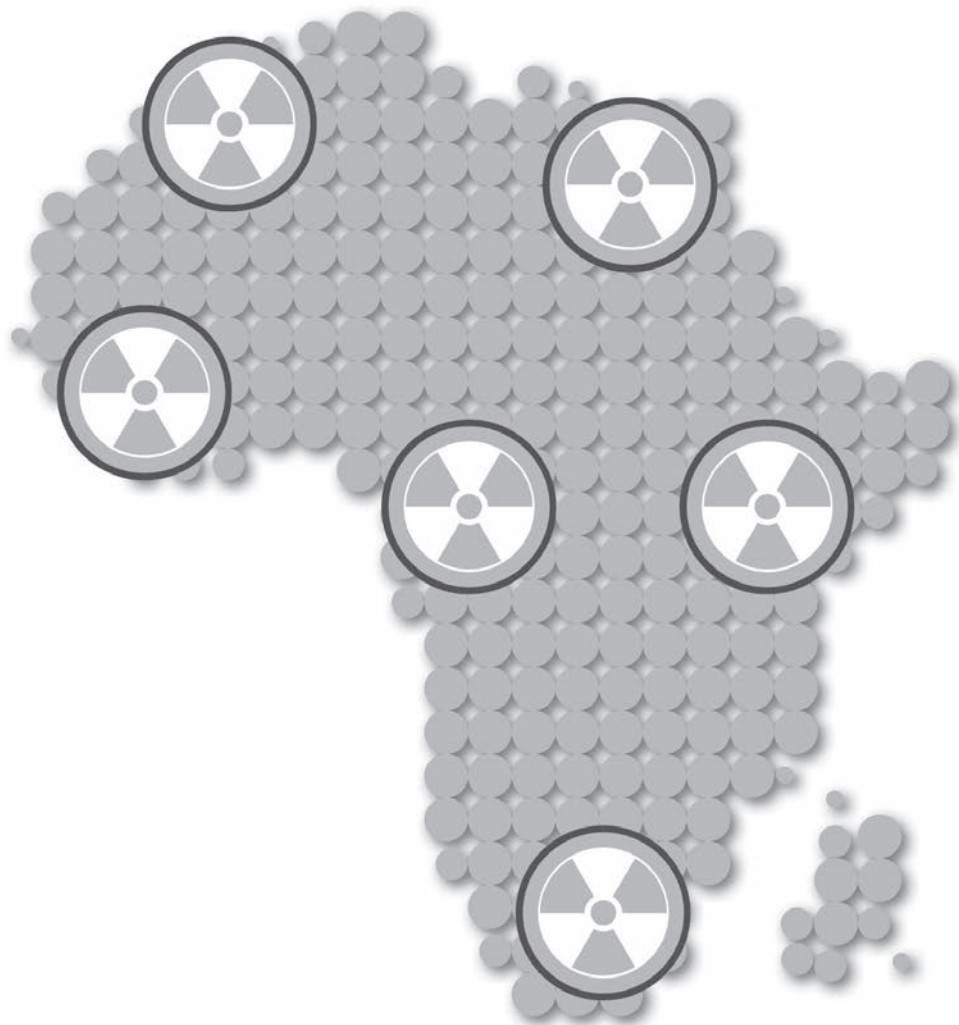


PROGRESS TOWARDS SECURING AFRICA'S NUCLEAR RESOURCES



Compiled by Amelia Broodryk and Noël Stott

This publication is an updated and enhanced version of the booklet
Securing Africa's Nuclear Resources published by the Institute for Security Studies in 2011

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Acronyms

ACSRT	African Centre for the Study and Research on Terrorism
AFCONE	African Commission on Nuclear Energy
AFRA	Africa Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology
AU	African Union
CIGI	Centre for International Governance Innovation
CPPNM	Convention on the Physical Protection of Nuclear Material
CTBT	Comprehensive Test Ban Treaty
DIRCO	Department of International Relations and Cooperation
DTRA	Defense Threat Reduction Agency
FNRBA	Forum of Nuclear Regulatory Bodies in Africa
GICNT	Global Initiative to Combat Nuclear Terrorism
HEU	Highly enriched uranium
IAEA	International Atomic Energy Agency
ICSANT	International Convention for the Suppression of Acts of Nuclear Terrorism
INENS	International Network of Emerging Nuclear Specialists
INSSP	Integrated Nuclear Security Support Plan
ITDB	Illicit Trafficking Database
LEU	Low-enriched uranium
NECSA	Nuclear Energy Corporation of South Africa
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
OAU	Organisation of African Unity
PSI	Proliferation Security Initiative
RASCA	Regional Advisory Safety Committee for Research Reactors in Africa
RDD	Radiological dispersal devices
SENES	Survey of Emerging Nuclear Energy States

UN	United Nations
UNREC	United Nations Regional Centre for Peace and Disarmament
WINS	World Institute of Nuclear Security
WMD	Weapons of mass destruction
WNA	World Nuclear Association

Foreword

Although the need to better secure nuclear and other radioactive material and associated technologies has been on the international agenda for many years, it has taken on heightened significance in recent times.¹ This is as a result of the uncovering of an international nuclear smuggling ring – the A.Q. Kahn network² – in 2004, implicating a number of citizens of various countries in spreading sensitive nuclear technologies without authorisation; and, post-9/11 evidence suggesting that al Qaeda-linked groups may have an interest in acquiring or developing a weapon of mass destruction (WMD) and in particular a nuclear or radiological explosive/dispersal device.³

Radiological dispersal devices (RDD) or ‘dirty bombs’ combine a conventional explosive device, such as TNT, with radioactive material. Compared with a nuclear explosive device (any nuclear weapon or other explosive device capable of releasing nuclear energy) RDDs generally require limited technical knowledge to develop and the radiological isotopes can be obtained from a wide variety of sources, including nuclear weapon arsenals, nuclear research reactors, nuclear power plants and orphan sources – discarded and abandoned redundant industrial products and waste from medical facilities – as well as uranium mines and other mines that produce uranium as a by-product.

In response to the growing demand for a nuclear-weapon-free world, in April 2009, US President Barack Obama presented an ambitious three-part strategy to address international nuclear threats and in particular the increase in the risk of nuclear material diversion and illicit trafficking by: 1) proposing measures to reduce and eventually eliminate existing nuclear weapon arsenals; 2) strengthening the Non-Proliferation Treaty (NPT); and, 3) preventing ‘terrorists’ from acquiring nuclear weapons or materials.⁴

Despite the differences between these types of sources, clearly small and insignificant (from their potential to be used maliciously) sources greatly

outnumber larger and more hazardous sources, while fissile material (in the form either of nuclear weapons or of materials related to nuclear power) is under tighter control at a much smaller number of sites than radiological sources.⁵

Researching the African nuclear security environment

This publication is the result of research on the current status of nuclear security in Africa undertaken by the 'Africa's Development and the Threat of Weapons of Mass Destruction Project' (WMD Project) at the Institute for Security Studies (ISS), with support from the British High Commission in South Africa. The United Kingdom's interest lies in its belief that an armed attack using nuclear devices represents one of the most destructive risks to global security. The UK was influential in shaping the outcomes of the Washington Nuclear Security Summit, which aimed to generate agreement on a common understanding of the threat posed by nuclear terrorism, to agree to effective measures to secure nuclear material and to prevent nuclear smuggling and is playing its part by setting the highest domestic security standards and encouraging the adoption of comparable standards elsewhere, including through its support of the IAEA.

The ISS is an independent African human security research institution working towards a stable and peaceful Africa characterised by sustainable development, human rights, the rule of law, democracy and collaborative security. The ISS has a staff of 130 people in five offices; two in South Africa, Pretoria and Cape Town and in Nairobi, Kenya, Addis Ababa, Ethiopia and Dakar, Senegal. As such, the ISS is well placed to undertake research outlining the African nuclear security environment and identifying the current threats, as well to determine the status of implementation of nuclear security regimes in Africa. In addition, as a non-governmental organisation, the ISS is in an ideal position to provide a 'safe' platform for operators and regulators to share lessons and experiences in strengthening nuclear security in Africa and to explore the feasibility of co-ordinating their actions to secure vulnerable materials from unauthorised persons or organisations.

The ISS' WMD Project aims to identify and broaden Africa's role in international efforts to strengthen disarmament and non-proliferation as they relate to weapons of mass destruction (WMD) in the context of Africa's developmental imperatives.

The project's objectives include:

- To build African capacity to engage positively and effectively in international disarmament fora
- To engage with members of the scientific community and industry in discussion and debate about the risks, rules and their responsibilities in relation to their activities
- To stimulate discussion and dialogue about ways in which Africa can positively balance its development needs with non-proliferation concerns

In order to determine the current status of nuclear security in Africa and to identify the challenges in securing Africa's nuclear resources, the ISS hosted two experts' workshops, one in 2011 on 'Securing Africa's Nuclear Resources' and one in 2012 on 'Progress on Securing Africa's Nuclear Resources'. The workshops brought together a range of African stakeholders, including officials from various South African government departments, African national nuclear regulators, power plants, atomic energy commissions and radiation protection authorities, the Africa Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA), the African Union (AU) and the Forum of Nuclear Regulatory Bodies in Africa (FNRBA).

Nuclear security risks

The International Atomic Energy Agency (IAEA) has categorised four potential nuclear security risks:

- Theft of a nuclear weapon
- The acquisition of nuclear materials for the construction of nuclear explosive devices
- The malicious use of radioactive sources, including in so-called 'dirty bombs'
- The radiological hazards caused by an attack on, or sabotage of, a facility or a transport vehicle⁶

The responsibility for securing nuclear and radioactive materials ultimately rests with individual states. However, countries tend to rely on a number of international instruments and acknowledged principles to guide the control

of nuclear and other radioactive materials. These instruments and principles include: the Convention on the Physical Protection of Nuclear Material and its 2005 Amendment; the International Convention for the Suppression of Acts of Nuclear Terrorism; the International Convention for the Suppression of Terrorist Bombings; the International Convention for the Suppression of the Financing of Terrorism; UN Security Council Resolutions 1373 and 1540; various IAEA documents such as the Code of Conduct on Safety and Security of Radioactive Sources⁷; the Guidance on the Import and Export of Radioactive Sources (INFCIRC/663); the Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/ Rev.4); and, the Physical Protection Objectives and Fundamental Principles (GC(45)/INF/14).

According to the IAEA,

this broad range [of] instruments (many developed under IAEA auspices) provides a framework for using such material safely and securely in ways that protect all States – both those with active nuclear programmes and those conducting only limited nuclear activities.⁸

The IAEA has also noted that,

illicit trafficking in nuclear materials is a potential threat to the security of states and international security. Nuclear trafficking could be a shortcut to nuclear proliferation and to nuclear terrorism. And loss or unauthorized disposal of nuclear material or nuclear waste may result in grave economic and environmental consequences.⁹

However, not all states adhere to the existing body of regulations governing nuclear security, and many have not implemented them effectively through their national legal and regulatory frameworks. This has led to gaps in the global system that could potentially be exploited by armed non-state actors or other criminal networks.

Although terrorism and organised crime have traditionally been considered distinct threats to peace and security, there is a growing body of evidence to suggest that their interests, modus operandi and motivations might overlap. Organised crime networks already possess many of the resources sought by nuclear and radiological ‘terrorists’, including mechanisms for illicit transport, circumventing control regimes and access to prohibited goods.¹⁰

Africa and the threat from organised criminal elements and from acts of terrorism

Notwithstanding the African perception that there is little or no risk of an imminent attack with radiological devices or weapons of mass destruction (WMD) on the continent, nor a significant threat of nuclear trafficking through the region by domestic or transnational armed non-state actors, according to the IAEA's Illicit Trafficking Database (ITDB), from January 1993 to December 2011, a total of 2164 confirmed incidents were reported by participating states and some non-participating states.

Of the 2164 confirmed incidents, 399 involved unauthorised possession and related criminal activities, 588 incidents involved the theft or loss of nuclear or other radioactive material and a total of 1124 cases involved other unauthorised activities, including the unauthorised disposal of radioactive materials or discovery of uncontrolled sources. Due to insufficient information, the remaining 69 cases could not be categorised.¹¹ Globally, between 1972 and 2007, 17 major terror attacks or acts of sabotage were carried out against nuclear power stations.¹²

According to the report, *Minimizing Threat Convergence Risks in East Africa and the Horn of Africa: Prospects for Achieving Security and Stability* there have been reports of smuggling of nuclear source material in Africa:

Of the illicit nuclear trafficking cases reported from the region, the majority point to the Democratic Republic of Congo (DRC) as the point of origin. The DRC has uranium mines and the Regional Centre for Nuclear Studies in Kinshasa, a nuclear research facility known as CREN-K, which possesses low-enriched uranium (LEU) and spent fuel, but which has not been operational since November 2003. The IAEA stated in 2008 that CREN-K's material is not a proliferation concern, but could be used to make [an]...RDD, or 'dirty bomb'. Two fuel rods were stolen from CREN-K in the 1970s, one of which was never recovered. The other was recovered in Italy almost a decade later and was reportedly found in the hands of a group linked to the mafia. Tanzania and Kenya have also been used for transiting materials, including two recent incidents, one in Tanzania in mid-2007 and one in Kenya in late 2008.¹³

Eastern Africa, and the Horn as a whole, presents numerous opportunities for sub-state actors to acquire or transit the region with radiological material.¹⁴

A report by Maplecroft, a UK-based risk advisory consultancy, indicates that Eastern Africa remains a fertile ground for terrorism. The report finds that Kenya, Uganda and Tanzania are all at risk. The group puts Uganda among countries that are top targets of al Qaeda or other regional extremist groups such as al Shabaab of Somalia. Kenya is rated as 'high-risk' while Tanzania, though it is put among 'low-risk' countries, is considered by virtue of its proximity to Somalia a potential target. Somalia, which has been without a properly functioning government for almost two decades, occupies the top position among the 'extreme-risk' countries and states neighbouring Somalia appear to be at serious risk of being the foremost targets, according to the 2010 Terrorism Risk Index.¹⁵ According to the 2011 Terrorism Risk Index, Somalia is again at the top of the list of 'extreme risk' countries, with South Sudan, the DRC, Central African Republic (CAR), Algeria, Sudan and Nigeria making the top 20.¹⁶

In Southern Africa, in November 2007, armed men entered the Pelindaba nuclear facility in Pretoria, South Africa, which is surrounded by an electrified security fence and intrusion detectors. The teams were able to shoot a worker and spend forty-five minutes inside the facility without being engaged by security forces.¹⁷

Existing and potential sources of radiological material in Africa

According to the IAEA, Algeria, Egypt, Ghana, Libya, Morocco, Nigeria and South Africa have operational nuclear research reactors. South Africa also has two nuclear power reactors. The DRC research reactors are no longer in operation. A number of African countries have uranium ore deposits, including Algeria, Botswana, Central African Republic, DRC, Guinea, Equatorial Guinea, Malawi, Mali, Mauritania, Morocco, Namibia, Niger, Nigeria, Somalia, Tanzania and Zambia. Gabon has been a significant uranium supplier in the past. In 2010, Namibia was the fourth-highest generator of mined uranium with an annual production rate of approximately 5 000 tonnes, and Niger was the fifth-highest generator with an annual production of about 4 200 tonnes.¹⁸

Nuclear material has been recognised as an alternative source of energy for Africa by the New Partnership for Africa's Development (NEPAD) and a number of African countries are therefore in the process of investigating the feasibility of developing nuclear power plants for electricity generation.

These include, but are not limited to, Namibia, Algeria, Egypt, Ghana, Libya, Morocco, Kenya, Nigeria, Tunisia and Senegal. The IAEA has been providing research assistance to Algeria, Egypt, Ghana, Libya, Morocco, Nigeria and Tunisia, amongst others, regarding the adoption of nuclear energy as a means of generating electricity in these countries.

Both South Africa and Namibia have publicly announced plans to explore the possibility of developing the entire nuclear fuel cycle. According to Namibia's Draft Nuclear Fuel Policy, the country is already involved in uranium exploration, mining and related activities but will also consider enrichment and fuel fabrication. The policy also refers to radioactive waste and spent fuel management, as well as the associated activities such as transportation, handling, possession, transfers, storage, import and export of nuclear and radioactive material in the nuclear fuel cycle, including decommissioning of facilities in the nuclear fuel cycle, as well as sensitive nuclear technology.¹⁹ Namibia and South Africa, together with Niger, are amongst the main suppliers of uranium to the international community.²⁰

As such, African states are key to implementing President Obama's pledge to lead an international effort 'to secure all vulnerable nuclear material around the world within four years' which he concretised during the Nuclear Security Summit held in Washington DC in April 2010. The 47 participating nations present, which included Algeria, Egypt, Morocco, Nigeria and South Africa, and three international organisations, made commitments to take concrete measures towards ensuring that nuclear materials under their control are not stolen or diverted. They pledged to continue to evaluate the threat and improve security as changing conditions may require, and to exchange best practices and practical solutions for doing so.²¹

In March 2012, the second Nuclear Security Summit will take place in Seoul, South Korea. The same 47 countries invited to participate in the 2010 summit have been invited to attend the meeting in Seoul. The scope of the meeting will echo that of the 2010 summit and will focus on implementing the international nuclear security regime. In addition, the impact of the Fukushima Daiichi nuclear disaster will also be discussed. Although participation in the Nuclear Security Summit process is limited, it is another opportunity for states to commit to implementing the international nuclear security regime, which includes the legal and institutional framework for the protection of nuclear and other radioactive materials.²²

Conclusion

This publication is an updated and enhanced version of the booklet *Securing Africa's Nuclear Resources* published by ISS in 2011. Section I of this assessment addresses the central research question of how the challenge of securing nuclear materials on the African continent is currently being addressed by investigating existing and future activities undertaken by African governments together with the implementation support and compliance bodies of the various treaties governing the control of nuclear material, such as the IAEA. Section II is the Chairpersons' Summary of the 2012 experts' workshop on 'Progress on Securing Africa's Nuclear Resources' referred to above. The summary, prepared by the organisers, provides an overview of the issues and themes discussed at the workshop, as well as the outcomes, recommendations and a proposed way forward. This booklet also includes two annexures on the status of conventions and treaties related to nuclear security in Africa as well as a select list of conventions, protocols, documents and initiatives regarding nuclear security.

As the sections in this report indicate, from both preliminary research and the results of the experts' workshops, it is apparent that:

- There is a need to be committed to ensuring the safety and security of nuclear and other radioactive materials without impeding the continued delivery of the developmental benefits that such materials and related applications provide. In other words, African states need to develop the necessary legal and regulatory frameworks that would allow for the safe and secure development of uranium resources, as well as for the peaceful applications of nuclear technology. Therefore, a balance between security and development must be sought.
- Despite the general African perception that there is little or no risk of an imminent attack with radiological devices or weapons of mass destruction on the continent, nor a significant threat of nuclear trafficking through the region by domestic or transnational armed non-state actors and criminals, amongst operators of nuclear facilities, the prevailing view is that it is imperative that African states should not wait for a nuclear incident to occur and that the continent must focus on implementing preventative measures aimed at both the strengthening of controls and development of appropriate strategies to address the root causes of terrorist and/or criminal acts.

- There is a need for an independent threat assessment to be conducted on the continent and for this assessment then to be used to improve safety and security standards and controls, to upgrade physical protection and improve detection equipment both on-site and at ports of entry, as well as to align training and capacity-building initiatives, national legislation, and importantly, to inform the development of a continental framework document that spells out African needs in the area of nuclear security while at the same time assisting in national design-basis threat assessments.
- The strengthening of controls to curb activities that may contribute to the development of radiological dispersal devices should take place through close cooperation and sharing of information amongst states, that is, at a multilateral level.
- African national legislation and regulations with regard to nuclear security should be more in line with international best practice. Research into the shortcomings of existing national nuclear security laws in Africa needs to be drafted and effective regulatory infrastructure needs to be established.
- African states need to support the full implementation of the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) and, in particular, Article 10 (Physical Protection of Nuclear Materials and Facilities) where states parties undertake to ‘... maintain the highest standards of security and effective physical protection of nuclear materials, facilities and equipment to prevent theft or unauthorized use and handling...’ and the Treaty’s implementation body, the African Commission on Nuclear Energy (AFCONE) which is being established in South Africa.
- The African Union, through AFCONE, should put machinery in place for the development and promulgation of continental directives on nuclear security, which will be binding on member states without compromising their integrity.
- African states, the African Union and members of AFCONE that are participating in the 2012 Nuclear Security Summit must ensure that African concerns are reflected in the final document of the summit.
- Accession to, and compliance with, relevant international legal instruments on terrorism and international organised crime, such as the International Convention for the Suppression of Acts of Nuclear Terrorism, the International Convention for the Suppression of Terrorist Bombings and the International Convention for the Suppression of the Financing of Terrorism, as well as the implementation of relevant UN Security Council resolutions, such as UNSCR 1540, are crucial.

- The ratification of and compliance with existing international nuclear security instruments, such as the Convention on the Physical Protection of Nuclear Material and its 2005 Amendment and the Joint Convention on Spent Nuclear Fuel and Radioactive Waste Management, are also vital.
- The capacity of national law enforcement officials to deal with the trafficking of nuclear and other radioactive material needs to be reinforced through appropriate training in investigative procedures and the upgrading of border control equipment and resources.

Section I

An assessment of nuclear security in Africa

Introduction

Ensuring the security of nuclear and other radioactive materials and associated technologies has been on the international agenda for a number of years. However, due to developments such as the A.Q. Kahn network, nuclear security is now becoming a priority for many states around the world. Although African states acknowledge the importance of securing nuclear and radioactive materials, the continent currently faces a variety of other security challenges – including the proliferation of small arms and light weapons, the alleviation of poverty and the provision of basic goods and services such as food, housing, educational facilities and healthcare. The extent of these immediate challenges makes it difficult to argue that Africa should be more concerned about the threat of nuclear weapons or the diversion of nuclear material to armed non-state actors.

Although African participation in international legal regimes governing nuclear weapons and material has often been perceived as marginal, this [mis]perception often does not include an understanding of the African security context. A study of nuclear material security in Africa must include an acknowledgement of other sources of insecurity on the continent, including conflicts over natural resources, inadequate border security, ungoverned spaces, and linkages with organised crime and terrorism networks. In addition, the lack of participation by African states in international nuclear fora is often a result of a lack of capacity and resources, rather than the non-prioritisation of the issue.

This assessment will address the central research question of how the challenge of securing nuclear materials on the African continent is currently being addressed by investigating existing and future activities undertaken by African governments together with the implementation support and

compliance bodies of the various treaties governing the control of nuclear material, such as the International Atomic Energy Agency (IAEA), the United Nations Security Council Resolution 1540 Committee and the African Commission on Nuclear Energy (AFCONe).

The assessment outlines the nuclear security environment, identifying the current threats as well as exploring the current nuclear security regime. The assessment will also discuss the status of implementation of the nuclear security regime in Africa as well as the link between nuclear security and terrorism. The implications of the so-called nuclear energy revival or renaissance are also briefly described. The conclusion and recommendations section of this assessment will show that more work can be done to improve the security of nuclear material on the African continent through the development of appropriate mechanisms that simultaneously address the developmental and safety concerns of African states. Although the threat posed by nuclear material may not be a high priority to the African continent at present, this situation is changing and the continent is increasingly engaging with the international community to ensure global security.

Nuclear security

The present-day international security environment poses extraordinary challenges for the prevention of the spread of nuclear weapons and materials. There are suspicions that a number of armed non-state actors are actively seeking to acquire nuclear weapons or the material and technology required to produce them. In addition, the expansion of nuclear technology, as well as the development of civilian nuclear energy capacity, will in the future pose an increased challenge to current non-proliferation efforts.

Despite these challenges, nuclear security in many countries has improved substantially over the past 15 years, largely due to the development of national strategies and increased international cooperation in the field. According to Bunn, as of April 2010, '17 countries have eliminated all of the weapons-usable nuclear material on their soil'.²³ However, Howsley argues, 'the pervasive secrecy surrounding nuclear security means that no global mechanism is in place to identify the worst security performers and help them come up to the level of the best performers'.²⁴

Added to the challenge of overcoming nuclear secrecy, the present international nuclear security framework involves a substantial number of initiatives

ranging from national regulations and procedures to voluntary codes of conduct and legally binding international conventions. Countries may become overwhelmed by the wide range and scope of these elements, potentially leading to an over-complication of the implementation process. Given the exhaustive list of nuclear security initiatives, only a few will be discussed in this assessment, particularly those with direct relevance to Africa. The following section briefly describes current threats to nuclear security. The changing global security context means that African states have an obligation to remain vigilant and ensure that they continue to play a vital part in the international discussion of nuclear resource security.

Current international nuclear security threats

There are two main categories of nuclear security threats present in the international community today. The first involves attacks on nuclear facilities and the second is the diversion of nuclear material, through black market sales, illicit trafficking or smuggling, to state and non-state actors. The second type of threat is of greater concern and is evident in the steady increase in illicit trafficking cases since the early 1990s.²⁵

Although it seems highly unlikely that any group would attempt an attack on a nuclear installation, given the highly sophisticated security measures present, there is still a remote possibility that armed non-state actors may, in future, target nuclear reactors. In an age of suicide bombers and hijacked commercial aircraft, representatives from the nuclear industry and governments remain confident that nuclear structures are able to withstand airplane crashes, but this may not be the case in all countries currently housing nuclear installations. An additional security threat is a possible military attack on a nuclear facility in one state by another state, as in the case where Israel allegedly destroyed a nuclear reactor in Syria in September 2007.²⁶

A more pressing threat to international security is the acquisition of nuclear materials by armed non-state actors for the ‘purpose of making a nuclear weapon or radiological dispersal device’.²⁷ Thus, as more African states embark on the development of nuclear energy programmes and the mining of, and trade in, uranium, the need to reprioritise nuclear security on the continental agenda becomes more pressing.

The international nuclear security regime

In order to prevent potential threats to national security, including nuclear threats, from armed non-state actors and organised criminal groups, countries have developed strategies in line with their international obligations. However, unlike the international nuclear safety framework, the international structure governing nuclear security is not as 'extensive, advanced or entrenched'.²⁸ In addition, Findlay argues that within the nuclear security framework, there are 'less widely accepted sets of recommended security principles and practices, little collaboration between nuclear plant operators worldwide, practically no peer review and an abiding sense that nuclear security is too sensitive an issue to be subject to global governance'.²⁹

The Washington Nuclear Security Summit held on 12–13 April 2010 produced a work plan consisting of a number of (voluntary) steps that should be taken to ensure the safe 'storage, use, transportation and disposal of nuclear materials and in preventing non-state actors from obtaining the information required to use such materials for malicious purposes'.³⁰ The work plan represents the broad nuclear security architecture as it incorporates many of the national and international initiatives that countries can implement, including the International Convention for the Suppression of Acts of Nuclear Terrorism, the Convention on the Physical Protection of Nuclear Material, and United Nations Security Council Resolution (UNSCR) 1540.

Other important initiatives that support cooperation in the field of nuclear security include the Global Initiative to Combat Nuclear Terrorism (GICNT), an ad hoc discussion group of 82 countries established by the US and Russia in 2006; the World Institute of Nuclear Security (WINS), created in 2008 as an open forum for nuclear security operators to exchange best-practice experiences; and the G8 Global Partnership, a ten-year, \$20 billion threat-reduction effort launched in 2002.³¹

In addition, the Nuclear Threat Initiative (NTI) launched the Nuclear Materials Security Index in January 2012, which is 'a first-of-its-kind public benchmarking project of nuclear materials security conditions on a country-by-country basis'.³² The NTI Index was prepared in collaboration with the Economist Intelligence Unit. According to the NTI, the Index 'assesses the contribution of 32 states with one kilogram or more of weapons-usable nuclear materials toward improved global nuclear materials security conditions, using five categories:

(a) Quantities and Sites, (b) Security and Control Measures, (c) Global Norms, (d) Domestic Commitments and Capacity and (e) Societal Factors. An additional 144 states, with less than one kilogram of weapons-usable nuclear materials or none at all, are assessed on the last three of these categories'.³³

Status of the international nuclear security regime in Africa

Traditionally, African involvement in international nuclear disarmament and non-proliferation negotiations has been perceived as marginal. However, African countries cannot afford not to be concerned about non-proliferation and disarmament issues. In addition to reducing insecurity on the African continent, active participation in international negotiations by African states leading to global disarmament, will free up substantial resources that can be used for human and social development. Although there is a general perception that African states do not prioritise participation in international legal regimes governing nuclear weapons and material, this conclusion is usually based on a 'northern' understanding of Africa's numerous challenges. A discussion of nuclear material security in Africa must acknowledge other sources of insecurity on the continent, including the scarcity of food, unequal land distribution and perceived corrupt practices on the part of those in power. Ensuring the security of nuclear materials in Africa is therefore but one element of the continent's overall security architecture.

In a Defense Threat Reduction Agency (DTRA) discussion report of April 2009, members of a working group concluded that it would be unfair to assume that African states are not concerned about nuclear security, based on their lack of ratification of and/or participation in international agreements.³⁴ African states have often contended that some of these agreements are not specifically applicable to their countries or that they lack the resources, expertise or capacity to join these treaties. African government officials have also argued that their countries are often faced with the task of ratifying a large number of other international conventions and have not had the time to ratify instruments related to nuclear security. Countries have also argued that they will not sign up to a treaty until they know they can devote the necessary resources to comprehensively implement it. Ratifying a treaty or convention does not automatically imply that a country's nuclear material will be secured. Ratification is only one

step in the process that also includes domestication of international laws and actual implementation of a particular treaty or convention.

It is interesting to note that only five African states – Algeria, Egypt, Nigeria, Morocco and South Africa – were invited to attend the 2010 Nuclear Security Summit. This is probably due to their relevant experiences in the nuclear field, and these five countries could also be considered leaders in the field of nuclear technology in their respective regions and therefore could be influential in determining how this technology is managed on the African continent. The same five African countries will participate in the 2012 Nuclear Security Summit in Seoul, South Korea.

The International Atomic Energy Agency (IAEA) has identified a number of emerging nuclear energy states, including Ghana, Namibia and Senegal.³⁵ In addition, as more African states, such as Kenya, Nigeria, and Tanzania, are publicly announcing that they are considering nuclear energy, the security of radiological and nuclear material is steadily becoming more prominent. The potential impact of the nuclear energy 'revival' is discussed later in this assessment.

African states are party to a number of treaties and conventions that contribute to the global nuclear security framework. These include the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba), the Convention on the Physical Protection of Nuclear Material, the International Convention for the Suppression of Acts of Nuclear Terrorism and the OAU Convention on Prevention and Combating of Terrorism (Algiers Convention). The NPT, for example, is of vital importance, given the developmental and security imperatives facing Africa. Hence, African states played a significant role in the NPT Review Conference, which took place from 3–28 May 2010. Attended by virtually all African Union members, a number of African states made opening statements to the NPT Review Conference, in which they set out their positions. These included Algeria, Botswana, Burkina Faso, Cameroon (on behalf of the Africa Group), Congo, Egypt, The Gambia, Ghana, Kenya, Libya, Morocco, Mozambique, Namibia, Nigeria, Senegal, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe.³⁶

The adoption, by consensus, of a final document, while not meeting all of Africa's expectations, was seen by many African states as a significant achievement in maintaining the three pillars of the NPT namely, to prevent the spread of nuclear weapons and weapon technology; to further the goal of nuclear disarmament, and to promote cooperation in the peaceful uses of nuclear energy.

The final document also reaffirms the inalienable right of non-nuclear-weapon states to pursue peaceful uses of nuclear energy in terms of Article IV of the Treaty. Most importantly for Africa, the final document states that developing states should be given preferential treatment in this area. The final document referred to the role of the IAEA in fostering international cooperation in nuclear security, as well as in 'establishing a comprehensive set of nuclear security guidelines, and in assisting Member States, upon request, in their efforts to enhance nuclear security.'³⁷ At a workshop co-hosted by the International Network of Emerging Specialists (INENS) and the ISS in December 2011, African participants highlighted the importance of the follow-on actions related to nuclear security, including encouraging states to become parties to the Convention on the Physical Protection of Nuclear Material (CPPNM) and the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) and to strengthen national regulatory controls of nuclear materials as a matter of urgency.³⁸

As a means to further nuclear science and technology for African development, the IAEA and its African member states established the African Regional Co-operative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) in 1990.³⁹ AFRA is an important initiative given that it 'seeks to maximize the use of the available infrastructure and expertise in Africa and assists countries to move toward regional self-sufficiency using peaceful applications of nuclear techniques'.⁴⁰ Nuclear security and radiation and waste safety is one of AFRA's six thematic focus areas, which also include human health, food and agriculture, water resources, sustainable energy development and industrial applications. AFRA's nuclear security project, in support of the implementation of the IAEA's Nuclear Security Plan (2006-2009), ended in June 2010. The objective of the project was to increase 'national awareness and capacities in targeted African countries for the prevention, detection and response to malicious acts involving nuclear and other radioactive materials or facilities' and the 'illicit trafficking in nuclear and other radioactive material'.⁴¹ Between 2007 and 2010, the project hosted five regional training courses with participants from 33 African countries.⁴² The outcomes of the five regional courses included member states' understanding of the need for:

- Obligations related to combating malicious acts involving nuclear and other radioactive materials as described in the relevant international instruments

- Nuclear security infrastructure in a country
- Effective mechanisms to prevent malicious acts involving nuclear and other radioactive materials
- Effective detection systems at border crossings and other ‘choke’ points; the need for effective response mechanisms, both locally and nationally, to ensure that the detection of any unauthorised nuclear and other radioactive material is responded to in such a way as to protect people, the environment and society from the effects of nuclear terrorism and to ensure that any evidence necessary for successful prosecution of perpetrators is properly protected
- A systematic process for human resource development in the area of nuclear security in order for the state to effectively combat nuclear terrorism⁴³

The IAEA has been working closely with African states in order to implement the agency’s 2010–2013 Nuclear Security Plan. Notable achievements include the approval of Integrated Nuclear Security Support Plans (INSSPs) in nine African countries. These plans provide a confidential outline of a state’s nuclear security infrastructure and identify the main actions to be carried out by the state to improve its nuclear security. Since 2002, the IAEA has provided over 75 training courses to more than 1 800 participants in nuclear security in Africa. Importantly, the IAEA has established three Nuclear Security Support Centres in Ghana, Morocco and Tanzania. These centres will assist countries with developing human resources through implementing a tailored training programme, developing a network of experts and providing technical support for lifecycle equipment management and scientific support for the detection of and response to nuclear security events.⁴⁴

Another significant African initiative is the Forum of Nuclear Regulatory Bodies in Africa (FNRBA). The FNRBA was launched in March 2009. The FNRBA was formed in response to the increasing use of radioactive material in peaceful nuclear applications such as health, agriculture and energy and the desire of the regulatory bodies in the region to take ownership of nuclear safety and security.⁴⁵ There are currently 31 African countries that actively participate in the Forum.⁴⁶ According to the former IAEA Deputy Director General Tomihiro Taniguchi, the launching of the FNRBA ‘is a very positive step in strengthening nuclear safety and security in Africa’.⁴⁷ The FNRBA provides a mechanism for the exchange of regulatory experiences and practices among nuclear regulatory bodies in Africa, and importantly, aims to provide for the

enhancement, strengthening and harmonisation of the radiation protection, nuclear safety and security regulatory infrastructure and framework among the members of FNRBA. The work of the FNRBA complements the work of the IAEA's Nuclear Security Programme in Africa.⁴⁸ The FNRBA has over the past three years held several training workshops on nuclear safety and security involving the use of radioactive sources, nuclear research and power reactors in different African countries. For example, in 2011, the FNRBA, in collaboration with the IAEA, hosted a training workshop on the Applications of the Requirements and Guidance on Developing National Capabilities for Response to Nuclear or Radiological Emergencies in Khartoum, Sudan. Forum members also participated in a meeting on the Global Nuclear Safety and Security Network in December in Vienna, Austria. The Forum also held its third plenary meeting in Bamako, Mali in March 2011 to discuss progress in the implementation of its project with the IAEA on self-assessment of Regulatory Bodies in Africa. The fourth plenary meeting of the FNRBA was held in Yaoundé, Cameroon in March 2012.⁴⁹

Perhaps the most important example of Africa's commitment to a world free from nuclear weapons and from the abuse of radiological material is the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba), which was approved by African heads of state on 23 June 1995. The Treaty declares Africa a zone free from nuclear weapons and provides for the promotion of cooperation in the peaceful uses of nuclear energy; requires complete nuclear disarmament by African states and enhances both regional and global peace and security. As an important step towards strengthening the global non-proliferation regime, the Treaty of Pelindaba seeks to ensure that nuclear weapons are not developed, produced, tested or otherwise acquired or stationed anywhere on the African continent or its associated islands.⁵⁰

Twenty-eight ratifications and deposits were needed to bring the Treaty of Pelindaba into force, which occurred in July 2009. As of 1 February 2012, all 53 African states, as well as the territory known as the Sahrawi Arab Democratic Republic, have signed the Treaty, and 34 countries have deposited their instrument of ratification with the African Union. Under Articles 12 and 14, the African Union, as the Treaty Depository, is mandated to arrange a first Conference of Parties at which the composition, location and role and functions of the African Commission on Nuclear Energy (AFCON) would be finalised, and at which matters such as the Commission's budget and the scale of

Table 1 African Participation in AFRA and the FNRBA

African State	FNRBA membership	AFRA membership
Algeria	X	X
Angola	X	X
Benin		X
Botswana	X	
Burkina Faso	X	X
Burundi		
Cameroon	X	X
Cape Verde		
Central African Republic		X
Chad		X
Comoros		
Congo (Republic of)		
Côte d'Ivoire	X	X
Djibouti		
Democratic Republic of Congo	X	X
Egypt	X	X
Equatorial Guinea		
Eritrea		
Ethiopia	X	X
Gabon	X	X
Gambia		
Ghana	X	X
Guinea		
Guinea-Bissau		
Kenya	X	X
Lesotho		X

African State	FNRBA membership	AFRA membership
Liberia		
Libya	X	X
Madagascar	X	X
Malawi	X	X
Mali	X	X
Mauritania	X	X
Mauritius	X	X
Morocco	X	X
Mozambique	X	X
Namibia	X	X
Niger	X	
Nigeria	X	X
Rwanda		
São Tomé and Príncipe		
Senegal	X	
Seychelles	X	X
Sierra Leone		X
Somalia		
South Africa	X	X
South Sudan (Republic of)		
Sudan	X	X
Swaziland		
Tanzania (United Republic of)	X	X
Togo		
Tunisia	X	X
Uganda	X	X
Zambia	X	X
Zimbabwe	X	X

assessment to be paid by the state parties should be agreed. AFCONE would be responsible for ensuring that African states and nuclear weapon states comply with the provisions of the Treaty.

The First Conference of States Parties took place on 4 November 2010 at the AU Headquarters in Addis Ababa. Participants endorsed the 1996 Cairo Declaration and agreed that South Africa would host the headquarters of AFCONE.⁵¹ The Conference elected the following 12 countries as Commissioners of AFCONE: Algeria, Burkina Faso, Cameroon, Ethiopia, Kenya, Libya, Mali, Mauritius, Senegal, South Africa, Togo and Tunisia.⁵² On 4 May 2011, the First Ordinary Session (a meeting of the 12 Commissioners) of AFCONE was held to decide on the structure and budget of AFCONE and its rules of procedure, as well as to elect its chairman and vice-chairman and to establish a process to appoint an executive secretary.⁵³

The Treaty of Pelindaba contains specific provisions for ensuring the physical security of nuclear materials. Under Article 10 of the Treaty, states parties are legally obliged to maintain the ‘highest standards of security and effective physical protection’ of nuclear materials, facilities and equipment. Each party also undertakes to apply measures of physical protection equivalent to those provided for in the Convention on the Physical Protection of Nuclear Material and IAEA security guidelines.⁵⁴

During a workshop hosted by the ISS and the United Nations Regional Centre for Peace and Disarmament (UNREC) in March 2010, delegates argued that the fact that some countries have not yet ratified Pelindaba does not mean that there is no political will to do so. On the contrary, there was consensus that all African states were committed to their nuclear disarmament and non-proliferation obligations and that it was highly unlikely that this commitment would be reversed. Possible reasons for non-ratification included lack of knowledge and capacity, over-stretched staff, prioritisation of other issues (such as poverty alleviation) and other treaties that are seen as being of greater importance in the African context (such as those prohibiting the use, stockpiling, production and transfer of anti-personnel mines and certain types of cluster munitions and the United Nations Programme of Action on Small Arms).⁵⁵

The Treaty of Pelindaba is an important African initiative, and once AFCONE is fully operational, African states will have more control over the development of nuclear projects on the continent, which should also ensure increased security of radioactive material. AFCONE could potentially become the continent’s nuclear security hub, which could assist states with the implementation of

other international nuclear security instruments, including the Convention on the Physical Protection of Nuclear Material. As the only international legally binding instrument relating to the physical protection of nuclear material, this Convention establishes measures associated with the 'prevention, detection and punishment of offenses relating to nuclear material'.⁵⁶ As of 1 February 2012, 35 African states have ratified or acceded to the Convention.⁵⁷

In an effort to strengthen the existing international non-proliferation regime, the United Nations Security Council adopted Resolution 1540 in April 2004. The resolution, which is legally binding on all UN member states and therefore on all African states, aims to prohibit states from providing any form of support to non-state actors who attempt to acquire or produce weapons of mass destruction. It compels states to implement and enforce effective measures in their national legislation to prevent non-state actors from being able to develop, acquire, manufacture, possess, transport, transfer or use any type of chemical, biological, radiological or nuclear and/or related materials.

While many African countries have expressed support for UNSCR 1540, as of 1 February 2012, only 31 African states have submitted required reports to the 1540 Committee on progress made in implementing the provisions of the resolution. Most of the reports do not contain much detail, suggesting that implementing the resolution is not a high priority in Africa or that some African states do not have the capacity to fill in complicated forms or that there is simply 'reporting fatigue'. The majority of African countries have small 'disarmament and non-proliferation' departments and the number of reports that need to be compiled and submitted to various UN bodies is increasing. Non-reporting or late reporting then, should not be seen as a lack of political will or of non-implementation of international commitments and obligations.⁵⁸

Many of the African states that have submitted a report state that they do not possess any type of nuclear weapon and therefore could not assist non-state actors in acquiring them. Countries have also listed existing national legislation that broadly pertains to 1540 requirements; however, much of the legislation listed is out of date and insufficient to deal effectively with contemporary nuclear threats. Generally, border controls on the continent are notoriously weak and porous and while some reports indicate that sufficient border controls are in place, it is unlikely that these controls (which were put in place largely to curtail the illicit trafficking of small arms and other illegal substances) are

sufficient for preventing the proliferation of chemical, biological or nuclear weapons or their agents, materials and components. This is primarily because nuclear components are often more difficult for customs officials to identify without specific training. In addition, customs officials often have to do physical searches because scanning equipment or radiation detectors are not available. Although bodies such as the IAEA and AFRA have conducted training courses for customs officials in Africa, more resources are needed to really standardise this process throughout the continent.

Furthermore, the development of more effective border controls to this end could further contribute towards curbing the illicit small arms and drug trade.⁵⁹ While the 1540 Committee has also hosted a number of regional workshops on the African continent to assist states with implementation and reporting, such as in Kenya in February 2010, more work needs to be done to assist African states in meeting the demands of the Resolution.

Africa's response to the threat of terrorist acts

The threat of terrorist acts is not new to the African continent. However, 'African countries were not fully committed to implement existing regional and international strategies until the events of 11 September 2001 (9/11)'.⁶⁰ Incidents such as the 1998 bombing of US embassies in Kenya and Tanzania, the 2002 Mombasa attacks and the July 2010 bomb attacks in Uganda, made African states more aware of the dangers of transnational terrorism. Regional bodies, such as the African Union, have taken steps to establish more effective counter-terrorism measures on the continent, including the OAU Convention on the Prevention and Combating of Terrorism (Algiers Convention), the development of a Plan of Action on the Prevention and Combating of Terrorism in Africa and the establishment of the African Centre for the Study and Research on Terrorism (ACSRT).⁶¹

Africa's approach to terrorism in all its various forms, whether domestic, international, transnational or nuclear, has been reflective of the security priorities of the continent. With limited resources and numerous other priorities, it is important for African states to deal with particular incidents and to focus on the root causes of all forms of terrorism as well as to develop appropriate strategies to address these challenges.

African states have shown various levels of commitment to international and regional agreements that aim to counter terrorist acts. As an important part of

the global counter-terrorism framework, the International Convention for the Suppression of Acts of Nuclear Terrorism imposes an obligation on state parties to 'establish the offences within the scope of the Convention as criminal offences under their national laws and to make these offences punishable by appropriate penalties which take into account their grave nature'.⁶² The Convention also imposes the obligation to 'establish jurisdiction, territorial as well as extra-territorial, as may be necessary, over the offences set out in the Convention'.⁶³ Thus far, only 17 African states have ratified the Convention and 17 have signed it. There is very little public information available on the status of implementation of the Convention in Africa. As mentioned earlier, a key reason why this Convention has not been as successful on the continent could be that African states do not perceive nuclear terrorism to be a pressing threat to the continent. However, due to the increased interest in incorporating nuclear energy and technology into their domestic development strategies, African states will have to ensure that the materials used in these types of applications are not diverted to armed non-state actors.

An example of a continental counter-terrorism strategy in Africa is the OAU Convention on Prevention and Combating of Terrorism, adopted by the 35th Ordinary Session of the Assembly of Heads of States and Government in Algiers, in 1999. The Convention makes provision for fostering cooperation amongst member states, with a particular emphasis on the exchange of information on terrorist groups and their finance networks.⁶⁴ The Convention came into force on 6 December 2002. To date, 40 African states have deposited their instrument of ratification and a further nine countries are signatories to the Convention. A Protocol to the Algiers Convention opened for signature at the AU (successor to the OAU) in Addis Ababa on 2 July 2004. The main aim of the Protocol is to enhance the effective implementation of the Algiers Convention. It also outlines the 'need to coordinate and harmonize continental efforts in the prevention and combating of terrorism in all its aspects, as well as the implementation of other relevant international instruments'.⁶⁵ As of 1 February 2012, only 12 African states have ratified the Protocol to the Convention, which will only enter into force thirty days after the deposit of the fifteenth instrument of ratification.⁶⁶

Interestingly, the Algiers Convention only briefly mentions the 1979 Convention on the Physical Protection of Nuclear Material and the document does not mention nuclear terrorism at all. This could be an indication that, at the time of the drafting of the Convention, the then OAU did not consider nuclear terrorism to be a great threat to the African continent. The predicted

increase in the peaceful use of nuclear energy and technology, including the mining of uranium, in Africa may compel the AU to increasingly take note of the possible threat from the unauthorised use of nuclear materials and other radioactive sources. As discussed earlier, the Treaty of Pelindaba, and its African Commission on Nuclear Energy, may be the ideal instrument to monitor nuclear security trends on the continent.

The implications of nuclear energy

South Africa is the only country in Africa currently producing electricity from nuclear power reactors. However, as mentioned earlier, a number of African countries, including Algeria, Egypt, Ghana, Kenya, Nigeria and Uganda, have publicly expressed their interest in developing nuclear energy as a means of resolving their energy shortages and as a means to mitigate climate change.⁶⁷ In addition, eight countries on the continent, including South Africa, currently possess nuclear research reactors.

A Survey of Emerging Nuclear Energy States (SENES)⁶⁸ developed by the Nuclear Energy Futures Project of the Centre for International Governance Innovation (CIGI) identified ten African countries that are actively pursuing peaceful nuclear energy programmes. These countries include Algeria, Egypt, Ghana, Kenya, Libya, Morocco, Namibia, Nigeria, Senegal and Tunisia.⁶⁹ In addition, the World Nuclear Association (WNA) also includes Sudan and Uganda on the list of emerging nuclear energy states.⁷⁰ Emerging African nuclear energy states are only at the initial stages of developing nuclear power programmes. Egypt, for example, has well-developed plans but commitment by stakeholders is still pending. According to a September 2010 report by the IAEA on the international status and prospects of nuclear power, 21 (un-named) African countries 'are expressing interest in, considering or actively planning for nuclear power'.⁷¹

An IAEA handbook on steps countries need to take in order to launch a nuclear power programme estimates that the development of such a programme will take 10 to 20 years from the 'pre-project phase' to the 'construction phase'.⁷² Part of this process includes the establishment of appropriate security structures, systems and practices as well as the development of a suitable security culture that incorporates all stakeholders from nuclear technicians and customs officials to government representatives.⁷³

There are currently eight African states that have nine operational and two shutdown nuclear research reactors. These are Algeria, the DRC, Egypt, Ghana, Libya, Morocco, Nigeria and South Africa.

Table 2 lists the research reactors per country and the bodies responsible for operating these reactors.

Table 2 Types of Research Reactor in Africa⁷⁴

Country	Facility Name	Type	Thermal Power (kw)	Operator	Status
Algeria	Nur	Pool	1000	Centre de Recherche Nucléaire de Draria (CRND)	Operational
	Es-Salam	Heavy water	15 000	Centre de Recherche Nucléaire de Birine (CRNB)	Operational
Democratic Republic of Congo	TRICO I	TRIGA Mark I	50	Commissariat Général a L'énergie Atomique (CGEA)	Shut down
	TRICO II	TRIGA Mark II	1000	Commissariat Général a L'énergie Atomique (CGEA)	Shut down
Egypt	ETRR-1	Tank WWR	2000	ETRR-1 Reactor	Temporarily shut down
	ETRR-2	Pool	22 000	Atomic Energy Authority of Egypt	Operational
Ghana	GHARR-1	MNSR	30	National Nuclear Research Institute	Operational
Libya	IRT-1	Pool, IRT	10 000	Tajoura Nuclear Research Center	Operational
Morocco	MA-R1	TRIGA Mark II	2000	CNESTEN	Operational
Nigeria	NIRR-1	MNSR	30	Centre for Energy Research and Training	Operational
South Africa	SAFARI-1	Tank in pool	20 000	South African Nuclear Energy Corporation (NECSA)	Operational

As mentioned earlier in this assessment, nuclear regulatory bodies in Africa have the opportunity to meet regularly as members of the FNRBA in order to share experiences in nuclear safety as well as nuclear security. Given that nuclear safety is more relevant to the continent, the Regional Advisory Safety Committee for Research Reactors in Africa (RASCA) was established in June 2010 in order to advise operating organisations of their safety obligations. RASCA will also act as a nuclear safety experts' network, which will work together with the IAEA to ensure that nuclear safety standards are being met in African countries currently operating research reactors.⁷⁵ As more African countries develop nuclear power programmes, these nuclear safety fora may also need to consider the issue of nuclear security.

International experience has proven that the nuclear energy option is a far more complex undertaking than many African states may expect, therefore if African states want to incorporate nuclear energy into their energy mixes in future, planning has to begin now. According to Holger Rogner, head of the IAEA's planning section, 'twenty years from now, many of these [African] countries may be ready for it', but this will take considerable time and money – two extremely precious commodities for a continent that faces numerous other challenges.⁷⁶

Another aspect of the nuclear energy industry that will have an impact on global nuclear security is the mining of uranium. Africa has considerable mineral deposits, including deposits of lower-grade uranium. At present, uranium mining (whether in the prospecting phase or fully developed) is taking place in 35 African states.⁷⁷ Namibia, Niger and South Africa have the most comprehensive uranium mining infrastructures at present. Thus far, African governments, in collaboration with mining companies, have taken chief responsibility to ensure the safety and security of the raw materials produced from mining activities with a reasonable amount of success. The locations of some of these mines often make them vulnerable to other national insecurities, such as intrastate conflict, bringing into question the security of these materials.

The number of confirmed incidents of natural uranium smuggling has been comparatively low in Africa, with only 12 such incidents occurring between 1994 and 2005. These took place in Tanzania (four incidents) and the DRC, Kenya, Namibia and South Africa (two incidents each). Most of the incidents involved stolen uranium ore, usually stored in containers, from unidentified sources. The deterioration of security around mining sites in the DRC due to

political instability probably represents the most pressing nuclear security challenge in Africa today. Of particular concern is the illegal uranium and cobalt mining at the Shinkolobwe mine in Katanga Province, where the source material for the atomic bombs that were dropped on Hiroshima and Nagasaki in 1945 originated.⁷⁸ To date, there has only been one incident of lower-enriched uranium (LEU) trafficking and one known theft of nuclear fuel from a research reactor in Africa. In 1997, eight fuel rods of uranium were stolen from a Kinshasa research reactor. Only one of the rods was recovered, the whereabouts of the remaining rods is still unknown.⁷⁹

These incidents highlight the importance of securing vulnerable nuclear material in countries experiencing political instability. It is therefore vital that national, regional and international strategies take into account the local security situation when developing and implementing nuclear safety and security measures. Thus far, incidents of nuclear material smuggling in Africa have been isolated, but as more countries become involved in nuclear energy development and uranium-mining activities, strategies to combat illicit trafficking activities will have to adapt. African countries must work together in order to ensure the security of nuclear material on the continent.

Conclusions and recommendations

Addressing the challenge of securing nuclear materials in Africa must take into account the local context. For example, the experiences of states in North Africa are quite different from those in sub-Saharan Africa, and therefore, the principles applied on the African continent should include an assessment of regional as well as sub-regional dynamics.

Although it is very important that these materials are safeguarded against those who would potentially want to use the material to cause harm, it would be inappropriate to argue that African states should spend a large amount of financial and human resources in order to achieve this goal. There are already a number of initiatives taking place on the continent, but more work can certainly be done using the resources currently available to African states. The most important challenge to address is demonstrating to African states why actively participating in and implementing international nuclear security agreements are important, not only to their national security, but also to their socio-economic development. It is vital that African states are made aware of benefits of

complying with international conventions, which often come with assistance packages and increased inter-governmental cooperation.

The following are a few policy recommendations not only to ensure that nuclear materials become more secure in Africa but also that the international instruments that govern these kinds of material are implemented effectively:

- African states must develop a comprehensive nuclear security strategy for the continent, incorporating current initiatives, in order to ensure the security of nuclear materials.
- The international donor community should offer resources in the form of legal expertise to assist in drafting reports and appropriate legislation and for the technical aspects of implementing the provisions of the NPT; the Treaty of Pelindaba; and UNSCR 1540, either through appropriate NGOs or through government-to-government projects.
- The African Union should be engaged in nuclear security issues to promote more ‘buy-in’ into what is largely perceived to be a concern of the developed world.
- Additional programmes, including arrangements for sponsorships, should be developed to assist African states to participate fully in, for example, the conferences of the IAEA so that they may participate actively in international non-proliferation and disarmament fora.
- Those African states that have not yet ratified the Treaty of Pelindaba should be encouraged to do so as a matter of urgency.
- Regional meetings should be organised in order to provide African states with the opportunity to engage in issues of relevance to the continent with respect to nuclear security.
- Greater political support is needed to help place the NPT, the Treaty of Pelindaba and UNSCR 1540 into an African developmental context and to highlight the socio-economic benefits of full implementation of these agreements.
- States should be approached bilaterally for discussions on UNSCR 1540 and the significance of implementing its provisions. A particular focus should be placed on states that are considering developing nuclear power programmes, as well as those that possess extensive uranium deposits. A focus should be placed on those states that have not yet submitted an initial report or on those whose reports are deemed inadequate.

- Bodies such as the FNRBA, AFRA and AFCONE should be supported as they work towards safeguarding nuclear and other radioactive materials in African countries.

Section II

Experts' workshop on progress on 'securing Africa's nuclear resources', 8–9 February 2012

Chairpersons' Summary

This report, prepared by the organisers, provides an overview of the objectives, themes and outcomes of the workshop. The authors of this report bear sole accountability for its contents and it is not to be seen as reflective of all views expressed during the workshop.

Organisational factual summary

1. From 8–9 February 2012, the Institute for Security Studies held an experts' workshop on 'Progress on Securing Africa's Nuclear Resources' at Monash University in Ruimsig, South Africa. This workshop was a follow-on to an experts' workshop hosted in February 2011.
2. The workshop was made possible with the financial support of the British High Commission in Pretoria, South Africa.
3. Monash South Africa sponsored the conference facilities and assisted with workshop logistics.
4. Participants, while not necessarily representing their organisational views, included officials from: the African Union (AU), the Forum of Nuclear Regulatory Bodies in Africa (FNRBA), the Kenyan Radiation Protection Board; the Ghana Atomic Energy Commission; the Atomic Energy and Radiation Protection Authority of Namibia; the National Nuclear Regulator (NNR), South Africa; the Department of Energy, South Africa; the Nuclear Energy Corporation of South Africa (NECSA), South Africa; Eskom, South Africa; the *Centre National de Radioprotection* of Tunisia; the Radiation Protection Board of Zambia; the Radiation Protection Authority of

Zimbabwe; the 'Africa's Development and the Threat of Weapons of Mass Destruction' Project of the Institute for Security Studies (ISS) and Monash South Africa.

5. Although invited, representatives from the Radiation Protection Authorities of Algeria, Cameroon, the Democratic Republic of Congo, Egypt, Mauritius, Libya and Tanzania. The African Commission on Nuclear Energy (AFCONE) and the Department of International Relations and Cooperation (DIRCO) were unable to attend due to unforeseen circumstances.
6. In total, 20 participants attended the workshop over the two days – consisting of 12 men and 8 women.
7. The objectives of the workshop were to:
 - a. Provide an opportunity for participants to share progress in strengthening nuclear security in their respective countries since the February 2011 workshop.
 - b. To identify challenges and needs in Africa in the field of nuclear security.
 - c. To revise and update the African Action Plan for securing Africa's nuclear resources, which was drafted at the previous workshop in 2011.
8. The workshop programme included presentation and plenary discussion sessions.
9. Presentations covered the following topics:
 - a. Current nuclear security developments in Africa.
 - b. Progress in the 2011 African Action plan for securing Africa's nuclear resources.
 - c. IAEA efforts in the area of nuclear security in Africa.
 - d. African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba): Overview, Status and its Major Milestones.
 - e. FNRBA efforts and activities in the area of nuclear security in member states.
 - f. A New Paradigm for the Fight against Long-term Threats and Risks: European External Action Service.
 - g. International Network For Nuclear Security Support Centres and Training Centres (NSSC).
 - h. Nuclear Security education supported by the South African Nuclear Energy Corporation.
10. Plenary sessions explored the following:

- a. Activities and challenges related to nuclear security in Ghana, Kenya, Namibia, South Africa, Tunisia, Zambia and Zimbabwe that took place in 2011.
 - b. Moving the nuclear security agenda forward in Africa.
11. A final session was dedicated to revising and updating the 2011 African Action Plan for securing Africa's nuclear resources to reflect developments that have taken place internationally and in Africa since February 2011.
 12. Participants expressed their appreciation to the organisers and donors as well as to their fellow participants and resource persons for the valuable information received and the knowledge shared as well as for the opportunity to network with one another.
 13. Participants also encouraged the organisers (and donors) to continue to provide opportunities and a platform for on-going dialogue and action on nuclear security issues and to include a broader range of relevant African stakeholders in such events, in particular the nuclear industry, law enforcement agencies, customs officials and civil society.

Discussion outcomes and updated 'action plan'

Declaration on progress on securing Africa's nuclear resources

9 February 2012

We, the participants in an experts' workshop on Progress on Securing Africa's Nuclear Resources, held from 8 – 9 February 2012 at Monash University, South Africa:

RECALLING, that in July 1964, the then Organisation of African Unity (OAU) adopted the Declaration on the Denuclearization of Africa [AHG/Res.II(I)] and that in June 1995, at the 31st Ordinary Session of the OAU held in Addis Ababa, the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) was agreed to;

RECALLING ALSO, that on 11 April 1996, the Treaty was signed by all OAU members in Cairo and that on 15 July 2009, the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) entered into force;

NOTING that on 4 November 2010, the First Conference of Parties to the Treaty of Pelindaba was held in Addis Ababa and that at this meeting the first steps were taken to establish the African Commission on Nuclear Energy (AFCONE) in order to ensure compliance with Africa's undertakings not to develop, produce, test or otherwise acquire or station nuclear weapons anywhere on the African continent or its associated islands and to promote cooperation in the peaceful uses of nuclear energy [as] an important step towards the strengthening of the non-proliferation regime, complete disarmament, and the enhancement of regional peace and security;

NOTING ALSO, that on 4 May 2011, the First Ordinary Session (a meeting of the 12 Commissioners) of AFCONE was held to decide on the structure and budget of AFCONE and its rules of procedure, as well as to elect its chairman and vice-chairman and to establish a process to appoint an executive secretary;

ACKNOWLEDGING that the Treaty of Pelindaba supports the use of nuclear science and technology for peaceful purposes and in this respect each party undertakes to conduct all activities for the peaceful use of nuclear energy under strict non-proliferation measures; to provide assurance of exclusively peaceful use; to conclude a comprehensive safeguard agreement with IAEA for the purpose of verifying compliance; and not to provide source or special fissionable material or equipment or material especially designed or prepared for the processing, use or production of special fissionable material for peaceful purposes to any non-nuclear-weapon state unless subject to a comprehensive safeguards agreement concluded with IAEA;

RECALLING FURTHER, that in Article 10 (Physical Protection of Nuclear Materials and Facilities) of the Treaty of Pelindaba, states parties undertake to:

...maintain the highest standards of security and effective physical protection of nuclear materials, facilities and equipment to prevent theft or unauthorized use and handling. To that end each Party, inter alia, undertakes to apply measures of physical protection equivalent to those provided for in the Convention on Physical Protection of Nuclear Material and in recommendations and guidelines developed by IAEA for that purpose.

DETERMINED to promote international and regional cooperation for the development and practical application of nuclear energy for peaceful

purposes in the interest of sustainable social and economic development of the African continent;

DETERMINED to ensure the safety and security of nuclear and other radioactive materials in Africa, without detracting from the continued delivery of the developmental benefits that nuclear materials and related applications provide, for example, radionuclides intended for use in life-saving medical applications;

COMMENDS the work of the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA), which includes nuclear security and radiation and waste safety as one of its thematic focus areas and the formation of the Forum of Nuclear Regulatory Bodies in Africa (FNRBA) which provides an important mechanism for the exchange of regulatory experiences and practices among nuclear regulatory bodies in Africa, and importantly, in the context of this workshop, aims to provide for the enhancement, strengthening and harmonisation of the radiation protection, nuclear safety and security regulatory infrastructure and framework among the members of FNRBA;

HAVING CONSIDERED the various documents made available to participants and presentations made at the workshop, including a review of the communiqué of the 12–13 April 2010 Washington Nuclear Security Summit and the Summit Work Plan, which provides guidance for national and international actions to carry out US President Obama’s pledge to lead an international effort ‘to secure all vulnerable nuclear material around the world within four years’, including: cooperating through the United Nations to implement and assist others in connection with relevant Security Council resolutions such as UNSCR 1540 (which legally requires all countries to provide ‘appropriate effective’ security of and accounting for any nuclear stockpiles they may have) and that the risk of nuclear material diversion and illicit trafficking is growing both globally and potentially on the African continent;

HAVING ALSO CONSIDERED the numerous studies that indicate that:

- It is plausible that a sophisticated non-state organisation could develop a crude nuclear explosive device if it obtained the materials needed.
- There have been a high number of recent cases of theft or loss of plutonium or highly enriched uranium (HEU), the essential ingredients of nuclear explosive devices.

- The porous nature of Africa's borders, the scale of legitimate trade across African countries, and the small size and weak radiation signal of the materials needed to make nuclear explosive devices make nuclear smuggling difficult to detect.

HAVING ALSO REVISITED the IAEA Nuclear Security Plan of Activities which has three main points of focus:

- Prevention – requiring effective physical protection of these materials in use, storage and transport, protection of related nuclear facilities and strong state systems for accounting for and control of nuclear material. This requires training workshops and technical guidance documents — on nuclear security, physical protection, ‘design basis threat’ assessments and nuclear material accounting.
- Detection – ensuring that systems are in place that can identify, at an early stage, illicit activity related to nuclear materials or radioactive sources. This involves training customs officials, installing better equipment at border crossings and ensuring that information on trafficking incidents is shared effectively.
- Response – to establish and strengthen programmes to ensure that, in the event that illicit activity occurs (including acts of terrorism involving nuclear material or radioactive sources), the response can be prompt, well coordinated and include the recovery of radioactive sources that have been stolen or lost.⁸⁰

HAVING RECOGNISED the importance of the original and subsequent revisions of the IAEA's Physical Protection of Nuclear Material and Nuclear Facilities document (INFCIRC/225/Rev.4), which rests on inter alia the understanding that the effectiveness of physical protection depends on states collectively implementing measures to prevent malicious acts on nuclear facilities and materials in transport;

HAVING NOTED THAT:

- The African Union Common Defence and Security Policy identifies nuclear and other weapons of mass destruction as a common security threat to Africa.

- It is imperative that African states do not wait for a nuclear incident to occur, and that the continent must focus on implementing preventative measures.
- African national legislation and regulations with regard to nuclear security should be more in line with international best practice.
- African regional bodies can assist in developing a more constructive engagement between African states and the international community.
- Political leadership ought to realise that nuclear security has to be central to national and regional security frameworks.
- There is a need for a proper threat assessment to be conducted on the continent and for this assessment to be then used to both improve safety and security standards, as well as to align training and capacity-building initiatives, national legislation, etc.
- Human resource development should form a major part of African national nuclear security strategies.
- There is an urgent need to look at the status of security of transport of nuclear materials in the waters surrounding Africa.
- The Forum of Nuclear Regulatory Bodies in Africa (FNRBA) is a unique organisation from which other pan-African bodies can draw lessons from its mandate, structure and modus operandi.
- The African region should make use of its own safeguards inspectors – IAEA, AFCONE, FNRBA and AFRA could assist in training additional African inspectors. African states may feel more comfortable being inspected by their peers.
- There is an urgent need for a platform that ensures that African countries can move beyond national regulatory frameworks to inter-regional/regional frameworks, which can act as bridge between international discussions and actions and those at the African national level.
- There is a need to develop an African framework document that spells out African needs in the area of nuclear security – AFRA already has a regional framework that could possibly inform an AFCONE position on nuclear security.
- There is a need to actively support AFRA's training and educational programmes in order to ensure that they remain both sustainable and appropriate.
- There appears to be a disconnect between national and international approaches to nuclear security.
- It is imperative that African states make use of every opportunity to engage with the IAEA Africa Programme constructively and assertively.

- National Nuclear Regulators have formed the FNRBA and operators network under AFRA. However, these two groups do not often have an opportunity to engage with each other and hence there is a need to bridge the gap between regulators and operators.

COMMITTING ourselves to strengthen our country's and continent's nuclear safety and security measures in order to reduce the threat of criminal elements, armed non-state actors or other unauthorised persons or organisations acquiring nuclear and radiological materials;

THEREFORE AGREE to *encourage, promote and/or implement the following actions amongst relevant national, continental and international authorities and/or workshop participants:*

At the INTERNATIONAL LEVEL,

- a. African states, the African Union and members of the African Commission on Nuclear Energy (AFCONe) participating in the 2012 Nuclear Security Summit must ensure that African concerns are reflected in the final document of the summit.
- b. The submission by African states of appropriate country programme documents (the tool by which the IAEA engages with member states) to the IAEA, which articulates a country's developmental needs.
- c. Those states that have not yet done so to conclude comprehensive safeguards agreements with the IAEA and to conclude additional protocols to their safeguards agreements on the basis of the Model Additional Protocol approved by the Board of Governors of the IAEA on 15 May 1997.
- d. The active participation of African states individually and through bodies such as AFCONe in existing international nuclear security regimes established by the UN and the IAEA.
- e. All states to accede to and comply with relevant international legal instruments on terrorism and international organised crime, such as the International Convention for the Suppression of Acts of Nuclear Terrorism, the International Convention for the Suppression of Terrorist Bombings and the International Convention for the Suppression of the Financing of Terrorism as well as to implement relevant UN Security Council resolutions, such as UNSCR 1540.

- f. All states that have not yet done so, to sign and/or ratify relevant international disarmament and non-proliferation agreements, including the Comprehensive Test Ban Treaty (CTBT).
- g. The remaining nuclear-weapon states and the non-nuclear-weapon state that have not done so, must sign and/or ratify the protocols to the Treaty of Pelindaba relevant to them.
- h. The ratification and compliance with existing international nuclear security conventions, such as the Convention on the Physical Protection of Nuclear Material and its 2005 Amendment.
- i. The ratification and implementation of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.
- j. The call for better coordination between international networks on nuclear security in order to better utilise human and financial resources.

At the REGIONAL LEVEL,

- a. To support the full implementation of the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) and the establishment of AFCONE.
- b. To view the Treaty of Pelindaba, and hence AFCONE, as the inter-regional/regional framework through which, inter alia the following can be performed:
 - 1. The development of an African framework document that spells out African needs in the area of nuclear security;
 - 2. To co-operate, where applicable, with the IAEA Safeguards regime;
 - 3. To develop as a centre of excellence in the area of nuclear security (together with the IAEA, the FNRBA and other appropriate bodies);
 - 4. To raise awareness amongst the general public and to promote the peaceful uses of nuclear technology amongst AU member states;
 - 5. To raise awareness of the safety and security of nuclear technology bearing in mind that it has socio-economic benefits.
 - 6. To encourage member states to the Treaty of Pelindaba to adhere to the IAEA Codes of Conduct.
 - 7. To promote the harmonisation of nuclear safety and security rules.
 - 8. To develop a policy and programme at African Union level for the disposal of nuclear waste;
 - 9. To encourage strong regulatory infrastructure at national level within a broad continental framework.

- c. To support regional bodies, such as AFRA, FNRBA and AFCONE, in their quest to develop nuclear security norms together.
- d. To encourage the African Commission on Nuclear Energy to leverage the strength of both the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) and the Forum of Nuclear Regulatory Bodies in Africa (FNRBA) so as to both avoid duplication of effort and to prevent gaps.
- e. To further encourage the AFCONE to play a central role in bridging the gap between the political and technical understandings of the concept of nuclear/radiological security and to act as a mechanism of weaving bilateral and multilateral agreements and activities together.
- f. To encourage AFCONE and/or civil society to provide the opportunity and safe space for national nuclear regulators and operators to engage with one another.
- g. To support regional and sub-regional bodies to promote the ratification and implementation of the Treaty of Pelindaba.
- h. To advocate that the African Union, with the support of other regional/sub-regional bodies, host a meeting in order to develop a broad African policy on nuclear security.
- i. To promote engagement of the AU to initiate a steering committee or working group on nuclear security to better coordinate activities on the continent.
- j. To conduct a regional/sub-regional nuclear security threat assessment to obtain an accurate picture of the status of nuclear security in Africa. This assessment should be presented to relevant policy-making bodies at the AU.
- k. To encourage more African states to enact appropriate legislation, adopt regulatory frameworks and then become members of the Forum of Nuclear Regulatory Bodies in Africa, and to actively participate in its activities and programmes.
- l. To strengthen regional and continental cooperation among police, customs and border control services to address the potential trafficking of nuclear and other radioactive materials. These efforts should include, but not be limited to, training, the exchange of information to support common action to contain and reduce such trafficking across borders, and the conclusion of the necessary agreements in this regard.
- m. To encourage sub-regional bodies to develop regional protocols for nuclear safety and security.

- n. To urgently organise a regional meeting (AU level) to discuss nuclear fuel bank models currently under review internationally.

At the NATIONAL LEVEL,

- a. To become parties to relevant conventions relevant to nuclear security and the domestication of these agreements – especially the Treaty of Pelindaba and those referred to above.
- b. To make use of continental experts in order to promote nuclear security within the context of the need for sustainable socio-economic development on the continent.
- c. To put in place effective policies, legislation and regulatory frameworks for nuclear security and to take steps to ensure the safety of nuclear and other radioactive materials and facilities, as well as to improve import and export controls.
- d. To adopt, as soon as possible, where they do not exist, the necessary legislative and other measures to establish as a criminal offence under national law, the illicit possession of, trafficking in and use of nuclear and other related materials.
- e. To put in place, where they do not exist, national nuclear regulators and the appropriate institutional infrastructure responsible for policy guidance for, research into and monitoring of all aspects of the peaceful application of nuclear and other radioactive materials.
- f. To enhance the capacity of national law enforcement officials to deal with the trafficking of nuclear and other radioactive material, including appropriate training in investigative procedures, border control and the upgrading of equipment and resources.
- g. To take appropriate measures to control the transfer of such material by manufacturers, suppliers, traders, brokers, as well as shipping and transit agents.
- h. To convert HEU-fuelled research reactors on the African continent and, where possible, to convert these to LEU-fuelled reactors.
- i. To identify and establish the key national institutions that can take custody of all nuclear materials and activities. These institutions include handlers, processors, users, and transporters of nuclear and radioactive materials.
- j. To evaluate existing national laws in Africa in order to determine whether they meet international standards and legal instruments, and whether they are implemented effectively.

- k. To develop national design-basis threat documents (DBTs) – taking into account nuclear threats unique to that particular country.
- l. To promote increased coordination and information sharing between local departments and ministries and liaison offices in New York, Geneva and Vienna on nuclear security issues.
- m. To encourage, where appropriate, the active involvement of civil society, including professional bodies, in efforts to enhance the promotion of nuclear safety and security.
- n. To promote the above Declaration on Progress on Securing Africa’s Nuclear Resources through already existing bodies, such as AFRA, FNRBA and AFCONE, and to improve and maintain communication between these bodies in order to facilitate the exchange of best practices, strengthen security culture, and ensure African cooperation in improving nuclear safety, security and accounting. In this regard, the organisers should play an important role.

Recommendations for the organisers in cooperation with bodies such as AFCONE, AFRA and the FNRBA,

- a. To provide assistance to states in undertaking national or sub-regional threat assessments.
- b. To undertake research into the existing national nuclear security laws in Africa to identify their shortcomings and to draft best-practice guidelines for appropriate national nuclear security laws, regulations and infrastructure.
- c. To strengthen partnerships with continental bodies and improve and maintain communication in order to facilitate the exchange of best practices, strengthen security culture, and ensure African cooperation in improving nuclear safety, security and accounting.
- d. To communicate the outcomes of the experts’ workshop at key regional and international meetings in order to promote African views of nuclear security.

Annexure A

Status of conventions and treaties related to nuclear security in Africa

African State	1540 Reports	NPT	Treaty of Pelindaba	CTBT	Joint Convention	CPPNM	Algiers Convention	ICSANT
Algeria	X	X	X	X		X	X	X
Angola	X	X					X	
Benin	X	X	X	X			X	
Botswana		X	X	X		X		
Burkina Faso	X	X	X	X		X	X	
Burundi		X	X	X			X	X
Cameroon	X	X	X	X		X		
Cape Verde		X		X		X	X	
Central African Republic		X		X		X		X
Chad		X	X				X	
Comoros		X				X	X	X
Congo (Republic of)		X					X	
Côte d'Ivoire	X	X	X	X				
Djibouti	X	X		X		X	X	
Democratic Republic of Congo	X	X		X		X		X

African State	1540 Reports	NPT	Treaty of Pelindaba	CTBT	Joint Convention	CPPNM	Algiers Convention	ICSANT
Egypt	X	X					X	
Equatorial Guinea		X	X			X	X	
Eritrea	X	X		X			X	
Ethiopia	X	X	X	X			X	
Gabon	X	X	X	X	X	X	X	X
Gambia		X	X				X	
Ghana	X	X	X	X	X	X	X	
Guinea		X	X	X		X	X	
Guinea-Bissau		X	X			X	X	X
Kenya	X	X	X	X		X	X	X
Lesotho		X	X	X		X	X	X
Liberia		X		X				
Libya	X	X	X	X		X	X	X
Madagascar	X	X	X	X		X	X	
Malawi		X	X	X			X	X
Mali		X	X	X		X	X	X
Mauritania		X	X	X	X	X	X	X
Mauritius	X	X	X				X	
Morocco	X	X		X	X	X		X
Mozambique		X	X	X		X	X	

African State	1540 Reports	NPT	Treaty of Pelindaba	CTBT	Joint Convention	CPPNM	Algiers Convention	ICSANT
Namibia	X	X		X		X		
Niger	X	X		X		X	X	X
Nigeria	X	X	X	X	X	X	X	
Rwanda	X	X	X	X		X	X	
São Tomé and Príncipe		X						
Senegal	X	X	X	X	X	X	X	
Seychelles	X	X		X		X	X	
Sierra Leone	X	X		X				
Somalia		X						
South Africa	X	X	X	X	X	X	X	X
South Sudan (Republic of)								
Sudan	X	X	X	X		X	X	
Swaziland		X	X			X		
Tanzania (United Republic of)	X	X	X	X		X	X	
Togo		X	X	X		X	X	
Tunisia	X	X	X	X		X	X	X
Uganda	X	X		X		X	X	
Zambia		X	X	X				
Zimbabwe		X	X					

Annexure B

Select list of conventions, protocols, documents and initiatives on nuclear security⁸¹

1. *African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba)*

Under Article 10 (Physical Protection of Nuclear Materials and Facilities) of the Treaty of Pelindaba, states parties undertake to: "... maintain the highest standards of security and effective physical protection of nuclear materials, facilities and equipment to prevent theft or unauthorized use and handling. To that end, each Party undertakes to apply measures of physical protection equivalent to those provided for in the Convention on Physical Protection of Nuclear Material and in recommendations and guidelines developed by IAEA for that purpose".

2. *Convention on the Physical Protection of Nuclear Material and 2005 Amendment*

The Convention on the Physical Protection of Nuclear Material (CPPNM) is an international, legally binding initiative that aims to ensure the physical protection of nuclear material. Its components are divided into three categories including: prevention, detection and punishment of offenses. The 2005 Amendment legally binds states parties to protect both nuclear facilities and nuclear material, whether the latter is for peaceful domestic use, in storage, or during transport. It requires increased cooperation among states parties in the areas of locating and recovering nuclear material, alleviating the consequences of radiological damage, and preventing and combating radiological incidents.

3. *International Convention for the Suppression of Acts of Nuclear Terrorism*

The Convention outlines multiple binding obligations for member states including: Punishment for individuals attempting to sell nuclear materials

for the purpose of sabotaging property, inflicting human casualties or extortion and the need to apprehend nuclear terror suspects and share accurate and verifiable intelligence regarding those suspects.

4. *International Convention for the Suppression of Terrorist Bombings*

The Convention strives to improve the international response to terrorism by extending the legal obligations of state actors. Convention obligations are based on previous counterterrorism conventions; however, the rules are expanded to include terrorist acts that occur in the public sphere. The Convention also strengthens cooperation among law enforcement agencies spanning multiple countries, and it dictates the regulations by which states are permitted to establish jurisdiction for cases involving terrorist bombings.

5. *International Convention for the Suppression of the Financing of Terrorism*

The Convention bans supplying or gathering funds with the intention to utilise such funds to carry out a terrorist attack. It calls for joint efforts to identify, freeze, and seize any funds that have been collected and allocated to facilitate terrorist acts. The Convention also requires parties to prosecute terrorists or extradite them to the party that suffered as a result of their illegal actions.

6. *UN Security Council Resolutions 1373 and 1540*

Both Security Council Resolutions are binding on UN members under Chapter VII of the UN Charter. Adopted on 28 September 2001, Resolution 1373 calls upon all UN member states to work cohesively in order to suppress terrorist financing, share information and intelligence regarding various terrorist targets, effectively monitor borders and the crossings made at those borders and, finally, to conduct relevant international conventions, protocols, and workshops to develop counter-terrorism best practices.

Resolution 1540 obliges all UN member states to implement a set of supply-side controls related to the non-proliferation of nuclear, biological and chemical weapons, and criminalise proliferation activities within their territories. Specifically, this legally binding resolution calls upon states to:

adopt and enforce laws that prohibit any non-state actor from manufacturing, acquiring, possessing, developing, transporting, transferring, or using nuclear, chemical or biological weapons and their means of delivery; develop and maintain measures to account for and secure such items in production, use, storage, or transport; develop and maintain effective physical protection measures; develop and maintain effective border controls and law enforcement efforts to detect, deter, prevent and combat illicit trafficking; establish, develop, review and maintain appropriate effective national export and trans-shipment controls over such items. Importantly, in resolutions 1673 (2006) and 1810 (2008), the Security Council emphasised the importance of the regional and sub-regional dimensions of the implementation of resolution 1540, while stressing the national responsibility to take appropriate effective measures.

7. *The IAEA Code of Conduct on Safety and Security of Radioactive Sources*⁸²

Published in 2001, the Code of Conduct recognises that radiological materials are prevalent among today's technologies and that these materials must be secured in a timely manner. The Code expresses the need for proper disposal of certain radiological materials, in addition to fostering a security culture, establishing effective export controls and taking a variety of other measures to secure these materials. The Code provides states with a list of regulations and obligations that must be met in order to establish the security of readily available radiological materials.

8. *IAEA Nuclear Security Series Documents*

The IAEA commenced its Nuclear Security Series in 2006 and to date sixteen guides have been published:

1. Technical and Functional Specifications for Border Monitoring Equipment offers instruction to member states and equipment manufacturers in terms of the design, testing, qualifying and purchasing of radiation-monitoring equipment for use at national borders.
2. Nuclear Forensics Support lists the tools and procedures for proper forensic investigations of nuclear sites.
3. Monitoring for Radioactive Material in International Mail Transported by Public Postal Operators explains the techniques and equipment

available to detect radioactive material being carried in mail processed by public postal operators.

4. Engineering Safety Aspects of the Protection of Nuclear Power Plants against Sabotage provides regulations for evaluating the engineering safety aspects of the protection of nuclear power plants against sabotage, including standoff attacks.
5. Identification of Radioactive Sources and Devices assists non-specialist individuals and groups in terms of contact with and initial identification of radioactive sources, devices and packages.
6. Combating Illicit Trafficking in Nuclear and other Radioactive Material focuses on illicit acts involving nuclear and other radioactive material and functions as an information and training resource for law enforcement personnel.
7. Nuclear Security Culture explains the key aspects and characteristics of a nuclear security culture and how they relate to other nuclear security policies. It illustrates how nuclear security is ultimately dependent on individuals, including policy makers, regulators, managers, and individual employees.
8. Preventive and Protective Measures against Insider Threats provides general information to the managers and operators of nuclear facilities concerning the prevention of and protection against insider threats.
9. Security in the Transport of Radioactive Material assists states in implementing, maintaining and/or critiquing nuclear security systems in order to guard radioactive material (including nuclear material) effectively while in transport.
10. Development, Use and Maintenance of the Design Basis Threat aids in the creation of a design basis threat, which is a description of the attributes of insiders and external adversaries who might attempt a malicious act, thus setting a facility's standard for protection.
11. Security of Radioactive Sources provides guidance and recommendations for employing various security measures for radioactive sources. This publication aims to assist countries in developing effective security policies.
12. Educational Programme in Nuclear Security provides both the theoretical knowledge and the practical skills necessary to meet the requirements described in the international framework for nuclear security.

13. Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities intends to provide guidance to states and their competent authority on how to develop or enhance, implement and maintain a physical protection regime for nuclear material and nuclear facilities through the establishment or improvement of their capabilities to implement legislative and regulatory programmes.
14. Nuclear Security Recommendations on Radioactive Material and Associated Facilities provides guidance to states and competent authorities on how to develop or enhance, implement or maintain a nuclear security regime for radioactive material, associated facilities and associated activities.
15. Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control provides recommendations to a state for the security of nuclear or other radioactive material that has been reported as being out of regulatory control, as well as for material that is lost, missing or stolen but has not been reported as such or has been otherwise discovered.
16. Computer Security at Nuclear Facilities provides guidance specific to nuclear facilities on implementing a computer security programme and evaluating existing programmes.

9. *Guidance on the Import and Export of Radioactive Sources (INFCIRC/663)*

This guide contains supplementary material aimed at equipping states to implement the Code of Conduct on the Safety and Security of Radioactive Sources; it serves to support the export and import provisions in this Code. It provides a general framework for states to use in accordance with their national legislation.

10. *The Physical Protection Of Nuclear Material And Nuclear Facilities (INFCIRC/225/Rev.4)*

The original Physical Protection of Nuclear Material and Nuclear Facilities document stems from the understanding that physical protection is of international concern. It was created in 1975 in response to an anticipated need for the IEAE to have a role in helping states secure their nuclear facilities and material. Subsequent revisions occurred in 1977, 1989 and 1993. In

1997, the IAEA Secretariat decided to conduct an extensive review of the document and national experts met in June and October of 1998 for that purpose. The fourth review seeks to clarify the document and account for technological innovation and international practices, including a provision for handling a sabotage situation. The spirit of this document rests on the understanding that the effectiveness of physical protection depends on member states collectively implementing measures to prevent malicious acts on nuclear facilities and materials in transport.

11. Physical Protection Objectives And Fundamental Principles (GC(45)/INF/14)

The IAEA Board of Governors created this document in September 2001, supporting it as a measure of providing security fundamentals. The physical protection objectives component seeks to guard against unauthorised transport of nuclear material, to protect nuclear facilities and nuclear materials from sabotage, reduce the consequences of radiological sabotage and ensure that states have methods for recovering lost nuclear material. The fundamental principles are viewed as necessary for accomplishing the objectives of physical protection. They include responsibility of the state, security culture, quality assurance, contingency plans, responsibility of licensees and other principles.

12. Handbook on Nuclear Law

This handbook contains instruction materials used for teaching professionals, including lawyers, scientists, engineers and government administrators how best to formulate a framework for managing nuclear energy.

13. Proliferation Security Initiative

The Proliferation Security Initiative (PSI) aims to halt the trafficking of WMD, their delivery systems and related materials to and from states and non-state actors of proliferation concern. PSI allows for the interdicting of international shipments as nations call upon others to inspect cargo being transported abroad. Supported by some 90 countries outside the US, PSI acts as an innovative and proactive approach to thwarting proliferation. PSI participants utilise national and international authorities to terminate WMD-related trafficking and take steps to strengthen those authorities as necessary.

14. G8 Global Partnership

Since its initiation in 2002, the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction has made considerable headway in restricting non-state actors and the countries that support them from obtaining, researching, or developing nuclear weapons or the materials to fashion such weapons. The Global Partnership aims to address non-proliferation, disarmament, counterterrorism, and nuclear safety issues by hosting cooperative projects in areas such as destruction of chemical weapons, the safe dismantling of decommissioned nuclear submarines, the security of fissile materials and the resettlement of former nuclear scientists to secure locations in order to protect and contain nuclear know-how. Progress made on the G-8 Global Partnership is announced and discussed during the annual G-8 summits.

15. Global Initiative to combat nuclear terrorism

Originally formed in October 2006, the Global Initiative has now come to fruition and garnered support from 82 partners worldwide, including the International Atomic Energy Agency, the European Union and the International Criminal Police Organization which act as official observers. The Global Initiative remains open to determined nations that share in its common goals and are actively committed to countering nuclear terrorism. The Global Initiative's goals are defined as:

- Bringing together experience and best-practice expertise from various fields of study, including non-proliferation, counter-proliferation and counter-terrorism
- Integrating collective abilities and resources to reinforce the overall global effort to combat nuclear terrorism
- Providing the forum for countries to share information and expertise in a legally non-binding atmosphere

16. Nuclear Security Summit

From 12-13 April 2010, US President Obama hosted over 40 heads of state to an international nuclear security summit to implement his pledge to lead an international effort “to secure all vulnerable nuclear material around the world within four years”. The Nuclear Security Summit highlighted the global threat posed by nuclear terrorism and the need to work together to secure nuclear material and prevent illicit nuclear trafficking and nuclear terrorism. The leaders

of 47 nations came together to advance a common approach and commitment to nuclear security at the highest levels. The summit reinforced the principle that all states are responsible to ensure the best security of their materials, to seek assistance if necessary and to provide assistance if asked. It promoted the international treaties that addressed nuclear security and nuclear terrorism and led to specific national actions that advanced global security.

The Summit Work Plan laid out specific steps that had to be taken to realise the vision of the Communiqué. These steps included:

- Ratifying and implementing treaties on nuclear security and nuclear terrorism
- Cooperating through the United Nations to implement and assist others in connection with Security Council resolutions
- Working with the International Atomic Energy Agency to update and implement security guidance and carry out advisory services
- Reviewing national regulatory and legal requirements relating to nuclear security and nuclear trafficking
- Converting civilian facilities that use highly enriched uranium to non-weapons-usable materials
- Research into new nuclear fuels, detection methods, and forensic techniques;
- Development of corporate and institutional cultures that prioritise nuclear security
- Education and training to ensure that countries and facilities have the people they need to protect their materials
- Joint exercises among law enforcement and customs officials to enhance approaches to nuclear detection

The 2012 Nuclear Security Summit will take place in Seoul, South Korea from 26–27 March. The same 47 countries invited to participate in the 2010 summit have been invited to attend the meeting in Seoul. Participating countries were chosen according to their geographic, economic and political diversity, as well as their involvement in nuclear security in general. The scope of the meeting will echo that of the 2010 summit and will focus on implementing the international nuclear security regime. In addition, the impact of the Fukushima Daiichi nuclear disaster will also be discussed. Although participation in the Nuclear Security Summit process is limited, it is another opportunity for states to commit to implementing the international nuclear security regime, which

includes the legal and institutional framework for the protection of nuclear and other radioactive materials.

Notes

- 1 As a result of a series of incidents of illicit trafficking in nuclear material between 1992 and 1994, in September 1994, the IAEA General Conference adopted, as part of a major initiative to address what was seen as a growing problem, a resolution calling upon Member States 'to take all necessary measures to prevent illicit trafficking in nuclear material' and inviting the Director General 'to intensify the activities through which the IAEA is currently supporting Member States in this field'.
- 2 Abdul Qadeer Khan, the so-called father of the Pakistani nuclear weapon programme, provided the government of Pakistan with centrifuge designs and sold nuclear technology to Libya, Iran, and the Democratic Peoples' Republic of Korea (DPRK).
- 3 See for example, R Mowatt-Larssen, *Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?*, Belfer Center for Science and International Affairs, Harvard Kennedy School, 2010.
- 4 U.S. President Barack Obama speech on nuclear security, U.S. Embassy (Prague), 5 April 2009, available at <http://prague.usembassy.gov/obama.html> (Accessed 9 January 2012).
- 5 M Martellini and K McLaughlin, *The Security of High-Activity Radiological Sources*, Briefing Paper number 3, November 2005, Landau Network-Centro Volta, available at <http://archives.sipri.org/contents/expcon/BP3.pdf/download> (Accessed 4 January 2012).
- 6 Mohamed ElBaradei speech on Nuclear Terrorism: Identifying and Combating the Risks, IAEA Headquarters, Vienna, 16 March 2005.
- 7 It should be noted that support for such a Code was expressed in April 2001 by the First Africa Workshop on the Establishment of a Legal Framework Governing Radiation Protection, the Safety of Radiation Sources and the Safe Management of Radioactive Waste. The workshop, held in Addis Ababa, adopted a 'Common Position' in which it called upon the International Atomic Energy Agency to 'create a forum for African countries to consider the Code of Conduct on the Safety and Security of Radioactive Materials, and give it a legally binding effect so that the safe and peaceful use of nuclear technology is not compromised'.
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The Institute for Security Studies' Africa's Development and the Threat of Weapons of Mass Destruction Project

The Institute for Security Studies' Africa's Development and the Threat of Weapons of Mass Destruction Project (WMD Project) aims to identify and strengthen Africa's role in international efforts to strengthen disarmament and non-proliferation as they relate to WMD in the context of Africa's developmental imperatives.

Thematically the project engages the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and other related Conventions such as the 1980 Convention on the Physical Protection of Nuclear Material and the Comprehensive Nuclear Test Ban Treaty; the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba); the Biological and Toxin Weapons Convention; the Chemical Weapons Convention; and relevant United Nations Security Council resolutions such as UNSCR 1540.

Project objectives include:

- To identify and report on African attitudes and interests in the international debate on nuclear, chemical and biological non-proliferation and disarmament.
- To build African capacity to engage positively and effectively in international disarmament and non-proliferation fora.
- To strengthen global security by reducing the risk of use, and preventing the spread of, nuclear, biological and chemical weapons in Africa.
- Increasing the quality and accessibility of information about threats and dual-use concerns in relation to nuclear, biological and chemical weapons.
- To engage members of the scientific community and industry in discussion and debate about the risks, rules and responsibilities in relation to their activities.
- To stimulate discussion and dialogue about how Africa can positively balance its development needs with global non-proliferation concerns.

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