

Nuclear Responsibilities and the Global Nuclear Order

Perspectives from São Paulo

JANUARY 2020

**The British American Security
Information Council (BASIC)**

17 Oval Way
London
SE11 5RR

Charity Registration No. 1001081

T: +44 (0) 20 3752 5662
www.basicint.org

**The Institute for Conflict, Cooperation
and Security (ICCS)**

Edgbaston
Birmingham
B15 2TT

Tel: +44 (0)121 414 8683
[https://www.birmingham.ac.uk/
schools/government-society/centres/
iccs/index.aspx](https://www.birmingham.ac.uk/schools/government-society/centres/iccs/index.aspx)

© The British American Security Information Council (BASIC) &
The Institute for Conflict, Cooperation and Security (ICCS), 2020

Front cover image: CC 2.0, Rafael Vianna Croffi, Flickr.

The opinions expressed in this publication are the responsibility
of the authors and do not necessarily reflect the views of BASIC
or ICCS.

All rights reserved. No part of this publication may be
reproduced or transmitted in any form or by any means,
electronic or mechanical including photocopying, recording or
any information storage or retrieval system, without the prior
written permission of the copyright holder.

Please direct all enquiries to the publishers.

The Author

Alice Spilman is a PhD candidate in the Department of Political Science and International Studies with the ICCS at the University of Birmingham, and a Researcher on BASIC and ICCS's Programme on Nuclear Responsibilities, a multi-year diplomatic initiative exploring the responsibilities of states and other actors around nuclear weapons. Alice holds a BA in Politics from Newcastle University and an MSc in Global Cooperation and Security from the University of Birmingham. Her research interests include exploring states' conceptions of responsibility and trust within the nuclear sphere.

Acknowledgements

The author would like to thank The Ministry of Foreign Affairs of Brazil for their assistance in bringing this meeting to fruition, and Fundação Getúlio Vargas for hosting the meeting, with special thanks to Lucas Perez Florentino, Matias Spektor, and Marcelo Paz Saraiva Câmara. Funding for the meeting was kindly provided by the Counter Proliferation and Arms Control Centre (CPACC) of the United Kingdom. Thanks also to Sebastian Brixey-Williams and Nicholas J. Wheeler for their assistance editing the report and the design work, and to all the participants who generously contributed their time, perspectives and expertise at the roundtable.

BASIC

The British American Security Information Council (BASIC) is an independent think tank and registered charity based in Central London, promoting innovative ideas and international dialogue on nuclear disarmament, arms control, and nonproliferation. Since 1987, we've been at the forefront of global efforts to build trust and cooperation on some of the world's most progressive global peace and security initiatives, advising governments in the United States, United Kingdom, Europe, the Middle East and Russia. Through an approach based on active listening, understanding and empathy, the charity builds bridges across divides and lay new pathways to inclusive security.

BASIC has developed institutional expertise across a number of transatlantic issue areas, including the UK-US nuclear relationship, the UK's Trident programme, the politics of disarmament and arms control in the UK Parliament, NATO nuclear weapons in Europe, the Middle East, the evolving role of responsibility in nuclear governance, and expanding technological threats to SSBN platforms.

ICCS

The Institute for Conflict, Cooperation and Security (ICCS), based in the School of Government and Society at the University of Birmingham, adopts a multi-disciplinary approach to global security challenges to create innovative research, education, and training in conflict and cooperation in world politics.

Disclaimer

The views represented in this report in no way represent the views of the Government of Brazil, Fundação Getúlio Vargas, BASIC or the ICCS. Responsibility for the content of this report lies solely with the author.

Contents

Introduction	5
Perceptions of Brazil in the Global Nuclear Order	10
How Does Brazil Discharge its Nuclear Responsibilities?	12
Opportunities and Challenges	18
Conclusion	21
Endnotes	22

Introduction

The ideas presented in this report emerged out of a one-day roundtable on 'nuclear responsibilities' that was held on 28 November 2019 and hosted by the School of International Relations at the Fundação Getúlio Vargas (FGV) in São Paulo, Brazil. Held under the Chatham House Rule, participants included Brazilian representatives from the Ministry of Foreign Affairs, think tanks and academics, whose discussions were facilitated by Sebastian Brixey-Williams (Co-Director, BASIC) and Alice Spilman (PhD Researcher, BASIC and ICCS).

The purpose was to introduce the Brazilian nuclear policy community to the 'nuclear responsibilities' framing that underpins BASIC and ICCS's Programme on Nuclear Responsibilities (PNR). The Programme has been introduced at similar roundtables that were held in the United Kingdom, Malaysia, Japan, and the Netherlands. The aim of these roundtables has been to gather opinion on the plausibility and utility of the 'nuclear responsibilities' framing, and to assemble comprehensive suggestions of nuclear responsibilities for both nuclear weapon possessors and non-possessor states. The PNR seeks to build international understanding, dialogue and a shared culture of responsibilities around nuclear weapons that might contribute to trust building, risk reduction, and disarmament. The next step in the Programme is a five-way Nuclear Responsibilities Dialogue that will be hosted in London in January 2020; stakeholders from each state will come together to discuss the responsibilities that have been proposed thus far, and the opportunities and barriers to continued promotion of this framework.

The PNR engages with a range of nuclear possessor and non-nuclear possessor states, and Brazil was selected for a number of reasons. Brazil is a major economy in the Southern Hemisphere, and a major regional power alongside Argentina, bringing with it certain responsibilities for stability and security in Latin America. It has a strong history of involvement within the global nuclear order (GNO), broadly understood as an 'arrangement of states and institutions in the international system based on beliefs about the relationship between nuclear technology and international political power.'¹ Brazil is a longtime advocate of a progressive disarmament agenda, most notably in recent years in its leadership alongside several other states in the adoption and promotion of the Treaty of the Prohibition of Nuclear Weapons (TPNW), a process with strong normative underpinnings.

Much has been written on Brazil's nuclear ambitions. Brazil has an advanced civil nuclear programme, and has always defended its sovereign right to develop an indigenous peaceful uranium enrichment programme, which has resulted in two nuclear reactors (Angra 1 and Angra 2) that together generate around three percent of Brazil's electricity.² Whilst several factors, including financial constraints and corruption issues, have stalled the development of a further reactor (Angra 3), it has ambitions to expand its civil nuclear programme.³

Misperceptions abound about whether Brazil ever had a nuclear weapons programme, though recent scholarship has been able to present a more nuanced history. A common Western narrative is that Brazil had an active nuclear weapons programme that was later abandoned, though non-proliferation commentators are often quick to add that there is always a threat that it could be resumed at a later time.⁴ Oral histories and archival research has suggested that this narrative does not stand up to scrutiny.⁵ Resolving these misperceptions is important, since what one believes about Brazilian nuclear history has a bearing on the degree to which Brazil's actions and expressed intentions within the GNO today are deemed to be made in good faith.

Brazil does have a military nuclear programme, though not to develop nuclear weapons: rather, to build and operate a nuclear-propelled attack submarine. This has been an ambition of the Brazilian Government and Navy for decades, and the Bolsonaro Government elected in 2019 has indicated strong support to complete the programme. If successful, Brazil would join only six other countries (all nuclear weapon possessors) with this capability, becoming the first non-nuclear possessor state to have such an indigenously-produced vessel. How the Brazilian government elects to apply nuclear safeguards to this programme will therefore set an important global precedent, as Brazil will not be the last country to develop such a capability.

In summary, Brazil stands out among many non-nuclear possessor states both for its relatively-advanced military and civil nuclear programmes, and for its advocacy for a progressive agenda in disarmament and the peaceful uses of nuclear technology.

The Conceptual Framework

The PNR defines nuclear responsibilities most broadly as the responsibilities of states and other actors around nuclear weapons, avoiding labelling a state as either 'responsible' or 'irresponsible.' The PNR's operating principle is that states have 'common but differentiated responsibilities' (CBDR) within the global nuclear order, a framework also adopted in the United Nations Framework Convention on Climate Change (UNFCCC). Within the PNR's approach to CBDR, nuclear possessor states have so-called 'special responsibilities'⁶ resulting from their possession of nuclear weapons, but non-nuclear possessor states also have responsibilities, according to their level of access to power and historical roles in the perpetuation of the global nuclear order.⁷

Four key concerns – one categorical, and three regarding the effectiveness of CBDR as applied to nuclear issues – were raised during the roundtable.

First, as in much of traditional International Relations theory, the framework's referent has been state actors ('the responsibilities of states'). One participant proposed decoupling responsibilities from states and talking instead about the responsibilities of 'social actors' and 'constituencies' within the global nuclear order. This was argued on the basis that states are not unitary actors with coherent understandings of their roles or responsibilities, and so a state-based framework runs the risk of riding roughshod over nuance or obscuring minority voices within states. A shift from the state-centric focus to one where responsibility is discussed at multiple levels, by contrast, would enable the inclusion of other communities such as the military, parliamentarians, students of nuclear policy and international relations, and social movements not currently working on nuclear issues, such as those working on peace initiatives or climate change.

Second, the effectiveness of the CBDR framing to advance international trust-building, nuclear risk reduction, and disarmament, was challenged by some in the room. Participants noted that the spirit (if not the letter) of CBDR already exists in the non-proliferation and disarmament regime, and pointed out that thus far it hasn't worked to secure disarmament.⁸ The so-called bargain at the heart of the NPT puts a responsibility on the Non-Nuclear Weapon States (NNWS) not to develop nuclear weapons, and a special responsibility, under Article VI on Nuclear Weapon States (the five NWS as recognised under the NPT) to negotiate in 'good faith' towards disarmament.⁹ It is evident that most NNWS are adhering to their NPT obligations not to acquire or develop nuclear weapons, adhering to safeguard arrangements in the NPT. The five NWS on the other hand, seem committed to retaining their arsenals for the foreseeable future, reneging on their Article VI responsibilities. The four non-NPT NPS also seem committed to retaining their arsenals. Whilst it is possible to note numerous successes of the NPT such as the declining proliferation rate

witnessed after the implementation of the NPT and the high percentage of states that were capable of developing weapons but have exercised restraint (75%), few would consider the NWS to have been successful in achieving their Article VI commitments.¹⁰

Third, it was argued at the workshop that although CBDR is a central operating principle of the United Nations Framework Convention on Climate Change, it has not effectively curbed carbon emissions to within safe limits. Under the Paris Agreement, states need only make 'voluntary national contributions,' and are not each mandated to reduce emissions to specific levels. On the current trajectory, the world is due to warm to 3.0° above pre-industrial levels (predictions based on current policies), and it is arguable that CBDR is too weak to be able to put sufficient pressure on states to amend their behaviours before the point of no-return is reached.¹¹ On this basis, the room questioned how successful CBDR could be as an operating principle in the nuclear policy sphere. The riposte, although counterfactual, might be to ask whether the Paris Agreement is 'better than nothing' or whether agreement using a stronger alternative principle should have been used, even if it would have reduced the likelihood of getting multilateral agreement.

Finally, one participant questioned whether segmenting responsibilities through the CBDR framing too far would have the intended consequence of bringing states together or the unintended effect of dividing them further and perhaps fomenting tribalism? Answering this critique is difficult given the lack of evidence, though the intention of the Programme is very much to highlight collective global responsibilities over tit-for-tat horse-trading driven by national concerns.

Nuclear Responsibilities: Unilateral or Reciprocal?

Should states fulfil their responsibilities regardless of the actions of others, or should responsibilities only be discharged on a reciprocal basis? There are countless examples in the nuclear non-proliferation and disarmament regime of states withholding from taking certain actions before they see measures being taken by others: such behaviour is a mainstay of diplomacy more generally. Among them, Brazil and several other NNPS have opposed taking on additional responsibilities such as adoption of the Additional Protocol (AP) without the possessor states demonstrating progress on their Article VI commitments.¹² There are opportunities and costs to both approaches: taking unilateral action without being sure of reciprocity risks allowing competitors to free ride, while withholding from making progress while attempting to bargain can slow overall progress and embed stalemates.

There was a measure of agreement at the roundtable that NNPS lean towards unilateral actions that demonstrate an awareness of their responsibilities and serve as a model for the nuclear possessor states. Possessor states are inherently conservative when it comes to making fundamental changes to their nuclear programmes, and proliferation risks are a key concern that will need to be allayed through extensive assurances. NNPS who take an active role in implementing and communicating their responsibilities can lay claim to a strong leadership role in relation to the global nuclear order, based on an enlightened view of their own interests and values that are irrespective of the actions of the nuclear possessors, but would also provide fewer excuses for the lack of progress on disarmament. As one participant put it, rhetorically: 'Does a leader wait for others to do something first?'

Perceptions of Brazil in the Global Nuclear Order

The international community's perception of Brazil's nuclear programme and behaviour within the nuclear regime is misaligned with its domestic narrative, particularly in respect of three common perceptions, that Brazil:

- once had a nuclear weapons programme;
- takes advantage of nuclear latency today, as a hedge in case it decides to develop nuclear weapons in the future, and;
- deliberately lags behind on the adoption important nuclear regime norms, such as an Additional Protocol, as part of its hedging strategy.

It is important to address these perceptions, as they serve as important context when it comes to considering Brazil's nuclear responsibilities.

Did Brazil Pursue Nuclear Weapons?

The dominant perception is that Brazil began a covert nuclear weapons programme during the 1970s and 1980s, a claim often repeated in news outlets and popular knowledge platforms like Wikipedia.¹³ Within this narrative, the main driver of the alleged programme was regional competition and a security dilemma with Argentina, which resulted in spiralling competition between the two countries to develop nuclear capabilities. Brazil is said to have later rolled back its nuclear weapons programme due to financial constraints and a lack of political will following Brazil's transition to democracy in 1990.¹⁴

To support this view, proponents often cite Brazil's consistent defence of its sovereign right to pursue uranium-enrichment technologies, which has resulted in it being one of a number of states in the world to possess all major aspects of the nuclear fuel cycle. The concern to the outside world was that Brazil was using its civil nuclear energy programme to covertly develop weapons-grade uranium for a bomb. Dispelling this view was not helped by Brazil's public defence of the right of non-nuclear possessor states to conduct peaceful nuclear explosions up until the 1990s, which led commentators to believe that even if Brazil never managed to develop nuclear weapons, it is not because they did not want to.¹⁵

The Brazilian narrative is rather different: one of pursuing peaceful nuclear technology, cooperation with Argentina, and of self-regulation even before becoming an NPT signatory. This narrative is borne out in oral history and archival evidence. Academics Rodrigo Mallea, Matias Spektor and Nicholas Wheeler offer a 'Critical Oral History' of Brazil and Argentina's nuclear cooperation in which they conclude that neither Brazil nor Argentina were particularly concerned about rumours of weaponisation after they respectively announced their enrichment capabilities.¹⁶ A lack of suspicion, they note, stems from an acknowledgement that 'neither side was seriously working towards enriching vast quantities of uranium at bomb level.'¹⁷ Using declassified documents, Matias Spektor supports this argument, concluding in 2016 that 'at no point were Brazil's nuclear policies primarily motivated by the goal to build nuclear weapons.'¹⁸

Whilst there was some political interest in a nuclear weapons programme from high-level individuals in Brazil, such as General Leônidas, this more nuanced appraisal concludes that Brazil and Argentina's relationship 'should not be interpreted as a case of security dilemma dynamics.'¹⁹ Cooperation on nuclear issues actually started well before the two countries transitioned to democracy. Mallea et al stated that 'new archival materials show that between 1967 and 1979 there were no fewer than four attempts at drafting a bilateral nuclear agreement. The Brazilian nuclear sector and foreign ministry put forward proposals in 1967, 1972 and 1979, while Argentina's nuclear commission took the initiative in 1974.'²⁰ This cooperative and predominantly peaceful relationship continued more publicly in the 1980's, with Brazilian President José Sarney and Argentine President Raúl Alfonsín announcing the Iguazu Declaration that emphasised the vital role nuclear technology would play in economic and social development for Latin America in 1985.²¹ Drawing on Mallea et al's oral history once more demonstrates that through a series of face-to-face interactions, Presidents Sarney and Alfonsín were able to build 'empathy and trust between them, with positive and far-reaching consequences for the relationship between their two countries.'²²

Experts present were eager to add that security dilemma dynamics should not be assumed in Latin America, where regional security is understood in fundamentally different ways. Participants noted that South America does not think of its security in terms of conventional deterrence. It is not caught up in nuclear weapons security dynamics beyond the general threats that nuclear weapons pose to life on Earth, and states in the region do not rely on extended nuclear deterrence. Instead, regional security issues are dominated by concerns of poverty and inequality, described by some participants as South America's own 'weapons of mass destruction.' Human security and development constitute the core priorities in the region, and consequently, development has always been a fundamental driver of the Brazilian nuclear programme. This point is explored further by Mallea et al, who claim that the relationship built between Brazil and Argentina through nuclear cooperation reshaped the regional environment of South America, spilling over into issues of free trade and democracy promotion. This resulted in unprecedented levels of region formation in South America, which may have further contributed to the lack of security competition today.²³

Togzhan Kassenova of the Carnegie Endowment for International Peace, in her defining monograph *Brazil's Nuclear Kaleidoscope* (2014), has helped share these conclusions in the United States and wider Anglosphere, making the case that Brazil's attachment to its indigenous uranium-enrichment capability came out of a desire for 'modernity, technological independence, and prominence.'²⁴ Nevertheless, there is much to be done to dispel this persistent perception.

Is Brazil a Nuclear 'Hedge' State?

Brazil is sometimes accused of 'hedging' between being a non-nuclear possessor state and becoming nuclear-armed, should it perceive a need to do so. This in turn causes commentators to sometimes describe Brazil as a 'threshold' state, defined by William Walker as one 'standing on – or moving towards – the threshold between not possessing and possessing operational nuclear weapons,' although this description appears only be accurate in terms of Brazil's access to technology.²⁵ This second perception on hedging is principally based on four interrelated factors.

First, Brazil is a nuclear 'latent' state. Ariel Levite defines nuclear latency as describing 'the acquisition of nuclear-weapon-relevant technology and fissile materials as an (unintended) consequence of nuclear power and other non-nuclear weapon activity.'²⁶ Levite's definition provides a nuanced understanding of latency which highlights that nuclear latent states need not have an intention to develop nuclear weapons: the key distinction between a state that simply has

the technological means, and a state that consciously pursues a nuclear weapons programme to just below the point of weaponization: a hedging state.

Brazil is considered latent insofar as it retains a relatively-high level of technical knowledge and infrastructure from its civil nuclear fuel cycle that could, in theory, be directed towards nuclear weapons production. This being said, scholars Matthew Fuhrmann and Benjamin Tkach have created a dataset which suggests as many as 31 states have developed nuclear latent capabilities over the past 70 years, nine of which currently possess nuclear weapons.²⁷ Of the remaining NNPS possessing nuclear latent capabilities, some raise more concerns than others, in particular Iran. Much of this international concern has far more to do with identity and the extent to which the latent state is engaged with the non-proliferation regime, than actual latency. Fuel cycles capabilities are not in themselves evidence of intent to develop nuclear weapons or hedging behaviours.

Second, the perception that Brazil once sought nuclear weapons may leave the impression that there are still within the elites and establishment who would do so again. Dispelling the original perception that Brazil had an active nuclear weapons programme, as in the section above, should lessen this particular concern, even if it does not logically preclude the possibility that Brazil might weaponise.

Third, the safeguarding concerns posed by Brazil's nuclear-propelled attack submarine programme have led some analysts to conclude that one of the objectives of the programme is to divert fissile material out of civil nuclear safeguards, in order to use it for weapons purposes.²⁸ This is an important concern, but it is a step too far (and perhaps evidence of confirmation bias) to automatically assume that this is the primary reason why Brazil might want to add a layer of secrecy to this material, for there are other valid national security rationales.

Fourth, Brazil's unwillingness to date to complete an Additional Protocol with the IAEA has been used by critics as evidence of Brazilian bad faith or obstructionism within the non-proliferation regime. The universalisation of the Additional Protocol is indeed an elegant non-proliferation solution; however, it is by no means the only way to ensure that proliferation is not taking place. Crucially, such concerns are not shared by Brazil's closest neighbour and supposed largest rival, Argentina, with whom Brazil is engaged in a bilateral safeguards arrangements under the auspices of the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC): a binational agency to verify each others peaceful use of nuclear materials, created in 1991.²⁹ Brazilian and Argentinian representatives at the roundtable stressed that these arrangements were more than sufficient to meet the other side's bilateral concerns, and that Argentina understands well Brazil's politics and intentions as a regional power.

Is Brazil a 'Lagger' on Nuclear Norms?

The third common perception is that Brazil lags behind when it comes to taking up international nuclear norms. To a certain extent, this is true: Brazil only joined the NPT in 1998, holding out for many years on the basis that the imbalance of obligations within the treaty that put disproportionate constraints on NNWS in spite of a lack of clear commitment towards global nuclear disarmament.³⁰ While Brazilian leaders do not wish to see any role back of nuclear norms today (and in fact sought to strengthen the norm of non-use through the TPNW), participants were ready to admit that the country had not necessarily been as fast-moving as some other states in the international community. This they put down to their late involvement with the non-proliferation regime in the 1990s.

Participants were quick to add, however, that the nuclear normative 'goal posts' keep shifting. One individual described a pattern in which every time Brazil caught up with a new norm, the normative standards would change and international expectations would rise again. The main criticism levelled against Brazil in this regard is their refusal to sign an Additional Protocol (AP), which is discussed in a later section of this report. Moreover, these normative standards were not set by Brazil or their Latin American neighbours, but rather by those dominating the non-proliferation regime: the NWS as recognized by the NPT. From a Brazilian perspective, the NWS often fail to appreciate the contributions that Brazil has sought to make to regional norms set by arrangements, such as through ABACC, or to global norms, as by the TPNW. Further, the ABACC model could be usefully exported to help mitigate nuclear security dilemmas in other parts of the world.



Angra Nuclear Power Station in Brazil. Photograph by Mike Peel (www.mikepeel.net).

How does Brazil Discharge its Nuclear Responsibilities?

During the roundtable, Brazil's responsibilities to the global nuclear order were discussed with respect to the three pillars of the NPT. These responsibilities were noted as deriving from commitments in national and international law, and the conversation focused on Brazil's current adherence to these responsibilities.

Responsibilities for Non-Proliferation

Brazil is a party to a host of treaties that demonstrate its commitment to non-proliferation at the international level, but has also made commitments at the national and regional level. However, Brazil's reputation (which is partially beyond its control) on non-proliferation is mixed.

At the international level, Brazil was a latecomer to the NPT, resisting joining until 1998, principally on the basis that the regime is discriminatory and unfair. In particular, Brazil took issue with the disproportionate NNWS obligations and a lack of emphasis within the treaty on global nuclear disarmament.³¹ Alongside the NPT, Brazil is a party to all major international non-proliferation treaties including the 1959 Antarctic Treaty and the 1996 Comprehensive Test Ban Treaty (CTBT) and actively engages in the Missile Technology Control Regime (1995) and the Nuclear Suppliers Group (1996).³²

Brazil has also made significant non-proliferation commitments at the regional level. During the 1960s, Brazil played a dominant role in the pursuit of a nuclear weapon-free zone in Latin America which materialised through the Treaty for the Prohibition of Nuclear Weapons in Latin America, or

Treaty of Tlatelolco. Brazil signed the Tlatelolco treaty in 1967, and ratified it in 1968. By 2002, Cuba deposited its instrument of ratification and the treaty came into full force throughout the region.³³ Since 2002 the Tlatelolco Treaty has bound all 33 countries across Latin America and the Caribbean to an international commitment not to acquire, manufacture, test, use, or station a nuclear explosive device in their sovereign territory.

Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC)

Part of the justification for resisting joining the NPT in the later years was Brazil's unique safeguards arrangement with Argentina. Cooperation on nuclear issues between Brazil and Argentina began in 1980 when the two states signed the Agreement on Cooperation for the Development and Application of the Peaceful uses of Nuclear Energy. In the following years, the Brazilian and Argentinian leadership made numerous joint statements on the necessity of the exclusively peaceful purposes of nuclear energy, and on the need to align their respective nuclear programmes which resulted in the Guadalajara Agreement for the Exclusively Pacific Use of Nuclear Energy (Bilateral Agreement) in which, among other measures, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) was created.

The objective of ABACC is to administer and apply the Common System of Accounting and Control of Nuclear Materials (SCCC) in Brazil and Argentina, which verifies to one another and the international community that no nuclear material was being diverted to use in nuclear weapons. In this regard, ABACC has served as a confidence-building measure, establishing a cooperative, strategic partnership between Argentina and Brazil, and to some extent reassuring the international community of the two countries' dedication to peaceful uses of nuclear energy, a commitment to transparency and mutual trust-building that might strengthen regional and international security.³⁴ The Quadripartite Agreement between Brazil, Argentina, the IAEA and ABACC, which entered into force in 1994 and which was aimed at consolidating the application of safeguards in Brazil and Argentina, enables ABACC and the IAEA to conduct joint inspections.³⁵ Brazil, thus, has a sophisticated safeguard regime involving two individual agencies: ABACC and the IAEA.

Participants at the roundtable agreed that ABACC has been a positive instrument; it has never given rise to doubt about compliance, and the principle of 'neighbours watching neighbours' has helped to develop a close and trusting relationship between the two powers. However, participants believed this was not how ABACC was perceived by the international community.

Sure of the positive benefits of the unique bilateral arrangement, some participants suggested its potential application to other cases of regional rivalry, in particular Southern Asia, the Middle East, and the Korean Peninsula. This is not a new proposition. Paolo Foradori and Martin B. Malin note that important lessons can be learned from the experience of ABACC, as does José Goldemberg et al, who suggest that the logic behind supporting bilateral arrangements comes from the confidence and trust-building abilities of regionally focused initiatives.³⁶ They note further that such initiatives might then serve, in time, to bring competing neighbours further into the international non-proliferation and disarmament regimes.³⁷ There are debates however, over the extent to which the success of ABACC relied on prior levels of trust between the Brazilian and Argentinian leaderships. This is the argument made by Mallea et al, who argue 'that inter- personal relationships of trust between top-level diplomats, nuclear scientists, and even political leaders play an important, but hitherto marginalized, role in understanding the origins of the nuclear rapprochement.'³⁸ In such a case, ABACC may at the very least help maintain (if not also help develop) trust. Certainly, arrangements like ABACC are not an easily-exported panacea, but there

appear to be lessons that can be learnt from Brazil and Argentina's experience that might have salience in responding to 21st century concerns.

ABACC and the Additional Protocol

As a party to the NPT, Brazil accepts safeguards outlined in Article III of the NPT and in IAEA INFCIRC/153.³⁹ Yet whilst it is not perceived as an immediate proliferation threat, a commonly held view in Western circles is that Brazil could do better to contribute to the non-proliferation regime, and specifically, that Brazil has a responsibility to conclude an AP with the IAEA (despite its voluntary nature).⁴⁰ The principal concern of the international community is that ABACC safeguards only apply to declared nuclear activities, whereas the model AP permits the IAEA 'complimentary access' to conduct verification activities in undeclared locations. Such a level of access (or greater) is the only way the IAEA can be assured that a state is not developing nuclear weapons.⁴¹ The roundtable's participants were mixed on this assessment, with some advocating the view that if ABACC can reassure Brazil's closest competitor then the rest of the world should also be assured of its peaceful intentions.

The view of the Brazilian Government is that Brazil should not and will not sign the AP until significant further steps towards disarmament have been taken by those possessing nuclear weapons, whom it alleges are renegeing on their responsibilities outlined in the NPT, and that the present arrangements with ABACC and the IAEA are sufficient to allay any safeguarding concerns.

Kassenova notes that 'both the official establishment and the expert community in Brazil argue that the new Nuclear Suppliers Group language recognizes that the ABACC's safeguards are sufficient.'⁴² The NSG guidelines allow for sensitive technology transfers to states 'implementing appropriate safeguards agreements in cooperation with the IAEA, including a regional accounting and control arrangement for nuclear materials, as approved by the IAEA Board of Governors.'⁴³ On this basis, ABACC and the Quadripartite agreement are deemed sufficient for NSG purposes in place of an AP; the NSG was persuaded by the joint mutual arrangements under ABACC and the SCCC.⁴⁴ Nevertheless, a closer look at the language shows that the NSG only accepts regional safeguards arrangements pending adoption of the AP.⁴⁵

There have been discussions about Argentina signing the AP in recent years, both because Argentina's civil nuclear programme is oriented around export and because the Argentinian Ambassador Rafael Grossi was appointed Director General of the IAEA in December 2019 – an election campaign in which Brazil was also heavily involved. If this happens, it may force Brazil to reconsider its position, if it wishes to continue to work in tandem with Argentina. Nevertheless, participants seemed confident that Argentina would not do so imminently and that the two countries remain largely aligned on this matter. There has also been some change in the attitude of Brasilia in recent years: rather than refusing to discuss the AP, the Government and Navy are debating the prospect more publicly. This may be seen as part of a broader positive trend towards transparency in the Brazilian the Navy.⁴⁶

Responsibilities for Disarmament

Brazil has played a prominent role in promoting nuclear disarmament since the mid-1990s, as a founding member of the New Agenda Coalition (NAC) which led efforts towards the adoption of the 13 Practical Steps in the 2000 NPT Review Conference, and taking on the presidency of the 2005 NPT Review Conference. In 2016, Brazil was one of the co-sponsors of the UNGA resolution that mandated negotiations for the TPNW, which it subsequently signed in 2017, but has yet to

ratify. The official position of Brazil is to support the TPNW, having achieved consensus support for the treaty in the executive branch, but no estimate was given for when Brazil would ratify.

Where states choose to stand in relation to the TPNW is a polarizing issue, but the tensions between support and opposition for the Treaty is also felt within the relatively small nuclear weapons policy community within Brazil. Two arguments were made in support of the TPNW, which have been heard in previous debates at the international level. The first praised the humanitarian focus of the TPNW, which seeks to put victims of nuclear use to the centre of the debate. The second is that a step-by-step approach to nuclear disarmament has not produced significant outcomes in recent years and should be re-energised.⁴⁷ It was noted that the US Creating the Environment for Nuclear Disarmament initiative (CEND) and the France-Germany Nuclear Disarmament Verification Initiative were both indirect offspring of the TPNW and should be recognised as successes of the TPNW.

Participants' major concern with the TPNW was that it contains safeguards standards that fall short of the AP. Rather, the TPNW sets the IAEA Comprehensive Safeguards Agreement as the minimum verification requirements, which many believe to be ineffective at identifying clandestine nuclear activity.⁴⁸ These criticisms are perhaps overstated considering that the TPNW neither allows states to alter their existing safeguard arrangements, nor does joining the TPNW require a state to renege on its NPT commitments. Recently, leading TPNW states have spoken out to reaffirm that the NPT is the 'cornerstone' of the non-proliferation and disarmament regime, and that they are not seeking to replace it.

Brazil appears to recognise a responsibility to lead in the implementation and expansion of nuclear weapon-free zones Brazil played a pivotal role in the creation of a NWFZ in Latin America, which came into force in 1969 under the Treaty of Tlatelolco. Brazil also strongly supports the creation of NWFZs elsewhere, notably the Middle East; a participant noted that Brazil had recently held a meeting on this issue in New York.

Responsibilities for the Peaceful Uses of Nuclear Technology

Brazil strongly defends its right to develop peaceful nuclear capabilities, and the pursuit of greater access to nuclear technology for development, health and environmental protection was one of the main drivers for Brazil to join the NPT.⁴⁹ Brazil can be said to have demonstrated this commitment through its founding membership of the IAEA, and its role as a provider and recipient of nuclear technology and membership to the NSG. It is also a party to all relevant nuclear safety and security treaties including The Convention on Nuclear Safety (1994); The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997) and The Convention on Early Notification of a Nuclear Accident (1986).

Safety and security of the nuclear programme in Brazil provides a relatively good story. A particularly positive shift is the decision to create an independent regulatory agency separate from the National Nuclear Energy Commission (CNEN), which will help overcome concerns about conflicting interests, since CNEN has traditionally been responsible for both licensing and inspecting state companies under its control.⁵⁰ The creation of an independent regulatory agency will see these functions separated, adding an extra layer of independence and accountability to nuclear regulation. This is particularly important given the corruption challenges Brazil has faced, which are discussed in the next section.

Responsibilities around Brazil's Nuclear-Propelled Attack Submarine Programme

Since the 1970s, Brasilia has remained committed to the development of a nuclear-propelled attack submarine, named the Álvaro Alberto. Whilst beginning in the 1970's, completion of the submarine programme has been continually pushed back, with one participant noting that 'it's always 10 years away.' The completion date is now being pushed back as far as 2030. Two concerns over Brazil's submarine programme were raised: how it will be safeguarded, and the type of fuel that will be used. These speak to a broader debate about transparency and ambiguity, a recurring theme throughout the roundtables BASIC and the ICCS have held under the PNR.

First, the Western non-proliferation community has demonstrated persistent concerns about the possibility of nuclear materials being diverted towards nuclear weapons development during the unsafeguarded periods.⁵¹ This is because the NPT permits states to 'exempt nuclear material from international safeguards for use in nuclear submarine programs.'⁵² While there are reasonable national security logics for trying to limit the access of safeguards inspectors to sensitive military technologies, this exemption is frequently cited as a major 'loophole' of the non-proliferation regime, since the NPT does 'not address the military uses of nuclear technology beyond nuclear weapons.'⁵³ How the Brazilian Government negotiates the submarine safeguards question will set an international precedent that may influence how other non-nuclear possessor states developing nuclear-powered attack submarines in future years, such as South Korea, apply safeguards.⁵⁴ This puts a particular responsibility on Brazil to address this important issue.

It was repeatedly emphasised, however, that there are currently no safeguards applied to the submarine programmes of the NWS (because of the NPT 'loophole') or India, which lies outside the regime. Disproportionate concerns are therefore raised over Brazil's programme compared to those of possessor states, which participants saw as a continuation of the discriminatory nature of the non-proliferation regime. These concerns also ignore the more extensive safeguards applied to Brazil through ABACC and the Quadripartite Agreement, the latter of which means that Brazilian nuclear material will be subject to safeguards up until the point the nuclear reactor enters the submarine, the rest of the fuel cycle is subject to the same safeguards as all other nuclear material.⁵⁵ Since conclusion of an AP would enable the IAEA access to parts of the submarine programme, the Brazilian Navy prefers to proceed slowly on applying extra safeguards to the submarine programme until the other countries with nuclear-propelled attack submarines (the N5 and India) offer up their installations to safeguards.

Second, participants raised concerns about the current level of ambiguity around uranium enrichment levels, with the particular concern being that observers could believe enrichment levels might make the same material weapons grade (highly enriched uranium (HEU)). Nuclear-propelled attack submarines can use HEU, as in the US, UK, Russian and Indian fleets, the upside being that reactors are lighter and smaller than low enriched uranium (LEU).⁵⁶ However, the Chinese and the French opt for LEU (up to 10%), and there are calls for the others with this capability to do the same.⁵⁷ The extent to which the Navy should be transparent on this matter was debated with no consensus at the roundtable, with some participants arguing that greater clarity around the enrichment level would dampen international concerns, whilst others defending the need for ambiguity when concerning a military programme. If it were possible, a guarantee that only LEU will be used – irrespective of the final enrichment level – might a positive start.

On both the issue of safeguarding and of transparency around fuel, Brazil has a responsibility to consider and try to shape the precedent that it will be setting for the international community. In doing so, it may also help pave the way for changes in the programmes of the N5 and India.

Proposed Nuclear Responsibilities of Brazil

Throughout the day participants were invited to suggest responsibilities of NNPS and more specifically for Brazil. This list in the box below is the list of responsibilities, given in full, that the participants proposed for Brazil. The list is by no means exclusive and is presented in no particular order.

- Responsibility to provide verifiable evidence and regularly restate assurances disavowing nuclear proliferation.
- Responsibility to maintain high levels of transparency around its nuclear programme, and specifically to try to provide the maximum possible transparency around the nuclear-propelled submarine – as far as national security will provide – in order to set a positive and sustainable safeguards precedent for other states.
- Responsibility to use non-military aspects of state power to influence nuclear possessor states to make progress on nuclear disarmament.
- Responsibility to protect the environment, taking a holistic, sustainable and long-term perspective.
- Responsibility to guarantee the safety and security of nuclear activity sites.
- Responsibility to proactively combat hearsay and disinformation on nuclear issues by providing accurate information.
- Responsibility to prevent corruption and institute effective accountability mechanisms.
- Responsibility to educate the broader population on nuclear issues, to enable fuller participation in the democratic process.
- Responsibility to provide or incentivize academic education and professional training on nuclear science and technology, nuclear strategic thinking, and nuclear politics to a high standard.
- Responsibility to respect and protect current nuclear norms, especially in the context of new challenges.
- Responsibility to contribute to regional stability in Latin America, in order to minimise nuclear proliferation risks in the region.

Opportunities and Challenges

The Future of ABACC and Relations with Argentina

What is the future of ABACC? The Agency turned 25 years old in 2016, prompting reflections on its achievements to date and a collective need to think about the next quarter century in order to preserve ABACC utility and integrity.

The greatest concern for some was Brazil's foreign policy shift away from political and economic stability in South America towards a more global focus. The consequence of Brazil's desire to be seen as a 'global player,' and increasingly as independent of the BRICS nations, has been reduced attention to the region, and in particular, Argentina's relevance to Brazil, with one consequence being a sense of decay in the bilateral relationship. Not all participants shared this view, however, and reassurance were given that Brazil and Argentina remain close, and Argentina is not becoming less relevant, as recently demonstrated in the unprecedented support Brazil gave to Argentina to ensure Argentinian Rafael Mariano Grossi was elected as Director General of the IAEA.⁵⁸

Brazil, Argentina and in consequence, ABACC, will need to consider how they will relate to the AP over the next 25 years, particularly in the face of political pressure to make the AP the minimum standard for safeguards. At least two eventualities can be imagined if Argentina were to move to sign the AP unilaterally: it could encourage Brazil to reconsider its position on the AP, or it could challenge future cooperation between the two countries. Alternatively, if Brazil and Argentina were to sign the AP together, it may risk making irrelevant the bilateral system of safeguards that has fostered cooperation between the two states over the past 25 years.⁵⁹

In place of signing the AP, and in the context of calls for higher safeguard standards, ABACC has an opportunity to review its own application of safeguards, and role within the region. There may also be an opportunity for ABACC to expand its remit beyond Brazil and Argentina, to incorporate the rest of the region, and find new roles for itself as a confidence-building institution.⁶⁰

Corruption in the Nuclear Industry

Corruption allegations have been one of the more recent constraints on Brazil's nuclear programme. Since 2014, the country has been gripped by Operation Lava Jato (Operation Car Wash), an all-encompassing high-level corruption investigation that has spilled significantly into the nuclear sector.⁶¹ In 2015, Navy Admiral Othon Luiz Pinheiro de Silva, a leading individual in developing Brazil's nuclear capabilities was arrested on charges of receiving bribes during the construction of Brazil's third nuclear reactor, Angra 3. In March 2019, former President Michel Temer, responsible for launching the construction of the Brazilian Multipurpose Reactor, was arrested on the same bribery charges. The collusion between private companies and public officials, which resulted in these charges, bought a halt in Angra 3 construction.

Although the Navy has reacted to Operation Car Wash fairly swiftly and engaged with more cooperation with the office of public prosecution, these charges raise serious concerns about

transparency and accountability of Brazil's nuclear programme. Corruption challenges also question Brazil's responsibilities as an advanced nuclear technological state – there must certainly be a relationship between responsibility and corruption – although issues of corruption within the nuclear sphere are global and as such should face global exploration. Brazil now has the task of cleaning up nuclear financing and will need to establish stronger oversight to tackle collusion and embezzlement.

Democratic Control of the Nuclear Programme

The Brazilian Navy has always played a leading role in Brazil's civilian and military nuclear capabilities; both programmes began under military regimes in the 1970s and 1980s. The Navy was responsible for developing uranium enrichment technology which it now leases to the civilian programme. Under the new Bolsonaro administration, the military has been promised a prominent role across the whole administration, but particularly within nuclear policy.⁶² A growing number of military officials now hold positions within the government responsible for the civilian nuclear sector. Consequently, the Navy's role, which appears to be growing, leads to questions about who in Brazil really controls nuclear decision-making, leading some to be concerned that democratic controls over nuclear policy may erode further in time.⁶³ One participant raised this in the context of the relationship between democracy and nuclear responsibility, noting that if Brazil is trying to demonstrate responsibility through greater transparency and accountability, then an expanding Naval role would seem counterintuitive.

Others at the roundtable, however, whilst not denying the significant role of the Navy, acknowledged that in certain areas the Navy is actually demonstrating greater openness and transparency, such as by demonstrating a willingness to discuss the AP. The fact that the military also houses the majority of the expertise on the nuclear programme, as well as a lack of human resources in the civilian nuclear sector and an overall popular disinterest in nuclear issues, limits Brazil's ability to bolster civilian control over nuclear policy. There also appear to be little domestic resistance to the military's role precisely because it is deemed as efficient.⁶⁴ Maintaining and perhaps enhancing civilian control over nuclear policy will remain a challenge to Brazil in the coming years, as it figures out how to intersect civilian and military controls with its nuclear responsibilities.

Demographic Concerns

Around the world, there are difficulties in attracting and retaining scientists, technologists, and political analysts to the nuclear sphere, stemming from the fact that the science is now relatively old and a shortage of permanent positions. Matt Korda writes that young people are increasingly unhappy in the nuclear policy world, their discontent exacerbated by unrepresentative demographics and a commitment to stale thinking within the field.⁶⁵

This issue is felt keenly in Brazil, creating concerns about a generational gap in Brazil's nuclear sector that could pose a serious challenge to the future of Brazil's nuclear programme. With current experts in the field declining, and not enough young scientists interested in the field, there may not be the indigenous know-how to continue the programmes current and planned capacity. The lack of youth interest in the nuclear programme could also hold back Brazil's ability to modernise its 70-80 year old technology, posing a challenge to Brazil's position as a leading nuclear technology NNPS. Is it thus the responsibility of states to ensure the sustainability of their nuclear programmes by engaging future generations?

Participants therefore showed support for youth engagement initiatives globally, such as that led by the Argentinian Government as part of its preparations to chair the 2020 Review Conference. Beyond technical education, participants were also keen to see Brazil support initiatives to educate young people on nuclear issues at a political and strategic level. Participants believed that if Brazil wishes to continue developing its nuclear programmes, provision of this education and continued engagement with non-governmental actors constitutes an important responsibility of Brazil.

Environmental Considerations

Better aligning Brazil's nuclear and climate change policies emerged as an important nuclear responsibility, that would provide an opportunity for the state to demonstrate a global leadership role. Given Brazil's size and role within global politics, Brazil should be actively engaged in a project that seeks to establish consistency between nuclear and environmental issues. Immediate environmental reforms would include reducing the harmful impacts of Brazil's nuclear power programme, for example, by improving the management and disposal of radioactive waste from both Brazil's civil and military nuclear programmes, and strengthening environmental protection measures around uranium mining. Furthermore, Brazil needs to consider how nuclear energy could better be used across the region as a clean alternative to fossil fuels, pertaining to the peaceful uses of nuclear energy enshrined in the NPT. Such environmental policies need to consider present day measures, but also consider environmentally responsible long-term management solutions.

Conclusion

An overarching theme emerging from the roundtable is that Brazil is not accurately understood by those outside of South America. Whilst misperceptions are not uncommon in international relations, Brazil seems to have experienced overwhelming misinterpretation of its nuclear intentions, and while feeling an underwhelming appreciation for its effort towards ensuring non-proliferation in the region through ABACC and the Quadripartite agreement. Remaining outside of the global non-proliferation regime for so long perhaps acted as a catalyst for international concerns regarding Brazil's nuclear latency status; however, evidence cited in this report provides a more nuanced view.

This view instead frames Brazil as a state that never had official intentions to develop nuclear weapons, prioritising development and technological independence over an intentional nuclear 'hedge.' With the exception of an AP, Brazil can now be seen as a state committed to compliance with treaties and non-proliferation norms. Further investigation also highlights the significant and unexpected transformation from nuclear rivalry to nuclear cooperation between Brazil and Argentina that has helped cement a NWFZ in Latin America and a strong strategic relationship between the two states. ABACC would appear to provide a model that is worth studying for potential application to other nuclear rivalries.

Brazil faces numerous future challenges, which it should consider in relation to its national, international and cosmopolitan responsibilities. It must, with Argentina, consider the future relevance and sustainability of ABACC, and how choose how to fuel and safeguard its nuclear-propelled attack submarine programme. It must also address its corruption issues, and find new ways to foster public education and non-governmental engagement to support its ambitions. If addressed properly, these challenges may provide an opportunity for Brazilian leadership in the GNO, setting new standards among the non-nuclear possessor states, especially those with nuclear latency, and give the country a greater ability to lead the nuclear possessor states by example.

Endnotes

- 1 Toby Dalton, Togzhan Kassenova, Lauryn Williams, 'Perspectives on the evolving nuclear order', *Carnegie Endowment for International Peace*, (2016), <<https://carnegieendowment.org/2016/06/06/perspectives-on-evolving-nuclear-order-pub-63711>>.
- 2 *World Nuclear Association*, 'Nuclear power in Brazil,' 2019, <<https://www.world-nuclear.org/information-library/country-profiles/countries-a-f/brazil.aspx>>.
- 3 Matias Spektor, Togzhan Kassenova, Lucas Perez Florentino, 'Brazil's nuclear posture under Bolsonaro', *Arms Control Association*, 2019, <<https://www.armscontrol.org/act/2019-09/features/brazil%E2%80%99s-nuclear-posture-under-bolsonaro>>.
- 4 See for example Jean Krasno, 'Brazil's secret nuclear program,' *Orbis*, 38:3, (1994), pp. 425-437, and *Global Security*, 'Brazil's nuclear weapons program,' 2012, <<https://www.globalsecurity.org/wmd/world/brazil/nuke-3.htm>>.
- 5 See Togzhan Kassenova, *Brazil's nuclear kaleidoscope: An evolving identity*, Carnegie Endowment for International Peace, (2014); Rodrigo Mallea, Matias Spektor and Nicholas Wheeler, *The Origins of Nuclear Cooperation: A Critical Oral History of Argentina and Brazil*, Woodrow Wilson International Centre for Scholars and FGV, School of Social Sciences, (2012).
- 6 For a discussion on special responsibilities, see Mlada Bukovansky et al, *Special Responsibilities: Global Problems and American Power* (Cambridge: Cambridge University Press, 2012).
- 7 More details on the conceptual framework can be found in the reports: *Common but Differentiated Nuclear Responsibilities: Perspectives from Tokyo* (London: BASIC and ICCS, 2019); *Nuclear Responsibilities in an Interconnected World: Perspectives from Kuala Lumpur* (London: BASIC and ICCS, 2019); *Common Security through Nuclear Responsibilities: Perspectives from Geneva* (London: BASIC and ICCS, 2019); *Differentiated Nuclear Responsibilities among Non-Nuclear Possessor States: Perspectives from the Hague* (London: BASIC and ICCS, 2020) available online at <<https://basicint.org/portfolio/nuclear-responsibilities/>>.
- 8 This was also discussed at the Geneva roundtable, see Alice Spilman, Nicholas J. Wheeler and Sebastian Brixey Williams, *Common Security through Nuclear Responsibilities* (2019), <<https://basicint.org/report-common-security-through-nuclear-responsibilities-perspectives-from-geneva/>>.
- 9 Throughout this report, the terms Nuclear Weapon State (NWS) and Non Nuclear Weapon States (NNWS) will only be used when discussing the states recognised as lying within these categories under the NPT. The authors prefer the term Nuclear Possessor State (NPS) and Non-Nuclear Possessor State (NNPS), which allows for a discussion of states with nuclear weapons who choose to remain outside the NPT regime.
- 10 Jim Walsh, 'Learning from Past Success: The NPT and the Future of Non-proliferation,' *The Weapons of Mass Destruction Commission*, (2005), pp.2-65.
- 11 *Climate Action Tracker*, Temperatures, December 2019, <<https://climateactiontracker.org/global/temperatures/>>.

- 12 See Kassenova, *Kaleidoscope*, p.61. 'Egypt has also spoken out against the growth of nonproliferation measures in the absence of progress on nuclear disarmament. Egypt has therefore refused to sign the IAEA Additional Protocol', NTI, 'Egypt', <<https://www.nti.org/learn/countries/egypt/nuclear/>>..
- 13 See Kassenova, *Kaleidoscope*, p.2, and Matias Spektor, 'The evolution of Brazil's nuclear intentions,' *The Nonproliferation Review*, 23:5-6, (2016), p. 635; 'Brazil and Weapons of Mass Destruction,' *Wikipedia*, 20 January 2020, <https://en.wikipedia.org/wiki/Brazil_and_weapons_of_mass_destruction>.
- 14 José Goldemberg, Carlos Feu Alvim & Olga Y. Mafra, 'The Denuclearization of Brazil and Argentina,' *Journal for Peace and Nuclear Disarmament*, 1:2 (2018), pp. 383-403.
- 15 Spektor, 'Brazil's nuclear intentions,' p. 635.
- 16 For a critical oral history on nuclear issues between Brazil and Argentina, see Mallea et al, *Critical Oral History*.
- 17 Ibid, p.22.
- 18 Spektor, 'Brazil's nuclear intentions,' p. 636.
- 19 Mallea et al, *Critical Oral History*, p.101 and pp. 10-11.
- 20 Ibid, p.14.
- 21 ABACC, 'ABACC History,' <<https://www.abacc.org.br/es/a-abacc/historia.>>.
- 22 Mallea et al, *Critical Oral History*, p.10.
- 23 Ibid, p.2.
- 24 Kassenova, *Kaleidoscope*, p.36.
- 25 William Walker, 'The UK, threshold status and responsible nuclear sovereignty,' *International Affairs*, 86:2 (2010), p.447.
- 26 Ariel Levite, 'Nuclear Hedging and Latency: History, Concepts and Issues,' in Joseph F. Pilat (Org), *Nuclear Latency and Hedging*, 1st ed, (Washington D.C.: Woodrow Wilson International Centre for Scholars, 2019), p.23.
- 27 Matthew Fuhrmann and Benjamin Tkach, 'Almost nuclear: Introducing the Nuclear Latency dataset,' *Conflict Management and Peace Science*, 32:4 (2015), pp.443–461.
- 28 Whilst Costa does not suggest Brazil is diverting fissile material to nuclear weapons, he explains that it is a concern with nuclear propelled attack submarines 'because during the unsafeguarded periods of its life-cycle, the nuclear material in the reactor could be diverted for the production of nuclear weapons' see Eugenio Pacelli Lazzarotti Diniz Costa, 'Brazil's Nuclear Submarine: A Broader Approach to the Safeguards Issue,' *Revista Brasileira de Política Internacional*, 60:2 (2017), p.1.
- 29 Kassenova, *Kaleidoscope*, p.116.
- 30 Ibid, p.53.
- 31 Ibid, p.53.

- 32 Sergio de Queiroz Duarte, 'Brazil and the nonproliferation regime: a historical perspective,' *The Nonproliferation Review* 23:5-6 (2016), p. 547.
- 33 *NTI, Treaty for the Prohibition of Nuclear Weapons in Latin America and The Caribbean (LANWFZ) (Tlatelolco Treaty)*, 2019, <<https://www.nti.org/learn/treaties-and-regimes/treaty-prohibition-nuclear-weapons-latin-america-and-caribbean-lanwfz-tlatelolco-treaty/>>.
- 34 *ABACC, 'About ABACC,'* <<https://www.abacc.org.br/es/a-abacc/sobre/>>.
- 35 Goldemberg et al, 'Denuclearization,' p.396.
- 36 Paolo Foradori and Martin B. Malin, 'A WMD-Free Zone in the Middle East Creating the Conditions for Sustained Progress,' *Belfer Centre for Science and International Affairs*, 2012, <https://www.belfercenter.org/sites/default/files/legacy/files/WMDfz_PDF.pdf>.
- 37 Goldemberg et al, 'Denuclearization,' p.401.
- 38 Mallea et al, *Critical Oral History*, p.11.
- 39 Duarte, 'Nonproliferation regime,' p. 554.
- 40 Togzhan Kassenova, 'External perceptions of Brazil's nuclear policy: views from Argentina and the United States,' *The Nonproliferation Review* 23:5-6 (2016), p. 605.
- 41 David S. Jonas, John Carlson and Richard S Goorevich, 'The NSG Decision on Sensitive Nuclear Transfers: ABACC and the Additional Protocol,' *Arms Control Association*, <<https://www.armscontrol.org/act/2012-11/nsg-decision-sensitive-nuclear-transfers-abacc-additional-protocol>>.
- 42 Kassenova, *Kaleidoscope*, p.63.
- 43 Togzhan Kassenova, 'Brazil, Argentina, and the Politics of Global Non-proliferation and Nuclear Safeguards,' *Carnegie Endowment for International Peace*, 2016, <<https://carnegieendowment.org/2016/11/29/brazil-argentina-and-politics-of-global-nonproliferation-and-nuclear-safeguards-pub-66286>>.
- 44 Jonas et al, 'NSG Decision.'
- 45 See Jonas et al, 'NSG Decision;' Kassenova, 'Nuclear Safeguards.'
- 46 Spektor et al, 'Brazil's nuclear posture under Bolsonaro.'
- 47 Sebastian Brixey-Williams, *Reporting on Nuclear Disarmament: Success and Failure in 25 Years of Disarmament Diplomacy* (London: BASIC, 2019), <<https://basicint.org/report-reporting-on-nuclear-disarmament-success-and-failure-in-25-years-of-disarmament-diplomacy/>>.
- 48 Tytti Erästö, 'The NPT and the TPNW: Compatible or conflicting nuclear weapons treaties?' *Stockholm International Peace Research Institute*, 2019, <<https://www.sipri.org/commentary/blog/2019/npt-and-tpnw-compatible-or-conflicting-nuclear-weapons-treaties>>.
- 49 Kassenova, *Kaleidoscope*, p.54.
- 50 Spektor et al, 'Brazil's nuclear posture under Bolsonaro.'
- 51 Costa, 'Brazil's Nuclear Submarine,' p.1.

- 52 Jeffrey Kaplow, 'The Canary in the Nuclear Submarine: Assessing the Nonproliferation Risk of the Naval Nuclear Propulsion Loophole,' *The Nonproliferation Review*, (2015) 22:2, pp. 185-202.
- 53 Ibid.
- 54 Lami Kim, 'South Korea's Nuclear Hedging?' *The Washington Quarterly* 41:1 (2018), pp.115-133.
- 55 Costa, 'Brazil's Nuclear Submarine,' p.6.
- 56 George M. Moore, Cervando A. Banuelos, and Thomas T. Gray, 'Replacing Highly Enriched Uranium in Naval Reactors,' *NTI*, 2016, <https://media.nti.org/pdfs/Replacing_HEU_in_Naval_Reactors_Report_FINAL.pdf>.
- 57 Nick Ritchie, 'The UK Naval Nuclear Propulsion Programme and Highly Enriched Uranium,' *Federation of American Scientists*, 2015, <<https://fas.org/wp-content/uploads/2015/03/2015-FAS-UK-NNPP-HEU-final2.pdf>>.
- 58 *Brazil, Ministry of Foreign Affairs*, 'Candidature of Ambassador Rafael Mariano Grossi for Director General of the International Atomic Energy Agency (IAEA),' Statement from Brazilian Ministry of Foreign Affairs, 2 August 2019 <<http://www.itamaraty.gov.br/en/press-releases/21013-candidature-of-ambassador-rafael-mariano-grossi-for-director-general-of-the-international-atomic-energy-agency-iaea>>.
- 59 Togzhan Kassenova, 'Nuclear Safeguards in Brazil and Argentina: 25 years of ABACC,' *AIP Conference Proceedings*, 2017, <<https://aip.scitation.org/doi/pdf/10.1063/1.5009227?class=pdf>>.
- 60 Ibid.
- 61 Togzhan Kassenova, 'Turbulent Times for Brazil's Nuclear Projects,' *Carnegie Endowment for International Peace*, 2015, <<https://carnegieendowment.org/2015/10/29/turbulent-times-for-brazil-s-nuclear-projects-pub-61800>>.
- 62 Leonardo Bandarra, 'Brazilian nuclear policy under Bolsonaro: no nuclear weapons, but a nuclear submarine,' *Bulletin of the Atomic Scientists*, 2019, <<https://thebulletin.org/2019/04/brazilian-nuclear-policy-under-bolsonaro/>>.
- 63 Spektor et al, 'Brazil's nuclear posture under Bolsonaro'.
- 64 Ibid.
- 65 Matt Korda, 'At Nukefest, we asked all the wrong questions,' *Inkstick*, (2019), <<https://inkstickmedia.com/at-ukefest-we-asked-all-the-wrong-questions/>>.

- BASIC is an independent think tank promoting innovative ideas and international dialogue on nuclear disarmament, arms control, and nonproliferation. Since 1987, we've been at the forefront of global efforts to build trust and consensus on some of the world's most progressive global peace and security initiatives.
- The ICCS, based in the School of Government and Society at the University of Birmingham, adopts a multi-disciplinary approach to global security challenges to create innovative research, education, and training in conflict and cooperation in world politics.

**The British American Security
Information Council (BASIC)**

17 Oval Way
London
SE11 5RR

**The Institute for Conflict, Cooperation
and Security (ICCS)**

Edgbaston
Birmingham
B15 2TT