Chapter 5

The Necropolitics of Africa's Nuclear Sacrifice Zones

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5.1 Introduction

The contemporary African nuclear landscape is dynamic and remains relevant in constantly shifting global geopolitics. However, this landscape is deeply embedded in the emergence of the nuclear age during the Second World War, and on the continent. Global interest in Africa's uranium resources continues but so, seemingly, does global interest in continued practices of nuclear necropolitics on the continent. This is evident in the prevalence of nuclear sacrifice zones on the continent wherein communities, generations, and geographical areas, sometimes across national borders, continue to be exposed to the violence associated with nuclear technology and the military-industrial complex of nuclear weapons states as well as states aspiring to acquire these weapons of mass destruction.

This chapter considers nuclear necropower and necropolitical practices in Africa with specific reference to uranium mining on the continent and the illicit disposal of radioactive waste. The chapter begins by outlining the theoretical and conceptual framework of necropolitics before proceeding to explore Africa's historical and contemporary nuclear landscape. Then the chapter turns to uranium mining

as a nuclear necropolitical practice in Africa and the effects thereof. The penultimate section explores illicit radioactive waste disposal as a necropolitical practice and its impact on the continent. The final section of the chapter offers an assessment and concluding remarks.

5.2 Nuclear necropolitics and sacrifice zones

This section outlines the chapter's analytical framework by presenting a brief genealogy of the concepts of nuclear necropolitics and nuclear sacrifice zones. It begins with Foucault's concepts of biopower and biopolitics. The latter refers, *inter alia*, to the state's power over the biological sphere to control, regulate, and secure life under its sovereignty, and a state's biopower to control the biological health of its populations' bodies and the environment in which they live (Foucault 1967; 1979). To preserve the human and environmental lives that the state deems liveable, the state applies certain technologies, i.e., death technologies like weapons of mass destruction to threaten or proceed to kill and extinct with the goal of securing the survival of what a state deems worthy of living. The control over biological processes involves the appropriation of and control over space (land, territory, regions, etc.), which thereby creates spatial hierarchies, the distinction between spaces (utopias and heterotopias), and the political relations within these spaces where biopower is exercised (Foucault 1967:1–2).

Following on from his work on colonialism, slavery, and apartheid, Achille Mbembe (2003; 2019) expands on Foucault's (1979) notions of biopolitics and biopower by introducing the concept of necropolitics. Unlike Foucault's emphasis on life, Mbembe (2003; 2019) emphasises the state's control over death, both physical and symbolic. The state's preoccupation with death is also spatial, as it creates "death-worlds, new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of living dead" (Mbembe 2003:9–40). These life and death conditions, and the power structures associated with them, are relevant to the politics of nuclear technology and

nuclear energy. The designation of places, objects, and hazards as "nuclear" confers a status of nuclearity (Hecht 2012:3–4). Uranium, nuclear energy, nuclear weapons, and nuclear waste are thus all illustrations of a state's nuclearity. Alexis-Martin's (2019:152–176) idea of nuclear necropolitics extends these ideas by focusing on the nuclear imperialism-necropolitics nexus. Nuclear imperialism comprises "the economic and spatial needs created by nuclear weapons and energy, as resources such as uranium are exploited, or spaces become militarized for nuclear weapon development and testing" (Alexis-Martin 2019:153).

This chapter considers nuclearity and nuclear necropolitics in Africa. It is posited that African societies are living the "bare life" (Agamben 2005) due to the "slow violence" (Nixon 2013) caused by exposure due to state control, or lack thereof, to radiation in a particular nuclear space. This spatial dimension causes environmental injustice, as these societies and geographical areas also live and die in "sacrifice zones" (Lerner 2012), i.e., spaces disproportionately exposed to toxicity that have an impact on health and livelihoods and cause environmental harm on behalf of the state and others. This socio-ecological injustice is evident in the sacrifice of vulnerable communities for nuclear purposes, which thereby prolongs poverty and marginalization (Kaur 2021:1–12; Juskus 2023:4, 9). By extension, some African communities, regions, and states are sacrifice zones for global nuclear energy production and the nuclear military-industrial complex, as African uranium is exported to maintain these power structures in other states.

Two examples include the communities near the Shinkolobwe Mine in the Democratic Republic of the Congo (DRC), which produced uranium for the United States' nuclear weapons programme (Williams 2016), and the communities near the sites of the French nuclear tests in the Sahara Desert (Hennaoui & Nurzhan 2023:91–109). Uranium extraction and nuclear waste are thus linked to nuclear necropolitics and sacrifice zones. However, sacrificing on behalf of others has an underlying etymological religious connection to the word 'sacred'. For Juskus (2023:16–17, 20), this sacrificial ecopolitical theology binds some lives and lands to ecologies of

death in sacrifice zones so that other lives and lands may be freed to sustain themselves and flourish in greener pastures: in other words, some must die to save others. We now proceed to explore Africa's nuclear landscape in order to contextualize the continent's nuclearity and the prevalence of nuclear necropolitics and their associated sacrifice zone.

5.3 Africa's nuclear landscape

The contemporary African nuclear landscape is dynamic and remains relevant in constantly shifting global geopolitics. The need for global climate action and decarbonisation of energy production, together with increasing global energy demands, means that uranium remains important for global energy futures. Therefore, global interest in Africa's uranium continues. Globally, three of the top ten countries with uranium resources are African, namely Namibia, Niger, and South Africa (NEA & IAEA 2023:39). Besides these countries, uranium also occurs across the continent in Algeria, Botswana, Cameroon, Egypt, the Central African Republic, the DRC, Ethiopia, Gabon, Ghana, Lesotho, Madagascar, Malawi, Mali, Mauritania, Morocco, Nigeria, Rwanda, Somali, Sudan, Tanzania, Zambia, and Zimbabwe. Despite the prevalence of uranium resources in Africa, uranium mining varies depending on the economic viability and sustainability of mining (NEA & IAEA 2023:40–76).

In 2022, the United States (US), China, France, Spain, Poland, Canada, Germany, Denmark, Finland, Ireland, Luxembourg, and The Netherlands were the largest importers of uranium ores and concentrates (World Bank 2022). Moreover, in Niger there are Canadian, Chinese, French, Japanese, Spanish, and South Korean mining companies that own shares in uranium mining operations (NEA & IAEA 2023:395). Africa's nuclear renaissance has drawn several state-owned nuclear utilities to the continent. Utilities that have signed memoranda of understanding and cooperation agreements in the field of nuclear energy with African states include China, South Korea, and Russia. In August 2024, Ghana's nuclear utility Nuclear Power Ghana (NPG) signed an agreement with the Regnum Technology Group, a US firm, to develop a small modular

reactor (SMR) (Department of State 2024). Nuclear energy cooperation has also featured in several country-to-continent summits (e.g. US-Africa Nuclear Energy Summit in August 2024) and continent-to-continent summits (e.g. EU-AU) summits (Department of State 2024; Olutola 2018:20–36).

Despite the continent's rich uranium resources, Africa does not have a well-developed nuclear technology and energy sector. Notable exceptions are South Africa and Egypt. The former operates the only nuclear power plant in Africa while Egypt is constructing its first nuclear power station at El Dabaa in partnership with Rosatom. Several other African states, notably Algeria, Ghana, Kenya, Morocco, Namibia, Niger, Nigeria, Rwanda, Tanzania, Tunisia, and Uganda, have also expressed interest in developing nuclear power for electricity generation and desalination (NEA & IAEA 2023:110).

Africa's status and role in the global nuclear sector has been described elsewhere (Hecht 2012). At least three aspects are pertinent to Africa and nuclear security (e.g., non-proliferation). The continent's historical experience of French nuclear weapons testing in the Sahara Desert was one of the factors that contributed to the Organisation of African Unity's (OAU) adoption of the Cairo Declaration on a nuclear-weapon-free Africa in July 1964 (OAU 1964). This historical commitment was operationalised with the entry into force of the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) on 15 July 2009. In terms of the Treaty of Pelindaba, African states endeavour to renounce nuclear weapons and devices (Article 3), prohibit the stationing of explosive nuclear devices on the continent (Article 4) and the testing of nuclear weapons (Article 5), dismantle all nuclear weapons programme (Article 6), prevent the dumping of radioactive waste on the continent (Article 7), use nuclear energy for peaceful purposes (Articles 8 and 9), and protect nuclear material and facilities (Article 10) and an armed attacked thereon (Article 11) (OAU1996).

The African Nuclear-Weapon-Free Zone Treaty (the Treaty of Pelindaba) is universally accepted on the continent. It ensures the continent's future as a nuclear-weapon-free zone. Despite this normative and the legal commitment, several

challenges pertaining to the continent's nuclear future should be considered. Besides uranium exports to nuclear weapons states, African states' involvement in the development of other nuclear programmes have been questioned. Namibia's relations with Iran and North Korean have been flagged as nuclear proliferation concerns. Iran, for example, owns 25% of Namibia's Rössing Mine (El Obeid 2021:24–25). Moreover, uranium is a declared "strategic resource" in Namibia and South Africa (El Obeid 2021:15).

5.4 Uranium mining as a nuclear necropolitical practice in Africa

The time-bending quality of nuclear energy adds to its necropolitical features. A nuclear chain reaction can continue for a significant period, and thereby generate electricity, produce generative medical isotopes or the devastating effect of a weapon of mass destruction. Nuclear weapons are decidedly necropolitical: as weapons of mass destruction, whether used or not, affect life and death on a grand scale. The nuclear reaction of a destructive force such as a nuclear bomb is used to produce life-giving medical isotopes. Besides the duality of nuclear energy as a destructive and healing force as mentioned, nuclearity also relates to race. This is clear in uranium extraction in Africa for the global market (Hecht 2012), nuclear weapons tests, nuclear waste disposal on Aboriginal land, and the use of nuclear weapons against Japan. Moreover, references to a Black Bomb or an Arab Bomb abound in a world where The Bomb is typically regarded as "white". In addition, uncontained radioactivity continues over space and time, thereby producing interregional and intergenerational effects. Therefore, the contemporary dynamics and relevance of the African nuclear landscape cannot be divorced from the continent's historical role in shaping and being shaped by global geopolitical dynamics.

Africa's nuclear landscape emerged with the dawn of the atomic age during the Second World War when Britain and the US raced against Nazi Germany's production of an atomic bomb. At the time, South Africa's uranium resources were also considered as a source for the Manhattan Project's atomic

bombs, but the country's uranium resources and mining were too underdeveloped. Instead, the US used uranium from the Shinkolobwe Mine in the Katanga province in the Belgium Congo (present-day DRC) to produce two atomic bombs that were used against Japan in August 1945 (Williams 2016). After the war, both Britain and the US were involved in the development of South Africa's uranium mining and refinement, which commenced in earnest in 1952; uranium exploration in other African states also began after the Second World War. The 1960s saw France conducting 17 nuclear weapons tests in its North African colony, Algeria. By March 1970, the global nuclear order was established with the designation of nuclear weapon states (NWS) and non-nuclear weapon states (NNWS). South Africa commenced with its nuclear weapons programme in 1972, which resulted in the country producing six nuclear bombs. In 1993, South Africa became the first country to have voluntarily terminated its nuclear weapons programme and dismantled its nuclear weapons.

Underlying these developments and events are uranium's status as the most important resource for producing nuclear energy. However, plutonium and thorium production, as well as new nuclear technologies and advanced reactor technologies, are also concerning in terms of safety, radioactive waste, and resources. China is expected to start construction of the first thorium molten-salt nuclear power plant reactor in 2025 (NEI 2024). However, compared to newer nuclear technologies, uranium mines remain nuclear necropolitical sacrifice zones. Mining disturbs the earth, exposing radioactive uranium ore, which is dispersed by the wind as radioactive dust. Uranium mining is also water-intensive because of the leaching process that separates uranium from the ore. Moreover, uranium mining can also affect groundwater sources, as mining operations draw water from aquifers. The case of Niger is illustrative of this.

Niger is the world's fifth largest uranium producer (NEI 2023), providing about 25% of the EU's nuclear utilities' uranium supplies and making Niger the largest uranium supplier to the EU (ESA 2022:19). However, the country remains a nuclear sacrifice zone, and the benefits of uranium mining accrue

to external states and interests. Moreover, uranium mining and its legacy in Niger has created Foucauldian heterotopias such as radioactive contaminated regions and villages, and nuclear colonial infrastructure such as uranium roads and uranium railways. Moreover, the Nixonian "slow violence" of radiation has added to populations' poor health and degraded natural environments. French company AREVA, in its 40 years of operation in Niger, has used 270 billion litres of water, "contaminating the water and draining the aquifer, which will take millions of years to be replaced" (Greenpeace 2010a:6). A study on Gabon and Niger by the European Parliament (2010:iii–iv) found that in both countries there have been problems and negligence related to uranium mining and mine safety, a lack of transparency from mining companies about radioactive pollution, and the contamination of water sources and soil around mining villages. Despite the findings by Greenpeace (2010a), AREVA (2014) maintains that it remains transparent, environmentally accountable, and supportive of local populations. In April 2010, AREVA and local Nigerian authorities signed several protocols to "implement multipartite radiological control of materials and equipment" in the desert towns of Arlit and Akokan (NEA & IAEA 2023:396). Orano (formerly AREVA) maintains a similar position regarding its uranium mining operations in Niger (Orano 2024). However, aquifer depletion in Niger's uranium mining region continues (Dobi *et al.* 2021:1–15). The French-based *Commission de Recherche et d'Information Indépendantes sur la Radioactivité* (Independent Research and Information Commission on Radioactivity) reported that radioactive waste is threatening the water supply of Nigeriens, as about "20 million tons of radioactive tailings from uranium mining [that] have been dumped on the ground are still uncovered. Radioactive substances are dispersed by the wind and increase health risks for the population" (NEI 2023). Africa remains a major uranium market for EU states. Besides Niger, EU utilities purchase natural uranium from Malawi, Namibia, and South Africa (ESA 2022:84). Divergent views and data on the impact and socio-economic benefits of uranium mining in Africa persist.

The role of development cooperation in the environmental governance of the uranium mining sector in Niger, exposed to the expanding global uranium frontier, has been ambiguous. Donors have actively promoted the extractive industries, whilst grave environmental governance issues associated with uranium mining, pertaining to both alleged impacts and rampant institutional failures, have been a blind spot in the aid portfolio. Foreign aid to Niger has ignored grievances about grave environmental impacts and rampant institutional failures, while a crisis discourse on desertification and food insecurity diverts attention from geopolitical interests in mineral wealth (Larsen & Mamosso 2014:62).

There are continued efforts to counter such narratives on the negative impact of uranium mining on populations and the environment. In 2023, for example, the Nuclear Energy Association and the Organisation for Economic Co-operation and Development produced a guide for stakeholders to expand uranium mining's social and economic benefits, citing uranium mining operations in Namibia and Niger as examples of "leading practices" (NEA & OECD 2023:9, 69–74). OECD member countries are Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, South Korea, Latvia, Lithuania, Luxembourg, Mexico, The Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, the UK, and the US. The European Commission participates in the work of the OECD. The OECD Nuclear Energy Agency (NEA), established in 1958, includes 34 states, namely Argentina, Australia, Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, South Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Russia (suspended), the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, the UK, and the US. The European Commission and the International Atomic Energy Agency participate in the work of the NEA (NEA & OECD 2023).

The NEA and OECD have also remained headstrong in advancing and supporting uranium mining by shifting the blame for the negative effects caused by mining companies to governments and local authorities:

> Delivery of these [social and economic] benefits, and contributions to the broader sustainable development of the communities and regions in which they operate, has been a priority for uranium companies seeking to establish operations and build and maintain social and political support for their presence. But the role of local and/or regional, provincial and national governments in supporting and contributing to the socio-economic development of mining communities cannot be overlooked. Indeed, the primary responsibility of all tiers of government is to ensure citizen wellbeing, safety and security, essential to which are basic services and infrastructure. Too often, however, mining companies have been asked to take on (or by necessity have assumed) the exclusive role of services and infrastructure provider. In these cases, governments have regrettably neglected or abrogated their responsibility to provide basic goods and services to their citizens, outsourcing this responsibility to the private sector and/or civil society instead (NEA & OECD 2023:57).

Besides the nuclear necropolitics associated with uranium mining in Africa, there is another nuclear heterotopia associated with uranium mining that relates to nuclear colonial infrastructures such as roads, railways, and ports. Uranium products are often transported over large distances and across national borders to ports. These transport routes are effectively radioactive roads as communities remain exposed to risks. In Niger, for example, uranium concentrates from Arlit and Akokan are transported by truck 1,600 km to Parakou in Benin before being transported by train for 400 km to Cotonou port whence it is shipped to Comurhex in France (WNA 2024). The "uranium road" between Tahoua and Arlit, a 685 km road built in the wake of Niger's uranium boom in the 1970s and 1980s, remains

in a state of disrepair due to flash floods, poor maintenance, and insecurity in the Sahel. In Namibia as well, Chinese uranium investments were complemented by infrastructure developments such as the "uranium railway" from Walvis Bay to Kranzberg. China also constructed a container terminal in Walvis Bay in line with its Belt and Road Initiative (El Obeid 2021:22).

Like Niger, Malawi is a landlocked uranium-producing country. The Kayelekera Uranium Mine is in northern Malawi, and uranium oxide concentrate is trucked from there to the port of Walvis Bay, Namibia via Zambia, making it the world's longest transport route for uranium (NEA & IAEA 2023:339). These radioactive roads are also sacrifice zones. In February 2014, a shipping contractor's truck transporting uranium oxide concentrate from Kayelekera to Walvis Bay overturned, causing spillage of the radioactive material (WNN 2014). Besides this, elevated levels of uranium in soils around the Kayelekera Uranium Mine have been reported (Majawa, Tshivhase & Dlamini 2022:1353). African states such as the DRC, Malawi, Namibia, Niger, and South Africa that are heavily involved in uranium mining and milling, and states with extensive transport and port facilities such as Djibouti and Tanzania, do not have established or optimally functioning institutions and regulations for the safe handling and transportation of radioactive material. In addition, states such as Benin, which does not have any uranium mining operations, is affected by the transport of radioactive material from outside its borders (IAEA 2021). In May 2024, 23 African states completed a first draft of regulations, or revised their national regulations, on the safe transport of radioactive material in compliance with IAEA requirements (IAEA 2024c).

A neglected aspect of nuclear necropolitics relates to the uranium mining investment agreements signed between governments and foreign investors such as mining companies. In the case of Malawi, for example, the country's benefits from an agreement on the Kayelekera Uranium Mine were described as "tangential and dismal" due to hastily negotiated and non-transparent agreements (CHRR 2021). Moreover, the

government officials performing the negotiations were often not on par with the investors' astute negotiators, resulting in investors often benefitting disproportionately more than the government. Investors have also benefitted from Malawi's "archaic" tax and revenue legislation, resulting in less income for the state of Malawi, which could have been used for social development (CHRR 2021). A similar conclusion was reached by the United Nations Special Rapporteur on the Right to Food after a visit to Malawi: the country offers extensive tax incentives to domestic and foreign companies. Mining companies are exempt from customs duty, excise duty, and VAT on mining machinery, plants, and equipment. They can also sign special deals on the rate of royalty owed to the government. Companies operating in Export Processing Zones pay no corporate tax, no withholding tax on dividends, no VAT, and no duty on capital equipment, machinery, and raw materials. Revenue losses from special incentives given to Australian mining company Paladin Energy, for instance, which manages the Kayelekera uranium mine, are estimated to amount to at least US$ 205 million (MWK 67 billion) and could reach up to US$ 281 million (MWK 92 billion) over the 13-year lifespan of the mine. This amounts to at least US$ 15.8 million (MWK 6.5 billion) or up to US$21.65 million (MWK 8.9 billion) a year. The Special Rapporteur is convinced that, unless combined with a comprehensive enhancement and optimisation of tax revenue in Malawi, current macroeconomic reforms may not have substantive positive impacts on the realisation of the right to food (UN 2013). Archaic tax legislation in Namibia and Niger has also disproportionately benefitted uranium mining companies (The Namibian 2018; El Obeid 2021).

5.5 Radioactive waste as a nuclear necropolitical practice in Africa

The Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa entered into force on 22 April 1998. The Convention includes a ban on radioactive waste (Art 2(2)) (AU 1991). Despite the Bamako Convention, some African states have been caught up in organised criminal networks'

illicit toxic waste industry. North Africa is considered a common destination for Europe's waste for recycling, but these African states do not always have the technical expertise to process it, resulting in pollution, toxic environments, and health risks (Abderrahmane 2022). Moreover, radioactive waste has been dumped in Africa. The Indian Ocean Earthquake and Tsunami of 26 December 2004 exposed radioactive uranium waste that had been illegally dumped along Somalia's coastline in "containers and disposable leaking barrels which ranged from small to big tanks", causing health and environmental problems to fishing communities and groundwater contamination (UNEP 2005:134). But Somalia's nuclear necropolitics pre-dates the 2004 earthquake and tsunami. Hazardous waste, including radioactive waste, has been dumped in Somalia since the 1980s. Since 1991, Somalia has descended into civil war and lawlessness, which have exacerbated the natural and human-made environmental degradation. Since then, some industrialised countries such as Switzerland and Italy (Leonard & Ramsay 2013) have also been accused of dumping nuclear and other hazardous waste in Somalia, which due to its political instability (the country lacked a central government to guard and protect its coast and territory) has created attractive conditions for these activities. These conditions also meant that Somalis were not informed of these developments. Moreover, the country provided ample sites for dumping waste (UNEP 2005:11, 135). More evidence of the illegal dumping of radioactive waste in Somalia emerged in 2010 when it emerged that Italian businessmen and Somalian warlords entered into an agreement to dump radioactive and other toxic waste at Eel Ma'an, a port north of Mogadishu, between 1990 and 1997 (Greenpeace 2010b; Financial Times 2010).

These developments have not been limited to east Africa and to dumping by Europeans. In 2013, Algeria intercepted three containers of radioactive waste from China (Abderrahmane 2022). In 2015, a former director of the Sudan Atomic Energy Commission in Sudan, Mohamed Siddig, who was also responsible for the Sudan Radioactive Waste Management programme that commenced in 1995, declared that China brought 60 containers of radioactive waste to Sudan. Of these,

40 were buried in the desert near the Merowe (Hamdab) Dam, which was constructed by Chinese, French, and German companies and funded by Chinese and Arab financiers between 2004 and 2009, while the remaining 20 containers were disposed of, unburied, in the desert (Dabanga 2015). Since 2020, Kenyans from the Chalbi Desert have also been involved in a legal battle against their government. The applicants allege that, since the 1980s, the Kenyan government under Daniel Moi has dumped nuclear waste in their region that has caused deaths, long-term health effects, and environmental damage (Nation 2020; Kenya Insights 2024).

Radioactive waste remains a major global concern because of its health and environmental impacts but especially so given the explicit nuclear aspirations of African states and the continent's calls for nuclear redress and nuclear equity. In 2024, the African Commission on Nuclear Energy (AFCONE) signed an MOU with DeepGEO, a US-based company involved in the development of multinational deep geological high-level radioactive waste sites. The African Nuclear Energy Funding Initiative (ANEFI) agreement supports the development of multinational repositories for high level nuclear waste in Africa to promote regional governance and secure financing for vital infrastructure development (AFCONE & DeepGEO 2024).

According to AFCONE, the Initiative offers African states an opportunity "to leapfrog the established nuclear status quo, to collaborate as equal partners, and to take the development of nuclear power in Africa into their own hands" (AFCONE & DeepGEO 2024). DeepGEO is reportedly cooperating with several African governments that have expressed a willingness to host such facilities. DeepGEO will be introduced to African financial institutions and "will gain enhanced access to African decision-makers"; AFCONE, on the other hand, will benefit from a portion of the future proceeds and will immediately start work on establishing a template for regional nuclear governance that will facilitate nuclear energy deployment and the use of shared fuel-cycle facilities across the continent. ANEFI will also support the development of African financial institutions and enhance their capacity to invest in nuclear energy projects.

These institutions will seek to partner with international institutions to bring investment to the African nuclear sector. The goal is to eventually achieve nuclear autonomy for Africa, supporting regional nuclear fuel-cycle facilities, research and medical facilities, and a domestic supply chain (AFCONE & DeepGEO 2024).

5.6 Assessment and conclusion

Free-trade agreements aim to foster economic development, cooperation, and regional integration through the free movement of people, goods and ideas. This contributes to more trust between states and societies, and politically more stable regions. However, these ambitious and liberal conditions, often alike illiberal conditions, have a dark side, as illicit trade, insecurity, and environmental pollution can proliferate under these liberal conditions, making illegal activities more difficult to curb (DiLorenzo 2016). Besides arms, human, and drug trafficking and the proliferation of chemical, biological, radiological, and nuclear (CBRN) weapons, nuclear material, its means of delivery, and dual-use goods remain a major international security concern (UNICRI 2024). In addition to this, advanced technologies (processes and equipment such as nuclear reactors), alternative fuels, SMRs, and micro-reactors pose emerging security problems and may raise proliferation concerns that the continent collectively, and states individually, should be mindful of. Moreover, these developments could have a significant necropolitical consequence. What is required, therefore, is increased scientific accountability, political oversight, security cooperation, and practical commitment to nuclear non-proliferation in Africa.

The African Union (AU) adopted the African Continental Free Trade Agreement on 21 March 2018. The Agreement entered into force on 30 May 2019, thus creating the African Continental Free Trade Area. It aims to stimulate and develop extensive intra-African trade as a flagship of the AU's developmental blueprint, Agenda 2063. The free trade area consists of all 55 African states and eight regional economic communities

(RECs). Article 3 of the Agreement contains its general objectives, namely:

- the establishment of a single market for goods, services, and the free movement of people to deepen African economic integration;
- the creation of a liberalised market for goods and services through successive rounds of negotiations;
- the movement of capital and people to facilitate investment;
- the establishment of a Continental Customs Union;
- the promotion and achievement of sustainable and inclusive socio-economic development, gender equality, and structural transformation of member states;
- the enhancement of the competitiveness of members within the continent and the global markets; and
- the promotion of industrial development through diversification and regional value-chain development, agricultural development, and food security (AU 2018:4).

Following these general objectives, Article 4 of the Agreement outlines specific objectives:

- eliminate tariffs and non-tariff barriers to trade in goods;
- liberalise trade in services;
- cooperate on investment, intellectual property rights, and competition policy;
- cooperate on all trade-related areas;
- cooperate on customs matters and the implementation of trade facilitation measures;
- establish a mechanism for the settlement of disputes concerning their rights and obligations; and
- establish and maintain an institutional framework for the implementation and administration of the Agreement (AU 2018:5).

Article 4 of the Agreement is complemented by Article 2 of the Protocol on Trade in Goods, which aims to improve intra-African trade by eliminating tariffs and non-tariff barriers, improving customs procedures, trade facilitation, and transit, cooperating to remove technical barriers to trade and sanitary and phytosanitary measures, and developing and promoting

regional and continental value chains and socio-economic development, diversification, and industrialisation across Africa (AU 2018:19).

Despite these ambitions, perennial concerns about illicit economies in Africa, such as arms trafficking, drug trafficking, and trade in counterfeit goods, are amplified by the possibility of nuclear proliferation under the liberal conditions of the African Free Trade Agreement (Van Wyk & Bosman 2023). Nuclear proliferation can be defined as the illicit spread of nuclear technology, equipment, fissionable material, and expertise related to nuclear weapons that could be used to manufacture nuclear weapons. For the International Atomic Energy Agency (IAEA), nuclear proliferation also includes "unauthorized acquisition … through theft, supply, possession, use, transfer or disposal (intentional or unintentional) of nuclear and other radioactive material, with or without crossing international borders" (IAEA 2024a). Moreover, nuclear proliferation also includes unauthorised activities and incidents involving nuclear and other radioactive material inside or outside of regulatory control within or across national borders (IAEA 2024a).

The extent of global nuclear proliferation is unknown. However, the IAEA Incident and Trafficking Database (ITDB), established in 1995, provides some insights into the scope of global nuclear proliferation. The ITDB includes states' reporting of incidents of "illicit trafficking of nuclear and other radioactive material" and "all incidents in which nuclear and other radioactive material is or was out of regulatory control" (IAEA 2024b:1). In 2023, 168 incidents (22 more than 2022) were reported to the ITDB by 31 states. By mid-2024, 145 states, including 39 African states, were participating in the ITDB (IAEA 2024b:8). Between 1993 and 2024, the IAEA ITDB has recorded 4,243 incidents (IAEA 2024b:3). However, the IAEA ITDB is a voluntary mechanism for states and does not publicise the countries where these incidents occur or those involved, thus the true extent of incidents and trafficking remains unclear.

Another African security concern emerges from financial products and services linked to trade in proliferation-sensitive items. The rise in proliferation financing is associated with

technological advances, sophisticated evasion techniques, and a variety of state and non-state actors, including complex criminal networks, front companies, and professional intermediaries conducting operations on their behalf (UNICRI 2023:8). According to the United Nations (UN), the security threats associated with proliferation financing include:

- trade finance services for the procurement of strategic goods, material, and technology for weapons of mass destruction (WMD) proliferation programmes;
- finding through illicit and licit revenue-raising activities; and
- any form of financial service or related technical assistance facilitating financial support for WMD proliferation (UNICRI 2023:8).

There is no universally accepted definition of terrorism. However, the international community has adopted several legal instruments to counter terrorism. Seven of the nineteen international legal instruments against terrorism address CBRN terrorism, namely:

- The Convention on the Physical Protection of Nuclear Material (1980)
- The International Convention for the Suppression of Terrorist Bombings (1997)
- The International Convention for the Suppression of Acts of Nuclear Terrorism (2005)
- The Amendment to the Convention on the Physical Protection of Nuclear Material (2005)
- The Protocol to the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (2005)
- The Protocol to the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms located on the Continental Shelf (2005)
- The Convention on the Suppression of Unlawful Acts relating to International Civil Aviation (2010) (UNODC 2023).

Examples of nuclear sacrifice zones in Africa have been presented here in the context of nuclear necropolitics and

attendant features of physical and symbolic nuclear landscapes, i.e., the "bare life" (Agamben 1998) and "slow violence" (Nixon 2013). In this context, the deathscapes created by decades-long uranium mining in Africa have been presented as a nuclear necropolitical practice. These deathscapes have emerged since the dawn of the nuclear age, colonial powers' nuclear aspirations, and during the Cold War. Whereas nuclear weapons states have decreased their nuclear weapons arsenals, their need for uranium has not abated. For African states, uranium mining has been presented as the panacea of post-colonial development but these extractivist practices created a new type of colonialism: nuclear colonialism. In this power structure, violence continues but as "slow violence" (Nixon 2013). Uranium mining operations have created employment opportunities, but once mining operations become too costly, operations are terminated, and communities became entangled in the realities of the "bare life" (Agamben 1998). Moreover, "slow violence" continues to manifest in poor health and environmental degradation in uranium mining areas. Similar necropolitical practices and outcomes are evident in radioactive waste disposal in Africa. Nuclear waste sacrifice zones and its effects occur in, for example, Kenya and Somalia.

Given the continent's nuclear energy ambitions as well as the greater global demand for uranium to offset carbon-intensive energy generation, the continent faces several challenges. Radioactive environments, created by uranium mining and milling and the transport and disposal of licit and illicit nuclear waste, cannot be quickly decontaminated because of the half-life of radiation. This means that the effects of nuclear necropolitics are interregional and intergenerational and can at best only be managed rather than stopped or undone. For this, a stable political environment, accountable governance, law enforcement, and transparency are required. In this respect, the case of Somalia remains instructive. After the country spiralled into political chaos in the 1990s and continued without a central functioning government, illicit nuclear waste entrepreneurs were able to dump radioactive material in the country. Several cases have also shown the importance of equitable agreements between African states and the African and international nuclear

sector. In several cases, elites have benefitted more than the national fiscus, which meant less development could take place.

Another significant development is the uranium mining industry's efforts to counter narratives about the negative impact of uranium mining. African civil society is simply not able to compete with these interests. The expected benefits of uranium mining and nuclear development in Africa have not been realised. Instead, the social cost will remain and increase across time and space. These costs are likely to be exacerbated by political instability caused by coups. Ironically, the Sahel is one of the most important uranium mining areas in Africa, but it is also one of the most ungoverned territories on the continent. Since 2020, military coups have occurred in Gabon, Niger, Burkina Faso, Sudan, Guinea, Chad, and Mali.

In the above examples of Africa's nuclear sacrifice zones, common themes have emerged: the unequal distribution of, and lack of transparency about, the mining rent; poor health and safety; negative environmental impacts, such as depleted or contaminated aquifers and surface water resources; poor labour practices and unresolved disputes; and archaic legislation and ineffective legal controls and law enforcement.

Finally, the continent's efforts to assert its own agency, independence, and self-reliance are embedded in the ideals of Pan-Africanism and continental integration and unity. However, given the poor state of governance and ungoverned spaces resulting from conflicts and wars, the continent's developmental agenda, based on the peace-development-trade triad, is unlikely to achieve nuclear equity on and for the continent. The African Continental Free Trade Area is more likely to see illicit nuclear-related activities.

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