

## **Chapter 13: Policy Lessons**

The case of South Africa shows that nuclear disarmament is possible even after a country has built nuclear weapons. Its extensive cooperation allowed a rigorous verification of denuclearization by the International Atomic Energy Agency (IAEA), aided and supplemented by nations with a special stake in ensuring that all of South Africa's weapons were dismantled and the highly enriched uranium fully accounted for.

Sadly, no other country with nuclear weapons has followed South Africa's example. Twenty five years after dismantling its arsenal, South Africa remains the only country that has produced nuclear weapons and given them up. In fact, the situation is not better today, and it has perhaps even worsened. Although Ukraine, Belarus, and Kazakhstan gave up inherited Soviet-era nuclear weapons, North Korea has joined the ranks of those countries with nuclear weapons, bringing the total to nine. The other eight countries with nuclear weapons—Britain, China, France, Russia, the United States, Israel, India, and Pakistan--have made little progress on achieving nuclear disarmament, despite in some cases reducing the size of their arsenals. On the other hand, India and Pakistan have increased their numbers of nuclear weapons substantially in that time period. So, the set of circumstances that led South Africa to give up its nuclear weapons have not been duplicated in other states with nuclear weapons. The lack of progress highlights the remarkable confluence of factors that led to South African disarmament.

Despite little progress on nuclear disarmament, South Africa remains a rich example for efforts to stop the proliferation of nuclear weapons and understand the conditions necessary to achieve nuclear disarmament. There is detailed information of why, how, and when it pursued nuclear weapons, although a sufficiently detailed picture of its nuclear efforts has taken a few decades to emerge.

There remain a few remaining dim spots in the picture. The full story of the 1979 flash in the South Atlantic is a good example. Exactly what happened in what many regard as a secret, low-yield Israeli nuclear atmospheric test remains unsettled, including if there was any South African involvement or knowledge of an alleged test. There also remain questions about the Air Force and Armscor's plans to produce additional nuclear weapons in the 1990s and the nature and extent of the opposition to President de Klerk's 1989 dismantlement decision.

On balance, the current picture is sufficiently detailed to discuss a number of lessons on non-proliferation, export controls, sanctions, verification, nuclear strategy, and IAEA safeguards. The lessons presented here are admittedly motivated by the more technical focus of this book. Political and social scientists may choose to focus on other lessons. The case is rich enough to support many perspectives and lessons.

### **More Holistic View of a Nuclear Weapon**

For South Africa, a nuclear weapon was a nuclear device and a delivery system. Rarely did the members of the nuclear weapons program run by Armscor ever call the device or warhead itself a nuclear weapon. Its most threatening delivery system was Armscor's ballistic missiles, which were under development at the end of the program. Although not originally intended, in addition

to dismantling its nuclear devices and associated infrastructure, South Africa also dismantled its rocket programs, even though the latter had been transformed into a civilian space launch vehicle program. But a ballistic missile capable of carrying a nuclear weapon is in key ways the same as a space launch vehicle capable of putting a satellite into orbit. Its agreement to dismantle its most threatening nuclear-capable delivery system is often overlooked in discussing South Africa's denuclearization. But it remains a significant action, despite its cost in terms of lost jobs and technological development.

The dismantlement of both South Africa's nuclear device and space launch programs highlights their close connection; a view in contrast to traditional ones in the nuclear non-proliferation community. In many cases, the delivery system is not treated as the other half of a nuclear weapon in nuclear non-proliferation analysis or policy prescriptions. A recent example is the Iran nuclear deal, or Joint Comprehensive Plan of Action (JCPOA), whose designers pride themselves on having sculpted a deal that limits itself to nuclear issues without directly involving other areas, such as ballistic missiles. The JCPOA does not contain a word on Iran's ballistic missiles, some of which appear designed to carry nuclear weapons. Even United Nations Security Council resolution 2231, which institutionalizes the JCPOA in international law, accepted a weaker ban on Iranian ballistic missiles than the previous Security Council resolutions on Iran. And as Iran violates the new Security Council ban on testing ballistic missiles, the United States has carefully stated that Iran has not violated the JCPOA and its ban on nuclear weapons, despite the concern that these Iranian missiles could eventually have a nuclear warhead on them.

Certainly, it is critical to focus on the nuclear device, since it may be that the state first wants to develop the capability to detonate a nuclear test device, in order to demonstrate a nuclear weapons status. South Africa sought to do this with its first device codenamed Melba, even though it decided against detonating it. However, a narrow view of a nuclear weapon as only constituting the device can leave significant portions of the nuclear weapons program outside the limits or verification of an agreement. It specifically risks fostering agreements that do not limit ballistic missile programs, even though these programs may still be part of a secret nuclear weapons plan or ambition.

In the case of Iran and the JCPOA, unless more is done, Iran will essentially be able to work on one key facet of nuclear weapons – perfecting its nuclear-capable missile delivery systems – while only temporarily limiting its nuclear programs. This schism will likely create further regional and international insecurity regarding Iran's intentions after the nuclear restrictions start to lift at year 10 to 15 of the JCPOA. Thus, treating the warhead or device separately from the missile is counterproductive.

As a result, the United States should re-orient its policy on Iran to make stopping its ballistic missile program a higher priority. Otherwise, when the nuclear limitations end in 10 to 15 years, it may face an Iran not only racing to a nuclear warhead but also one well positioned for rapidly deploying those warheads on long-range ballistic missiles, making the nuclear arsenal highly threatening in short order.

Likewise, any future nuclear deal with North Korea should involve limits on its space launch and missile program, as the 2011 Leap Day deal tried to do. Although the Institute for Science and International Security has been sympathetic in the past to allowing a space launch exemption in any nuclear deal with North Korea, its domestic space launch capability hides a ballistic missile program, which should at least be frozen in any nuclear deal.

More generally, a lesson of the South African case is not to isolate the effort to build a nuclear device from the development or acquisition of advanced delivery systems, in particular ballistic missiles. They go together. The goal of nuclear non-proliferation and disarmament should be achieving limits on both.

### **Nuclear Materials Production**

In addition to confirming the importance of focusing on ballistic missile programs, the South African case confirms the common view that producing enough fissile material for nuclear weapons is challenging. Moreover, it also confirms that efforts to acquire such capabilities may hide secret or latent nuclear weapons intentions and should be seen as dangerous, justifying steps to prevent or limit these activities.

South Africa was able to build its first nuclear explosive device two years before it had enough highly enriched uranium to do so. Because of problems in its enrichment plant, it could not produce enough for its second device for another two to three years.

In addition, South Africa started its uranium enrichment program before it knew for sure it would build nuclear weapons. It was ambivalent about its ultimate intentions during almost the entire first ten years of its enrichment program.

As a result, efforts to enrich uranium and separate plutonium, the two primary ways to acquire nuclear explosive materials, should be discouraged, particularly in regions of tension. As a matter of policy, in regions of tension, they should be viewed with concern and as an indication of nuclear weapons intentions, regardless of national statements that these activities are for peaceful use only or will be under IAEA safeguards. Perhaps they are peaceful. However, the South African case would suggest that a more prudent attitude is suspicion about any effort to separate plutonium or enrich uranium. Efforts should be launched to eliminate or severely curtail any such activities.

As discussed, Iran's centrifuge program will likely remain a risk that will grow after the nuclear restrictions in the JCPOA end in 10 to 15 years. The United States and its allies need view Iran's centrifuge program as an on-going risk to international security and step up their efforts to constrain or negotiate an end to Iran's centrifuge program after the limits end. They should also step up efforts to ensure independently that Iran's nuclear program is indeed peaceful, a process that Iran has signaled it will resist.

More broadly in the Middle East, the United States needs to ensure that other states do not seek plutonium separation or uranium enrichment capabilities. Several countries may be motivated to follow Iran's lead in seeking sensitive nuclear facilities and capabilities.

The reprocessing programs in non-nuclear weapon states in North Asia deserve another look, as North Korea's expanding nuclear weapons program leads to increased discussions among U.S. allies about acquiring their own nuclear weapons. Although the governments in these countries remain against nuclear weapons, the security situation is fluid and could shift over the next several years. In certain cases, the pressure to acquire nuclear weapons could increase and easy availability of separated plutonium may assist the motivations to decide to build nuclear weapons. As a result, new reprocessing programs in North Asia should be discouraged. In the case of existing ones, if reprocessing is not economical or otherwise clearly justified, these programs should be reduced and eventually eliminated.

### **Highly Enriched Uranium Stocks**

South Africa ended its nuclear weapons program with a sizeable stock of highly enriched uranium. Concerns remain over the HEU's security against theft or diversion by criminal or extremist groups. For 25 years, the United States has worked to convince South Africa to blend down this HEU into low enriched uranium or send it out of the country. However, most of this HEU remains in South Africa. One of the most challenging aspects of South Africa's nuclear dismantlement has been its desire to hold onto this stock. The United States did succeed in convincing South Africa to convert its Safari reactor to the use of low enriched uranium fuel and targets. But this conversion took years and is not completely finished, as South Africa may still use some of its HEU in targets for medical isotope production.

A remaining step that South Africa should take to ensure against leakage of nuclear material is to blend down or ship out its remaining highly enriched uranium or trade it for low enriched uranium. This step would also signify a commitment to nuclear security norms which seek to reduce the amount and presence of HEU worldwide. The United States and other countries should remain steadfast in facilitating South Africa achieving the goal of having little or no HEU.

It should be noted that in the early 1990s some senior nuclear officials in South Africa considered sending all or a significant amount of the HEU abroad. A stumbling block was that no nation, including the United States, was prepared to act quickly and take the HEU before South Africa revoked the offer. The United States and other countries, including Russia, are better prepared today to seize such opportunities. The South African experience should serve as a reminder of how important those programs are.

### **Evasion**

Critical to South Africa's nuclear weapons program was deception. It was a fundamental part of keeping adversaries and allies guessing about its nuclear efforts and intentions. Its nuclear strategy depended on maintaining a highly sophisticated deception and concealment effort. Moreover, illicit procurement required a great deal of deception about the end use of the goods Armscor and the nuclear establishment bought overseas. Failures in concealment, such as unfortunate statements by uninformed or misguided South African government officials, were

denied officially but also used to create uncertainty about the existence of South Africa's nuclear weapons as part of phase 1 of its nuclear strategy.

Frank Pabian has pointed out that despite the “shining success story” of South Africa's nuclear disarmament, there “are the concealment efforts that continued despite outward signs of cooperation and transparency.”<sup>1</sup> Efforts to deny and hide the existence of a nuclear weapons program continued until March 1993. Even after that there were efforts to hide parts of the nuclear weapons program, and downplay certain aspects, such as the delivery systems of the nuclear weapons, the full nuclear strategy, the sophistication of the nuclear weapons, and foreign procurements. Likewise, the distortions were readily disseminated in expert and governmental communities, despite evidence to the contrary.<sup>2</sup>

Both Iran and North Korea use deception as a tactic. Despite the overwhelming evidence, including IAEA judgements, Iran still denies it ever had a nuclear weapons program. It is still hiding parts of nuclear efforts the IAEA had evidence about. North Korea both hides activities, such as it did for years with the centrifuge program, and exaggerates accomplishments, such as more recent claims that it can strike the United States with a nuclear-tipped ballistic missile.

One obvious implication of the South Africa case is that official Iranian and North Korean statements, and the echo of those supporting their statements, should be treated highly skeptically. The simple fact is that Iran and North Korea, like South Africa and others, lied about nuclear weapons. If for no other reason lying can minimize the international consequences of the truth and recognizes that success may depend on maintaining secrecy.

Countering the nuclear deceptions of countries such as Iran and North Korea requires robust international inspections and intelligence operations. It also requires an independent non-governmental community willing to uncover and challenge their deceptions. North Korea's exaggerations need to be guarded against lest they increase instability and overreactions among the United States and its allies.

### **Safeguards, Transparency, and Reversal**

The IAEA was profoundly affected by its experience in South Africa, which started about 25 years ago. It deployed new approaches, such as verifying the completeness of a declaration, gaining access to military industries associated with the former nuclear weapons program, interviewing former members of secret nuclear programs, and deploying nuclear weapon experts to dig deeply into the former nuclear weapons program. All of these practices have become important tools for IAEA safeguards.

For its part, South Africa's eventual transparency and cooperation stand out as one of the most significant aspects of its dismantling its nuclear weapons program and coming into compliance

---

<sup>1</sup> Frank V. Pabian, “The South African Denuclearization Exemplar,” *Nonproliferation Review*, 2015, Vol. 22, No. 1, pp. 27-52. <http://dx.doi.org/10.1080/10736700.2015.1071969>

<sup>2</sup> See for example, Waldo Stumpf, “South Africa's Nuclear Weapons Program: From Deterrence to Dismantlement,” *Arms Control Today*, December 1995/January 1996. Here, he downplays the sophistication and deliverability of the weapons and the nuclear strategy.

with the Nuclear Non-Proliferation Treaty (NPT). Full access, openness, and transparency were proven as vital to ensuring the credibility of the dismantlement effort and reaping sought after international engagement.

South Africa's initial position on transparency was not adequate. In reaction to calls for more transparency, fortunately, the government consistently moved to provide more. The evolution of President de Klerk's thinking from 1991 to 1993 was especially important, starting from when the IAEA launched its verification of South Africa's initial inventory of nuclear materials and South Africa sought to manage the amount of transparency it would provide, even misleading inspectors. Although the ANC, the United States, Russia, and the natural course of the IAEA's investigation pressured de Klerk to allow greater transparency, he had the wisdom to modify the government's position and come clean. By committing to greater transparency, South Africa also avoided serious conflicts with the IAEA that would have occurred if it had tried to continue hiding and denying the nuclear weapons program, which would have also undermined its international goals. The experience showed that countering remaining international suspicions and reviving international engagement required South Africa to eschew an attitude of "the past doesn't matter" regarding a nuclear weapons program. For South Africa, this path also helped achieve the important security goal of a nuclear weapons free zone in Africa.

The evolution of South Africa's transparency also showed the critical role of international oversight of a dismantlement process. It is needed for the international community and particularly regional neighbors to gain confidence about full dismantlement and future intentions.

Although South Africa rejected involving the IAEA while it was dismantling its nuclear weapons, it is still worth considering whether a different course would have been more effective. Had the IAEA been able to supervise the dismantlement from the start and oversee how the components of the program were destroyed, repurposed, or dispersed, it may have also been able to reach a quicker determination about the correctness and completeness of South Africa's nuclear declaration and the absence of an ongoing military nuclear program.

Another reason international oversight is imperative, as seen by this case, is that ambiguous nuclear weapon states may not fully admit to past military nuclear activities. South Africa still possessed nuclear weapons relevant information when it acceded to the NPT in July 1991; these documents were only ordered destroyed by de Klerk in March 1993. These preliminary obfuscations underscore that from the beginning of a dismantlement process international oversight is the most preferred method. They also show the practical and legal contradictions South Africa encountered in attempting to accede to the NPT while still in the process of dismantling its nuclear weapons program.

Relatedly, if a state decides to initially and secretly dismantle large portions of a nuclear weapons program as South Africa did, needed documentation and information can be lost, delaying the process of IAEA verification – particularly nuclear material accountancy. The dismantlement process, even though overseen by the auditor Wynand L. Mouton, left IAEA inspectors lacking uniform and rigorous records once its inspection role began. The lack of records on weapons components and technical documentation also affected the investigation.

With careful and recalibrated verification processes, the IAEA was able to overcome most of these challenges.

In its initial investigations, the IAEA was relatively tolerant of South Africa's deceptions about its nuclear weapons program. South Africa's initial declaration immediately raised the IAEA's suspicions as did the information about the past program received from member states. However, it said little to South Africa, IAEA member states, or the public about its doubts about the truthfulness of South Africa's declarations. At the time, the IAEA and many states viewed traditional safeguards agreements as requiring the IAEA to keep secret virtually all the information in the initial declaration and most other information provided by the state. Complicating the IAEA blowing the whistle on South Africa, South Africa had conditioned its transparency policy on the IAEA maintaining a high level of confidentiality about the information the government was providing to the inspectors. As a result, the IAEA had neither a mandate to reveal its suspicions about past use of this material nor the motivation to undermine South Africa's commitment to transparency, albeit involving untruths about its nuclear programs. This hesitancy to reveal critical information is a problem that the IAEA has not fully settled even today.

Another key lesson for future dismantlement cases is that taking specific, publicly reassuring steps is important to ensure against a restart of a dismantled nuclear weapons program. A key step South Africa took was allowing the IAEA to determine the scope of the program by allowing inspectors access "anywhere, anytime" to sites, access to nuclear weapons program officials, and revealing and allowing visits to sites the IAEA did not know about. It also agreed to allow ongoing investigations and case-by-case visits to former nuclear weapons related sites and experts upon IAEA request to ensure the program was not reconstituted.

South Africa also recognized that it needed to do more. It passed necessary domestic nonproliferation legislation and instituted export controls to prevent the leakage of proliferation sensitive goods. In addition to joining the NPT and engaging in efforts to expand NPT membership and compliance, it also joined other international nuclear nonproliferation regimes and groups and became a strong advocate of nuclear disarmament. Later in 2002 it began adhering to the IAEA Additional Protocol and today encourages broader signature of these expanded IAEA inspection authorities. All of these steps have helped reassure the international community and regional neighbors that South Africa is committed to its reformation as an NPT-compliant non-nuclear weapon state.

Ambiguous nuclear weapon states seeking greater international engagement may be less able to seek to extract concrete benefits for denuclearization. Such states must grapple with whether revealing a nuclear weapons program and then asking for concessions would harm efforts to be seen as a newly responsible member of the international community. By initially dismantling its program in secret, South Africa removed the option of trading dismantlement and accession to the NPT for concrete benefits from the international community. This decision was premised on an attempt to save face and not incur any additional sanctions or negative repercussions. It remains unclear if this decision making model has set any precedents for future dismantlement cases. The only similar case for comparison would be officially nuclear-ambiguous Israel. It

would be difficult to imagine Israel demanding concessions for a future decision to undertake nuclear weapons dismantlement.

Despite its eventual high level of cooperation and transparency, South Africa does not represent the “gold standard” for IAEA verification. Olli Heinonen, former head of safeguards at the IAEA and involved in the South Africa inspections in the early 1990s, believes Libya represents a “gold standard” for verification whereas South Africa met a “silver standard.” South Africa of course abandoned deliverable nuclear weapons and Libya fell short of making them. But once former dictator Muammar Gaddafi decided in 2003 to abandon the turn-key nuclear weapons program purchased from the Pakistani A.Q. Khan network, he immediately allowed unhindered access to IAEA inspectors and the full scale removal of the program from the country, including nuclear weapons designs, components, and documentation. The IAEA was able to reach a conclusion to its Libya investigation with only a few remaining caveats on its knowledge of a weaponization effort. Not only did South Africa delay providing full access, it also tried to mislead the inspectors initially about its nuclear weapons program. It also decided not to reveal to the IAEA details about its nuclear delivery systems and to withhold foreign procurement information from the inspectors. Much of this information has emerged since the mid-1990s as a result of new, less restrictive declassification policies of the ANC-led government, decisions by former members of the nuclear weapons program to reveal more about the program, and research and digging by independent experts and the media.

By comparison with South Africa and Libya, Iran has met neither the gold nor silver standard. Heinonen judges Iran as approaching a “bronze standard,” with potential for placing higher if the JCPOA succeeds or Iran comes clean about its past nuclear weapons activities. Iran has pursued a much more limited transparency strategy than South Africa. IAEA verification of Iran’s military nuclear weapons program has been highly limited. Iran continues to deny it ever had one, despite the overwhelming evidence and the IAEA judgement that it did have one. To reach even a superficial determination about Iran’s past military nuclear activities, the IAEA was forced to rely on evidence it had gathered or obtained from member states. Iran denied access to most Iranian sites, experts, and documentation of concern. Under the JCPOA, Iran has accepted the Additional Protocol, which requires the IAEA to re-look at its past nuclear activities. However, it is unclear if Iran will allow the IAEA sufficient access to sites and individuals to provide assurance that Iran’s nuclear program is peaceful. International concerns about its intentions are likely to remain for some time. Remnants of the military nuclear effort likely remain in-country and are available for use if needed. Moreover, Iran has not made a credible effort to show that its military program has indeed ended. Iran will thus represent a case that provides less international and regional confidence over the longer term about its potential for building nuclear weapons. Iran may also face far greater obstacles to economic engagement internationally than it initially counted on while it remains at the bronze level of IAEA compliance. Whether it will ever reach the silver or gold standard is unknown.

Could South Africa, after all of its efforts, reverse course and decide to reconstitute its nuclear weapons program? Once a country has acquired the knowledge needed to produce nuclear weapons, it is unlikely that it can be lost forever. Moreover, it retains hundreds of kilograms of HEU. Despite the burning of ostensibly all such records, could nuclear weapons designs remain somewhere in South Africa? The possibility, however remote, remains; at the very least it would

have a head start at reconstitution. Several government documents, which were thought destroyed have reemerged over the years, although none that relate to sensitive nuclear weapons information. On a practical level, this concern seems unwarranted given the absence of the conditions that led to its nuclear armament in the 1970s: a democratic government remains in power, South Africa's engagement with the international community is strong, and it lacks major security concerns.

## **Illicit Trade**

As has been the case for many developing countries, South Africa's military and civilian nuclear programs depended on buying a wide variety of goods overseas and acquiring sensitive technologies. South Africa pursued a tactic of exploiting international cooperation and procurements to obtain additional sensitive information for its nuclear programs. The South African case confirms that the detection of these procurements is a reliable indicator of secret nuclear activities, including nuclear weapons efforts.

South Africa was hardly alone in efforts to acquire illicitly many nuclear-related goods from abroad. South Africa, like India, Pakistan, Israel, Iran, Iraq, and North Korea, were active during this historical period buying for their covert nuclear programs.

South Africa made most of its key procurements when export controls were in their infancy. Only after the end of the South African nuclear weapons program and after the IAEA inspectors exposed Iraq's vast, covert nuclear programs and its extensive amount of foreign procurements, were dual-use goods controlled internationally.

Nonetheless, the controls existing during the 1980s did complicate South Africa's procurements for its nuclear programs. Despite that prior to the early 1990s, dual-use goods were not specifically controlled internationally, the growing number and effectiveness of embargoes on South Africa's military and nuclear programs posed a challenge. Armscor after all was a military entity subject to sanctions. To counter sanctions, South Africa employed many deceptive and inventive tactics to acquire needed, controlled goods from abroad. South Africa exploited weak export controls internationally to obtain key equipment. It sent engineers and technical professionals abroad to gather expertise from friendly countries willing to violate the embargoes, such as its missile engineers working with Israeli counterparts, which in at least one case informed related nuclear weapons applications. As the program matured, South Africa also developed advanced, indigenous nuclear and military capabilities and was able to draw on technical expertise to make some of its own items. However, it still required procurements from abroad for its rocket programs and Advena Central Laboratories.

The international focus on restricting the supply of goods slowed South Africa's nuclear efforts. In that sense, the South African case confirms that trade controls can create key chokepoints and bottlenecks to acquiring key goods and materials, slowing the programs or raising their cost. They can thus provide time for diplomacy or other remedies to have success at convincing countries' leadership to change course. The South African case also shows that without rigorous enforcement of sanctions and export controls, proliferant states could more readily and more

quickly acquire the goods they seek and expand or speed up their nuclear programs.

South Africa sought many goods for its military programs that were not on control lists but critical to a particular nuclear or missile program, including uranium enrichment and nuclear weaponization. Although more goods are controlled now, this type of strategy continues today among those seeking goods illegally such as Iran, North Korea, and Pakistan. This phenomenon underlines the need for governments and companies to expand export control lists and more effectively implement “catch-all” provisions in export controls and UN Security Council resolutions. Toward that goal, a helpful strategy is to develop and use “watch lists” to detect and prevent illicit nuclear and missile procurements. A watch list is a list of both controlled and non-controlled components, equipment, and materials that make up the technical aspects of nuclear programs, such as centrifuge enrichment programs. Governments and suppliers can work together to determine what goods may be targeted by proliferant states and add them to watch lists in order to better detect when a new proliferant state emerges or uncover strategic and tactical intelligence about a particular program.<sup>3</sup> A proliferant state seeking several goods on a watch list may sound an alarm to authorities and suppliers, enabling them to better stop such efforts.

During the dismantlement phase, extensive, prior illicit commodity trafficking by South Africa for its nuclear and missile programs posed an unexpected problem. In particular, Armscor's smuggling history was difficult to reconcile with South Africa's denuclearization, causing conflict within the new government and with the United States, undermining South Africa's new stature as a nonproliferation and disarmament leader. Armscor's transparency and cooperation was critical in overcoming these problems.

Nuclear dismantlement is made easier and more verifiable by revealing past illicit nuclear and delivery system procurements. Moreover, methods are needed to assure the international community that the state has revealed enough and will not illicitly procure again. The Iran deal lacks the necessary methods and is weaker as a result. In addition, Iran has publicly remained committed to illicit procurements for its missile programs, and few have any confidence that it would not procure illegally for its nuclear program, if it has the need and opportunity. In the case of North Korea, a nuclear agreement should include conditions banning illicit nuclear and missile trade and have a mechanism to determine what has been acquired in the past.

The South African case also demonstrates that there is another type of leakage other than that involving dangerous nuclear materials, which has been widely highlighted in the post-Soviet context. A significant concern is insiders and former members of a program illegally selling dangerous goods and technologies to other covert nuclear programs. The continuation of the South African node of the A.Q. Khan network was a particular egregious oversight. Leakage was not fully anticipated by the government or the nuclear or armaments industries.

---

<sup>3</sup> For more reading on preventing illicit nuclear procurement, see David Albright, Houston Wood, and Andrea Stricker, *Future World of Illicit Nuclear Trade: Mitigating the Threat* (Washington, D.C.: Institute for Science and International Security, July 29, 2013). [http://isis-online.org/uploads/isis-reports/documents/Full\\_Report\\_DTRA-PASCC\\_29July2013-FINAL.pdf](http://isis-online.org/uploads/isis-reports/documents/Full_Report_DTRA-PASCC_29July2013-FINAL.pdf)

Following a country's decision to dismantle or limit its nuclear programs, a priority is to develop methods to prevent leakage of nuclear assets. These activities should certainly target nuclear materials, such as HEU, but they should do more. They should also focus on blocking the leakage of expertise to foreign nations and shutting down illicit procurement networks. In essence, the South African case shows that the problem of leakage after dismantlement needs to be understood more broadly than only focusing on nuclear materials.

## **Sanctions**

The trade controls imposed by other nations on South Africa were made more effective by sanctions flowing from international opposition to the combination of apartheid and nuclear weapons. In fact, the concern about nuclear weapons served to expand international opposition to the apartheid state because the nuclear weapons program was viewed as more of a threat to the entire world's security. However, like trade controls, the sanctions were not capable of stopping the nuclear weapons program, although they slowed it and made it more costly. Moreover, political isolation increased the incentives to build nuclear weapons and led South Africa's defense establishment to become more self-sufficient technologically and more determined to defend itself.

Nuclear-related sanctions did slow down the nuclear programs by forcing them to economize. In the long term, economic and nuclear sanctions contributed to the draining of South Africa's economy, including its nuclear programs. As the 1985 budget cutbacks discussed in chapter 5, sanctions and an impacted economy played a role in slowing South Africa's nuclear program and forcing it to prioritize. The nuclear program was required to make difficult decisions such as halting the construction of a plutonium and tritium production reactor and discontinuing lithium production efforts intended for making thermonuclear-type weapons. Sanctions, combined with trade controls to restrict the supply of sensitive foreign goods to a nuclear program, do have an effect on restricting spending, forcing a nuclear program to make difficult priority choices, and constraining nuclear expansion.

Achieving the desired effect of sanctions can take time. Affecting South Africa's leadership to limit its nuclear weapons program was a slow process. Initially, sanctions served to reinforce the mentality and deepen the resolve of South African leaders to keep on the course toward nuclear weapons because of outside threats and isolation. Thus, any country imposing sanctions on a proliferant state should anticipate keeping them in place over a long duration in order to see desired change. They may be faced with the reality of needing to eschew competing policy requirements. Convincing a proliferant state to undertake nuclear dismantlement or significant nuclear limitations should take precedence over other policy goals if sanctions are to have success.

Sanctions influenced political events in South Africa in part because they had equal effects on the minority whites. This democracy of effects, albeit narrow, allowed for the creation of dissents against the established pro-nuclear policies of the defense and nuclear establishments. The election of President de Klerk amounted to "regime change" on this issue, but it happened in a white-controlled democratic process.

There is now a case to be made for strong nonproliferation sanctions of the kind that were levied against Iran starting in 2012 impacting its oil sales, foreign investment, banking, shipping, and other commercial ties. Many analysts judge that these sanctions had a direct result in changing Iran's cost/benefit analysis regarding its nuclear program, in part as a result of rising domestic discontent. Less internationally combative Iranian president Hassan Rouhani elected in 2013 was soon understood to have a mandate to seek sanctions relief in return for limits on the nuclear program. So, on balance, strong sanctions may influence political events and bring leaders to power who seek to reduce sanctions. Iran's elections are of course highly constrained as far as the extent of democracy but the grievances of citizens appear to have had an impact on the political leadership.

By contrast, however, sanctions on North Korea have not had the same effect. North Korea's highly isolationist dictator and military regime have been able to remain largely untouched by nuclear and other sanctions in that their needs are met with what they are able to reap from the poor economy and citizens are unable to rise up in protest. It remains to be seen whether newly strengthened sanctions against North Korea in the form of UN resolution 2270 (2016) will have an effect on convincing its leaders to undertake new nuclear talks and consider limitations in return for sanctions relief and other incentives.

In the case of South Africa, the removal of sanctions became another reason to eliminate the nuclear weapons program when it no longer served a security purpose. South Africa expected rewards for its actions, in particular a quick end to its international isolation. As the leading economic and military power in Africa, South Africa viewed itself as contributing importantly to the peace, stability, and development of Southern Africa. It also stood to benefit from new trade and investment in the region. South Africa expected significant rewards from the international community, particularly for joining the NPT. It is doubtful whether the actual rewards matched the original expectations, but South Africa's international political prestige benefited enormously from its actions.

On the negative side, as discussed above, sanctions and isolation led to the rise of Armscor as a highly militarized, independent defense organization. The defense industry, cut off from foreign purchases by the UN arms embargo, developed an attitude of independence and contempt of international and national trade controls. It attempted to produce or secretly procure many defense goods indigenously. Toward those goals, it procured goods from abroad in violation of embargos by using a wide range of deceptive means with suppliers. Arguably this phenomenon is present with regard to the Iranian Revolutionary Guards and Iran's defense industries and in similar entities in North Korea, all of which have also benefited in that way from sanctions. In South Africa, as well as Iran and North Korea, foreign expertise and goods were sought as needed and often obtained. As in the case of Armscor, efforts to limit nuclear programs in Iran and North Korea should also seek to limit their indigenous defense establishments, particularly those involving the most threatening military systems associated with nuclear weapons.

Overall, the South African case would argue that economic sanctions need to be carefully balanced with ongoing efforts to engage the political leaders of a proliferant state and other attempts to reduce security concerns. Otherwise, the effect may merely be to turn the country further inward and increase its focus on nuclear weapons armament. On balance sanctions did

play a positive role in limiting and contributing to ending the apartheid regime and South Africa's nuclear weapons program. Their application elsewhere remains a valuable policy tool.

### **Nuclear Strategy Implications**

South Africa's initial reasoning for its nuclear weapon strategy followed the revelation of its nuclear test site in 1977 and its decision to gain the ability to test rapidly. From that point onward, the strategy evolved in secret as South Africa built its nuclear arsenal. Although the nuclear strategy drove specific decisions on building nuclear weapons, it also paralleled and in some ways helped justify the country's efforts to acquire more sophisticated delivery systems.

South Africa's nuclear strategy was unique. It is the only nuclear strategy in the short history of nuclear weapons that was based on the theory that they would never be used. South Africa's political leaders saw deterrent value in nuclear weapons, but argued that the use of such weapons would amount to political suicide and undoubtedly result in a devastating nuclear counterattack from the Soviet Union, its primary strategic threat. According to those in the program, South Africa would have rather capitulated than use nuclear weapons and suffer Soviet retaliation or more accurately utter destruction.

The exclusion of the operational application of nuclear weapons appealed to the scientists and engineers who built the bombs. Some of their leaders contended that the top political leadership had promised them that the weapons would never have been used offensively.

But it is necessary to ask whether the strategy would have worked. And would the leadership in the end have reneged on their non-military use commitment and made a last stand against the Soviet Union rather than capitulate?

Determining whether the strategy would have worked in deterring a Soviet attack is difficult. In many cases, one would expect that the United States would have sought a resolution between the two that would be short of South Africa losing a war. However, this nuclear strategy was risky. The implied threatened use of nuclear weapons could escalate a crisis dramatically as South Africa instituted its strategy and did not receive the expected response from the United States or the Soviet Union. Moreover, the United States may not have been able to constrain the Soviet Union in some situations, potentially escalating the regional conflict to a global superpower one. The strategy's final step of threatening to use nuclear weapons on the battlefield could have prompted a pre-emptive nuclear strike by the Soviet Union.

There was also the risk that as the crisis worsened, and the reactions were not as expected, the South African leadership could do something desperate and highly dangerous. For example, in thinking thorough various options in case a crisis was not going well, according to a former leader of the nuclear weapons program, the South African planners thought about the possibility of putting a nuclear warhead on a torpedo and shooting it at a U.S. aircraft carrier. It is unclear if the warhead would be set to detonate but even in the case of a dud, the United States would be highly threatened, perhaps seeing it as an act of war. Certainly, it would have viewed an actual detonation as such an act. This option, according to this same official, was never seriously pursued. Nonetheless, it serves as an example of what could happen in desperation.

The strategy could have backfired. The United States and the Soviet Union could have banded together to end the South African regime rather than intervening to negotiate an outcome favorable to South Africa.

In terms of actual use, the issue was not with the strategic planners. It centered on P.W. Botha and the South African military. ANC officials did not believe that the government would have refrained from dropping nuclear bombs on black Africans to defend the Afrikaaner way of life. ANC officials wondered, in particular, what would have happened if a confrontation in the 1980s had spiraled out of control, and South African troops had faced a major military defeat against Cuban forces? If Cuban troops with full Soviet backing had invaded South African territory, for example, would South Africa have detonated its nuclear weapons?<sup>4</sup>

A concern is that State President P.W. Botha in a moment of desperation may have overridden the strategy plans and used them, leading to a devastating Soviet counterattack. However, it is by no means clear that he would have done so, given that the other side had nuclear weapons and appeared ready to retaliate in kind.

This strategy was embedded in a regional security threat environment that proved to be temporary. With the demise of the Soviet Union and the rise of regional peace, a nuclear weapons program became a liability as South Africa transformed to a democracy. But if the program had continued under the old apartheid regime, the strategy may have been further developed under the control of the Air Force. It is unclear if the no-operational military use condition would have survived. It is also unclear if an apartheid South African government would have refrained from testing nuclear weapons in the 1990s or 2000s as a way to certify advanced weapons or project itself as possessing nuclear weapons, as India, Pakistan, and North Korea have done since South Africa dismantled its nuclear weapons.

In the 1980s, the Cuban forces reportedly were deterred from invading by South Africa's perceived nuclear arsenal. The senior Cuban official Jorge Risquet, who led the Cuban delegation in the talks ending the southern African conflict in 1988, told Pik Botha and Waldo Stumpf many years later that Cuba feared South Africa's nuclear weapons and was deterred from invading Namibia.<sup>5</sup> Risquet said that Cuban planners believed that South Africa had deliverable weapons from 1985 onward.

There were mistaken perceptions on the part of South Africa. André Buys said in an interview in 2011 that based on Cuban writings, the Soviet Union did not support Fidel Castro's decision to send Cuban troops to Angola.<sup>6</sup> Buys said that South Africa had thought the opposite and had been deterred from sinking Cuban ship transports or taking over Angola, fearing a harsh Soviet intervention. But the implication of these writings is that the Soviet Union would not have intervened if either had happened. Lack of Soviet support would have likely also deterred Cuba from invading Namibia, regardless of South Africa's perceived nuclear weapons capabilities.

---

<sup>4</sup> For a fuller discussion of the possible military use of nuclear weapons by South Africa, see Michele A. Flournoy and Kurt M. Campbell, "South Africa's Bomb: A Military Option?" *Orbis*, Summer 1988, pp. 385-401.

<sup>5</sup> Nic von Wielligh and Lydia von Wielligh-Steyn, *The Bomb* (Pretoria: Litera Publications, 2014), p. 281.

<sup>6</sup> Interview with Buys, April 4, 2011.

Thus, one of the major motivations for a nuclear deterrent, namely Soviet intervention, may have been overstated.

Taken as a whole, it is difficult to see how South Africa's nuclear weapons contributed to regional stability or deterred its enemies from pursuing their goals in Angola and other parts of southern Africa as well as within South Africa. It is unclear whether nuclear weapons provided anything other than temporary assurance to an overly cautious and embattled government. South African officials were wholeheartedly convinced, on the other hand, that the Soviet Union would attack and saw its backing of communist leaning parties in South Africa as a sign of possible interventionist plans.

As the security situation for South Africa improved, and perhaps unfairly in hindsight given what is known today about Soviet calculations, one must ask whether nuclear armament was ultimately a necessary expenditure or simply wasted effort and resources with an untenable nuclear strategy undergirding it. That question will likely remain controversial.

In any case, the two sides' militaries did not engage in security dialogues. Perhaps, such dialogues would not have been possible. Nonetheless, if South Africa and the Soviet Union and its allies had found a way to open a dialogue on their security issues in the 1980s, South Africa in particular may have benefited. It may even have avoided some of the effort and expense of nuclear weapons development.

In general, security dialogues among adversaries' militaries are valuable. They can reduce misperceptions and threats. As a result, the United States should make special efforts to establish and maintain strategic dialogues among adversaries.

### **Proliferation Prospects Today**

The experience of South Africa and the factors which led to its decision to acquire nuclear weapons and then abandon them can inform today's discussion of the risk of proliferation or the chance for nuclear disarmament. Predicting proliferation or disarmament is difficult and beyond the scope here. However, the information from the case of South Africa is rich enough to support a general qualitative risk-based assessment that can stimulate discussion.

The factors that affected South Africa's proliferation and dismantlement decisions are present in other countries faced with difficult national security decisions. Political scientists use models incorporating a large number of factors for ranking both the likelihood that states will seek nuclear weapons or give them up, using many of the same elements that factored into South Africa's decision making. In the case of South Africa, perceived security threats, lack of security guarantees, political leadership conducive to international isolation and domestic power centralization, and a growing technological capability, were determining factors for nuclear armament. For dismantlement, key factors were the diminishing of the security threat, and political evolution wherein leaders seek international engagement and domestic power sharing. The length of time a country possesses a nuclear weapons appears to also be a factor in dismantlement likelihood; for example, the longer a country possesses them, the risk grows that

they become embedded in the national security structure. South Africa’s dismantlement notably came relatively early after the manufacture of its first deliverable nuclear weapons.

Predicting the risk of proliferation or the chance for dismantlement can allow policymakers to better judge which countries to engage in security dialogues and nonproliferation efforts, as well as decide which countries to monitor more closely or take actions against to counter negative developments. We assign a simple level of very low to high risk for proliferation in several countries (table 1) and low to high chances for dismantlement for current nuclear weapon states both within and outside the NPT (table 2) based mainly on assessing, including weighting, the key factors in South Africa’s case. Our choices of the prime candidates for nuclear weapons development were derived from internal and public discussions of the risk of proliferation.

The tables summarize our judgments. Other experts may come to different judgements based on other predictive factors.

<b>Table 1: Risk of Development of Nuclear Weapons Capability</b>									
<b>Country</b>	South Korea	Taiwan	Japan	Saudi Arabia	Iran	Egypt	Turkey	Jordan	UAE
<b>Risk Assessment</b>	Medium	Low	Very Low	High Medium	High	Low Medium	Low Medium	Low	Low

<b>Table 2: Likelihood of Nuclear Dismantlement</b>									
<b>Country</b>	Israel	India	Pakistan	North Korea	Russia	United States	China	Great Britain	France
<b>Likelihood</b>	Low	Low	Low	Low Medium	Very Low	Very Low	Very Low	Low	Very Low

One of the most striking implications of these tables is that for most countries the prospects of nuclear proliferation or disarmament must be evaluated within the context of regional tensions and insecurities. If the security situations in the Middle East, South Asia, and North Asia can be resolved, proliferation may be prevented and wide-scale nuclear disarmament may become achievable. However, no one should underestimate the challenges of solving these regional problems, and solving the regional tensions may not be enough to prevent proliferation or achieve disarmament. Nonetheless, ignoring the need for a regional focus is unlikely to stop proliferation or achieve denuclearization.

Overall, nuclear dismantlement has to be assessed to be rare. The factors that led South Africa to dismantle are currently missing among countries with nuclear weapons. In looking at Israel, India, Pakistan, and North Korea, only one – North Korea – is assessed as possibly abandoning its nuclear weapons in the short to medium term, and only if political and security conditions are adequate. India, Pakistan, and Israel may undertake limited reductions at some future point.

The likelihood of dismantlement for the NPT nuclear weapon states is assessed to be very low, except for Great Britain, which occasionally reevaluates the existence of its nuclear weapons. These countries have integrated nuclear weapons as part of their great power and national security status. These arsenals are also perceived to preserve a balance between China, Russia,

and the United States and the US nuclear umbrella is perceived as preventing aggression in Europe and North Asia. The NPT nuclear weapon states will thus likely be the last to disarm. Despite this difficulty, arms control restrictions and reductions should be diligently pursued among these states. However, they should be seen as having limits, absent the prevention of further proliferation and the resolution of regional security threats from which proliferation stems.

One of the most important lessons from South Africa is that proliferation can be prevented and nuclear disarmament achieved. However, that effort has to start locally, or by focusing on the regions facing the most dire security threats.