards. Currently, about 30% of IAEA professional staff are on long term contracts, most of them in the Safeguards Department.⁷⁰

The advantage of the rotation system is that it gives the nationals of more Member States an opportunity to work at the IAEA, which developing countries are constantly advocating. It also permits ‘fresh blood’, with new ideas and skills, to be regularly injected into the system. Less widely recognized, it also enables the Secretariat to send experienced safeguards staff back to their home countries where they may propagate safeguards best practice and culture in their national safeguards authorities. Finally, the rotation policy enables the IAEA to relieve itself of underperforming staff.

However, the disadvantages are considerable. ‘Rotation’ is a misnomer, as it suggests that staff rotate in and out of the Agency in an orderly fashion. In fact, many highly rated inspectors never return or return so late that they require retraining. The constant churn of personnel results in a loss of expertise and institutional memory and the chance to embed a strong safeguards culture in the workforce. Repatriation costs for terminated staff are considerable. In recruiting new staff, the IAEA cannot offer a guaranteed professional career path. The system also helps managers avoid what should be a standard staff assessment process, documenting both good and bad performance by staff, “which, by most accounts, is not a prevailing culture at the IAEA.”⁷¹ These are practices that no modern corporation would tolerate. Meanwhile, the IAEA struggles to recruit qualified staff from all geographical areas, as its Statute requires, particularly as specialized qualification requirements rise. In offering limited term contracts with no career path, the IAEA cannot compete. Large nuclear projects in several countries (including Bangladesh, Egypt, India, Turkey and United Arab Emirates) are drawing potential talent away—despite the lure of Vienna. A particular challenge is the recruitment of analysts, including those skilled in satellite imagery and social media analysis (where the IAEA has only just scratched the surface).

⁷⁰IAEA 2020b, p. 182.

⁷¹Rockwood et al. 2019, p. 31.

Although the IAEA Statute requires that “its permanent staff shall be kept to a minimum,”⁷² former IAEA legal adviser Laura Rockwood claims that there is no legal bar to modifying the rotation policy with immediate effect (ideally with Board approval or acquiescence).⁷³ In the meantime, several steps could be taken to replicate by other means the advantages of the rotation system. Rotation within the Department should be systematized, as recommended by the External Auditor (and agreed by the Department). Instead of rotating staff out of the IAEA, sabbaticals, exchange programmes and secondments could be used to refresh staff qualifications and experiences. National nuclear agencies or nuclear related organizations, including EURATOM, ABACC, the Comprehensive Nuclear-Test-Ban Treaty Organization, the World Nuclear University and the OECD’s Nuclear Energy Agency, could be potential collaborators. In any event a thorough study of IAEA staffing practices, perhaps by an external consultant, appears warranted.

Despite calls for revamping safeguards culture following the Iraq case in the early 1990s, and unlike the fields of safety and security, cultural change has not been widely recognized as part of the response to sustaining the effectiveness of IAEA safeguards.⁷⁴ The Secretariat has not adopted a deliberate cultural change strategy, nor for the most part has it used the language of culture. Yet revolutionary changes in the safeguards system since the Iraq case have inevitably produced changes in safeguards culture in the three areas identified by organizational theorists as key: artefacts, espoused values and underlying assumptions.⁷⁵

The greatest changes in espoused values have concerned correctness and completeness, the need for a more investigatory approach by inspectors, and the value of a more collaborative approach by all staff. The Department of Safeguards has made changes that have been culturally sensitive, such as the consultations that produced the Strategic Plan and its updates, improvements in recruitment and training, and reforms resulting from the quality management process. Staff turnover and generational change will help ensure that a new culture becomes widespread over time, and it also means that the culture may change in unexpected ways, especially as the proportion of women and personnel from under-represented countries increases. The Department also faces the continuing challenge of integrating or at least reconciling several subcultures, especially the bureaucratic and scientific ones, as well as the inspector and analyst subcultures.

Cultural change takes time, however, and such changes may not yet be fully reflected in underlying assumptions held by safeguards personnel. Scepticism about the value of the cultural approach still abounds within the Department, presumably due to a lack of understanding about the insights it can provide and perhaps fear of what it might reveal. This is despite the IAEA routinely urging its Member States

⁷²IAEA 1989, Article VII.C.

⁷³Rockwood et al. 2019, p. 31.

⁷⁴For a comprehensive study of IAEA safeguards culture, see Findlay 2022 (forthcoming).

⁷⁵Schein 2004, Schein and Schein 2017.

to attend to cultural aspects, not just in the areas of safety and security, but also in strengthening their national nuclear organizations.⁷⁶

The elements of an optimal safeguards culture should be apparent. Some of these are boilerplate aspirations that all organizations should aspire to: organizational excellence; a sense of service and loyalty; and a commitment to effectiveness and efficiency. Other values are specific to the IAEA as an international organization dedicated to a higher cause than its own well-being, notably international peace and security. An optimal safeguards culture should embody a strong commitment by the entire IAEA to the non-proliferation regime. Despite its best intentions, the Department of Safeguards alone is unable to change Agency-wide cultural norms, much less those of the United Nations system, that deeply affect safeguards culture—the most prominent being those related to leadership, management style, recruitment and promotion. Such change requires action from the highest levels of the IAEA, the Director General, and senior staff, as well as the Board of Governors and general membership.

As to safeguards culture specifically, the Secretariat should engage the entire safeguards community, including Member States, to reach an agreed definition of safeguards culture and identify the elements that constitute an optimal culture, just as the nuclear safety and security communities have done. While such an exercise will not automatically lead to cultural change, it can serve as a guide and inspiration to the Secretariat, Member States and other stakeholders. Furthermore, the IAEA should commission a survey and study of its organizational culture by qualified management experts, with a focus on safeguards and related staff. This should include reflections on the impact on safeguards culture of the staff rotation policy, recruitment and training practices, staff assessment counselling, and the reward system. It should also seek lessons from other organizations with regulatory functions. When contemplating major organizational change, the IAEA should from the outset include consideration of the likely cultural impact and put in place measures to achieve the desired cultural shift. Appointing an officer in charge of cultural change management would facilitate this process.

11.9 Future Verification Challenges

One of the challenges for safeguards planning is the periodic, unexpected demand for ad hoc verification services resulting from international agreements reached without the IAEA's direct involvement. The most prominent cases so far have been Iraq, the DPRK and the Islamic Republic of Iran. After years of zero real growth budgets, there is no 'fat' in the IAEA's system to provide for the costs (financial, technical, human resource and management) associated with such episodes. This forces the IAEA to rely on voluntary contributions from Member States. While these usually do arrive, sometimes just in time, the disruption to the IAEA's normal operations can

⁷⁶IAEA 2008a, b, 2014b.

be considerable. It is not just the lack of available funds but the diversion of key staff away from their day-to-day functions. This occurred in the case of the Iraq Action Team and again in the case of the Iran Task Force and later the Office for Verification in Iran. One way of coping with such cases in future would be for the IAEA to establish a special emergency fund. This could be used not just for non-compliance cases but also for nuclear accidents, such as at the Fukushima Daiichi nuclear power plant, when the Secretariat must scramble to mount a crisis response.

On the other hand, the IAEA should seek to derive benefit from the novel verification challenges that invariably arise from ad hoc arrangements. In the Iraq case, collaboration with the UN Special Commission (UNSCOM) and the UN Monitoring, Verification and Inspection Commission (UNMOVIC) exposed the IAEA, for better or for worse, to different approaches to verification, including documentary searches and interviews with key personnel, as well as new techniques such as environmental sampling. In the Islamic Republic of Iran, the IAEA has undoubtedly learned several lessons and gained invaluable experience from maintaining a 24-hour monitoring presence at some facilities and from, as the JCPOA coily puts it, the “use of modern monitoring technology”.⁷⁷ Although the JCPOA states explicitly that its provisions and measures “should not be considered as setting precedents”,⁷⁸ the knowledge and experience gained by the IAEA from the Iran experience will be impossible to firewall from its verification corpus and toolbox. The Secretariat should ensure that lessons learned are properly documented, catalogued and studied. Although some may regard the Secretariat’s continuing preparations for re-entry into the DPRK as a waste of resources, the maintenance of this capability enhances the IAEA’s overall capabilities, as well as removing verification unpreparedness as an obstacle to the DPRK’s swift return to safeguards or to its acceptance of additional monitoring measures.

In addition to these unforeseen one-off verification exercises, there has long been debate about the role of the IAEA in verifying future multilateral or bilateral agreements. The fissile material cut-off treaty (FMCT) has for decades been cited as the next key multilateral step on the road to nuclear disarmament with a potential IAEA verification role. Proposals have also been made for the IAEA to verify surplus nuclear material resulting from nuclear disarmament by the NWSS, especially the Russian Federation and the United States of America. The Trilateral Initiative of the 1990s and early 2000s was meant to pave the way for such involvement.⁷⁹ Finally, the 2017 Treaty on the Prohibition of Nuclear Weapons calls for multilateral verification of complete nuclear disarmament, although it does not take advantage of the existence of an experienced body like the IAEA to carry out the task. Nonetheless, at least since the tenure of Mohamed ElBaradei ended, the IAEA has been remarkably shy about putting its case for assuming any of these future roles. The IAEA’s Statute has proved extraordinarily flexible over the past 60 years in accommodating new

⁷⁷ Joint Comprehensive Plan of Action 2015, Annex 1, para 67.

⁷⁸ *Ibid.*, Preamble and general provisions, xi.

⁷⁹ Shea and Rockwood 2015.

tasks and there would seem to be no insuperable barrier to taking on any and all of these functions if requested by Member States.

Technological advancements pose continuing challenges to the effectiveness of safeguards, not just in terms of the IAEA ensuring that it has state of the art verification technologies and techniques, but also that it adapts its verification processes to new types of nuclear facilities and technologies of the Member States. The IAEA only has a small budget for research and development activities and relies on Member State support programmes to help drive its technical modernization. Modern information management processes are especially critical as the Secretariat copes with mountains of new data each year, struggles with the perpetual ‘signal to noise’ challenge and confronts the need to integrate all available information into the State-level approach.⁸⁰ The Department’s projects on Statistical Evaluation Platform for Safeguards (STEPS), State-Level Approach Implementation Planning (SLAIP) and Environmental Sampling Environment Enhancement (ESEE) are attempts to deal with such challenges. Meanwhile, the proliferation of microsatellites with advanced capabilities promises continuous improvements in remote monitoring from space that the Department must be prepared to exploit. Advanced social media monitoring, big data mining, and distributed ledger and block-chain techniques also remain to be fully exploited by the Safeguards Department. Funding and personnel constraints are constant. The use of artificial intelligence capabilities during on-site inspections, through handheld devices that inspectors can interrogate, is one promising idea that can save inspector time better utilized for other tasks.⁸¹

11.10 More Regional Offices?

For years, the IAEA has had two regional offices, in Tokyo and Toronto, to facilitate the large safeguards workload in Japan and Canada, respectively. During the COVID-19 pandemic, the two offices have proved especially useful in permitting on-site activity to continue with fewer interruptions from lockdowns and travel bans. DDG Aparo has floated the idea of additional regional offices to provide resiliency to the safeguards system in the event of future crises.⁸²

Additional offices may be useful not only for such purposes but also to establish an IAEA presence in regions that feel remote from Vienna and that could benefit from constant interaction with IAEA officials on safeguards issues. Such offices could also manage capacity building for SRAs, SSACs and RSACs, support safeguards training, enhance technical cooperation (TC) projects and further other aspects of the IAEA’s mandate, notably nuclear security. There would be cost implications, but one could envisage the IAEA sharing offices and collaborating with existing in-country UN offices such as the United Nations Development Programme (UNDP),

⁸⁰Baute 2021.

⁸¹Smartt 2021.

⁸²Aparo 2020.

which often acts as the focal point for UN activities in developing countries. Choosing each location would be a political challenge. Perhaps the least controversial approach would be to co-locate new IAEA regional offices with the existing regional centres of the UN Department for Disarmament Affairs (Lima, Peru, for Latin America; Lomé, Togo, for Africa; and Kathmandu, Nepal, for Asia and the Pacific). Moving some staff from costly Vienna to cheaper locales may turn out to be cost-neutral. The idea is worth investigating.

11.11 Safeguards Funding

Funding for safeguards has for decades been squeezed between increasing demand for safeguards, zero real growth budgets and linkage with funding for TC. There is a yawning gap between what the Department of Safeguards could do to maximize the effectiveness of safeguards and what it is funded to do through the regular annual budget. For the 2020–2021 biennium, the estimated cost of unfunded projects in the Department's 'wish list' amounted to approximately €33 million, compared with approximately €149 million in the regular budget.⁸³ Although the regular budget for safeguards has increased each year, it is insufficient to cope with increased demands arising from what the Secretariat calls its 'main challenges'. In addition to those discussed in detail in this chapter, these include planning for and conducting verification activities in a challenging security environment, which may require additional measures to ensure the physical safety of staff operating in the field and to ensure information security.

Despite the election of a US administration, led by President Joe Biden, that is more supportive of international organizations than its predecessor, it is unlikely to lead a major campaign to increase the safeguards budget, although voluntary US funding may increase. In any event, the 25% share of the IAEA budget borne by the United States of America is unhealthy for any international body, much less one as important to international peace and security as the IAEA. In the case of safeguards, it only reinforces the notion that safeguards are principally a 'first world' concern. Funding of safeguards is becoming more equitable through the end of the 'shielding' system, originally designed to protect developing countries from the rising costs of safeguards.⁸⁴ Category 3 States, which remarkably include China and India, are due to lose their shielding in 2024, followed by Category 4, comprising least developed countries, in 2032 (they already get a discount in overall regular budget assessments). It has always seemed inequitable that a country like China, that has been rapidly emerging as an economic powerhouse, should not provide a greater share of safeguards financing. Given the strength of the Chinese economy, it is hard to see why it should not contribute a similar amount as the United States of America to the safeguards budget. India's separation of its civilian nuclear facilities from its military

⁸³IAEA 2019b, pp. 139–140.

⁸⁴IAEA 2019a.

ones for safeguards purposes and its conclusion of a bespoke Additional Protocol has added considerably to the safeguards budget. Like VOAs, this arrangement is more symbolic than real since India already has nuclear weapons, but it benefits the country by allowing it greater access to peaceful nuclear technology. India should be prepared to at least offset the safeguards costs. Along with increasingly prosperous European States like Bulgaria, Estonia, Latvia, Lithuania, Poland and Turkey, both China and India should voluntarily remove themselves from the shielding system before 2024.

In theory, an additional way to increase the safeguards budget would be to detach it from the perpetual TC linkage.⁸⁵ This author has previously proposed a ‘grand bargain’ that would see TC included in the regular budget in return for including nuclear security (a developed country priority). The annual budget negotiations would then at least start from the premise that all main programmes of the Agency deserve regular budgetary funding. Another possibility is further pursuit of public–private partnerships. These work well in the case of technology, for supporting the IAEA’s laboratories and for inspection equipment, but are less likely, and may be too politically sensitive, for other safeguards activities. The establishment of an emergency verification fund, as proposed, could be partially funded from non-governmental sources. The IAEA has already pioneered such a funding model with the major contribution of the Nuclear Threat Initiative (NTI) to the IAEA Low Enriched Uranium (LEU) Bank.

11.12 Conclusion

The IAEA safeguards framework has truly undergone a revolution since the Iraq case in the early 1990s. The strengthened safeguards system is functioning well. The IAEA is now fully cognizant of the threat from undeclared nuclear materials and activities. The Safeguards Department has adopted strategic planning, improved its management and budgeting, and transformed recruitment and training. It has adopted modern technology, including IT, where it is likely to be effective and affordable.

But the IAEA is also aware of the continuing weaknesses of safeguards and the challenges involved in dealing with current and future non-compliance cases, advances in nuclear technology and external threats such as cyberattacks, and, latterly, pandemics. The long drawn-out case in the Islamic Republic of Iran threatens the integrity of safeguards because it challenges key elements of the strengthened safeguards system, including the implementation of elements of the Additional Protocol and the reaching of the broader conclusion. The Secretariat is also conscious that even strengthened safeguards may not be guaranteed to detect evolving and increasingly sophisticated non-compliance efforts. Enhanced technical capabilities such as wide-area sampling (currently prohibitively expensive) and new techniques such as data mining will be required, along with the continuing provision by States of appropriate

⁸⁵Findlay 2016.

intelligence information when necessary. Member States must also do their part by striving for the universality of safeguards agreements and robust national safeguards authorities. They and the international community generally need to provide the level of support—political, financial and technological—that is commensurate with the challenges that the IAEA’s safeguards system faces. As many have pointed out, the IAEA is an international security bargain.

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