Conclusion

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Over the next few decades, African states will increasingly be marked by high levels of migration, urbanisation, and population growth, trends likely to culminate in the largest and most intense developmental challenge in human history. Of overriding concern will be the delivery and availability of reliable and clean electricity, clean water, and nutritious food. When considered through the prism of (human) development, access to reliable electricity has often been touted as the most urgent need. Energy is the lifeblood of modern national economies. It is also, as alluded to in this book, indispensable for national self-defence and security, while providing those possessing a preponderance of wealth in energy sources and resources with significant geopolitical advantages. African economies and other developing economies continue to be plagued by the scourge of energy poverty. Whatever the merits or demerits of civilian nuclear energy, African leaders have often viewed this technology as a viable solution to address their soaring energy needs. In fact, as is often stressed in this book, the future African landscape is likely to be marked by increased interest in and reliance on nuclear energy. An increased African nuclear footprint is already evident, and an expansion in African states' reliance on civilian nuclear energy is not farfetched, especially in light of remarkable developments in civilian nuclear technology.

While civilian nuclear energy undoubtedly offers myriad advantages and opportunities to African economies, as explored in these pages, the authors of this volume have generally been careful to emphasise that nuclear energy provides a trade-off and not a solution. The diversity of views and perspectives put forward in this volume attest to the fact that civilian nuclear energy remains a deeply controversial topic and energy source,

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a reality conveyed by the title of the book. Notwithstanding this, the great virtue in airing different views and identifying issues and challenges is that it gives us the intellectual space to reflect on how best to manage—and, as some scholars in this volume would argue, *not* discard—Africa's increased reliance on civilian nuclear energy. Other scholars are of the view (see especially Chapter 6) that a future without nuclear energy is indeed possible. Ultimately, open dialogue and critical conversations about Africa's nuclear future is indispensable for steering the continent's nuclear ship to safe waters, an undertaking central to the aims and objectives of this volume. If managed with soberness and wisdom, civilian nuclear energy can provide a net benefit to the continent's developmental aspirations. The success of this endeavour is then inextricably linked to efficient, transparent leadership on the continent.

In assessing the potential benefits accruing from Africa's turn to civilian nuclear energy, Wandile Shezi and Prof. Anna-Mart van Wyk conclude that nuclear energy holds the potential to spur regional socio-economic development while addressing global climate change objectives. Regional and continent-wide attitudes, the authors strongly contend, should be based on a bedrock of scientific research and not on subjective fears and perceptions. Nuclear technology is also not a one-trick pony. The adoption of and reliance on civilian nuclear energy is likely to induce several positive economic spin-offs, ranging from national economic development to improved standards of living. To harness the benefits likely to accrue from nuclear technology, SADC member states should prioritise the harmonisation of regional energy policies, and should have fulfilment of the SAPP's mandate through the building of necessary infrastructure front and centre.

Isabel Bosman, whilst appreciative of the developmental and other benefits by civilian nuclear energy, urges that the peaceful uses of nuclear science and technology are highly dependent on—and should be seen as complementary to—the non-proliferation and disarmament regimes. The right to the peaceful uses of nuclear science and technology is enshrined in several legal instruments, the NPT being the most

important one. The latter treaty not only emphasises the need for nuclear disarmament and the obligation of states parties to non-proliferation but also paves the way to the inalienable right to peaceful uses of nuclear science and technology among members in good standing with the Treaty. Although accession to the NPT is near universal among African countries, the continent endeavoured to add an additional layer in the form of the Treaty of Pelindaba, which underscores the non-proliferation and disarmament obligations of the NPT. Bosman further notes that greater impetus is required to increase the number of states party to the Treaty of Pelindaba and recommends that public education about the peaceful uses of nuclear science and technology and, concomitantly, the legal framework that exists to protect and guarantee this right should be prioritised. Accordingly, African's increased nuclear footprint needs to develop in step with the existing continent-wide and international legal regimes governing nuclear issues.

Although Prof. Eben Coetzee makes a case for the adoption of civilian nuclear energy and, importantly, SMRs and micro-reactors, he notes that scant attention is paid to the geopolitics of nuclear energy in Africa, a shortcoming likely to bring devastating consequences to African agency, security, and development. Not unlike the Cold War, civilian nuclear energy projects are today harnessed by the leading powers in service of grand international order-building objectives, mostly focused on tearing down the US-led Western liberal order and reconstructing an order based on Chinese and Russian interests and values. Civilian nuclear energy projects thus constitute a powerful weapon in the hands of Chinese and Russian SOEs. This behaviour is not unusual, however. Throughout history, great powers have attempted to use all available means to augment their relative positions and to build an order reflective of their values and interests. Civilian nuclear energy projects will likely entrap African countries in decades-long alliances with authoritarian states, alliances that will shape and define this century's international order. Tellingly, Coetzee emphasises that African leaders must approach their prospective nuclear partners with eyes wide open, appreciating that geopolitical pressure will accompany *all* prospective nuclear partners.

This reality necessitates that African countries and their leaders deeply reflect on the type of society they envision for themselves and their neighbours and, more broadly, the future international order.

Dr Tom Vaughan and Prof. Joelien Pretorius provide a critical lens through which to view the role of the three regional organisations with a nuclear mandate in Africa, and place particular emphasis on these organisations' roles in negotiating and practising Africa's "non-nuclear" nuclearity. This nuclearity is practised through peaceful uses of nuclear energy, exercise of Africa's postcolonial identity in nuclear forums, and demonstrations of how Africa's agency relates to nuclear desire, thus fetishising nuclear energy as the solution to developmental needs and the path to a rightful place in the global order. The authors conclude that the kind of agency implicit in this role is likely to lead to a contradictory nuclear future that does nothing more than reify existing nuclear hierarchies and perpetuate a world with nuclear weapons. By calling for greater attention to alternative African nuclear futures, the authors aim to provoke debate about the need to think beyond the categories of the NPT that serves to fan nuclear desire to cement the horizon in this issue-area for Africa's ordering agency.

Prof. Jo-Ansie van Wyk identifies and explores several examples of nuclear sacrifice zones in Africa, presenting these in the context of nuclear necropolitics and the attendant physical and symbolic features of nuclear landscapes, i.e., the "bare life" and "slow violence". The dark side of the nuclear fuel cycle, especially in the form of decades-long uranium mining in Africa, is presented as a nuclear necropolitical practice, one that has been evident since the dawn of the nuclear age and continues into the present. There remains a growing appetite for uranium today. In the post-colonial environment, uranium mining has been presented as a path to development, but these extractivist practices only create a new type of colonialism, i.e., nuclear colonialism, where violence continues but in the form of "slow violence". While uranium mining operations have yielded several benefits, high operational costs have often led to their termination, subsequently entangling communities in

the realities of the "bare life". "Slow violence" also manifests in poor health and environmental degradation in uranium mining areas. Further, necropolitical practices and outcomes are discernible in radioactive waste disposal in Africa. Taken together, the effects of nuclear necropolitics are interregional and intergenerational and can, at best, only be managed rather than altogether terminated or reversed. Managing this precarious situation is, however, dependent on a stable political environment, accountable government, law enforcement, and transparency. In short, on this nuclear issue as with others, effective leadership is key.

In a critical assessment of the development and future of the continent's lone nuclear power station, Koeberg, Prof. Anna-Mart van Wyk outlined the various challenges that the beleaguered power station has faced and continues to face. A strong case is made for decommissioning the power plant. Although the focus is on the South African case, the chapter also provides strong grounds for considering the issues of managing nuclear power stations in the context of Africa's increasing nuclear footprint. There is much to be learnt from the South African case for African countries interested in traversing the nuclear path. Additionally, given Eskom's claim that electricity generation can remain stable without Koeberg, the chapter also directs African leaders interested in nuclear energy to consider the role of renewables in their country's energy mix.

In the main, the primary aim of the book has been to interrogate the politics of nuclear energy in Africa and, concomitantly, the potential benefits and pitfalls of Africa's potential turn to nuclear energy. Several key findings emerge:

- There is a strong case to be made for adopting nuclear energy as a means of addressing Africa's soaring energy needs. However, in some contexts (cf. Chapter 6) nuclear energy might not be preferable, especially where poor governance, mismanagement, and corruption are endemic.
- Misinformation about nuclear energy remains rampant. In some cases, the benefits of nuclear energy are wholly ignored, while its dark side (including Africa's nuclear sacrifice zones) is simply brushed aside.

- The case for nuclear energy, especially as it relates to its indispensability to power national grids, is by no means settled. More research is required to assess whether adopting the nuclear route is desirable and necessary in different contexts. Such research must consider how the development of SMRs might alter prevailing assumptions and calculations about nuclear energy.
- Increased reliance on nuclear energy in Africa must proceed within the ambit of the well-developed legal and institutional architecture already prevalent in Africa.
- While undoubtedly boasting many potential benefits, nuclear energy projects are deeply political in nature and cannot be separated from twenty-first century geopolitics. Importantly, African leaders must remain vigilant about the geopolitical baggage that accompanies nuclear energy projects.
- African nuclear desire could reify nuclear hierarchies and perpetuate a world with nuclear weapons.
- Advanced nuclear reactor and SMR development has the potential to allay many of the fears traditionally associated with nuclear energy.
- There is and remains an immense opportunity for South African SMR companies to service the nascent African and global market for SMRs.
- Nuclear energy remains a trade-off and not a solution. This reality should be foregrounded when African leaders and societies consider how best to address the scourge of energy poverty and unlock development.

Finally, in drawing a conclusion from these varied perspectives, one is compelled to acknowledge that, despite the myriad issues and challenges raised in this volume, civilian nuclear energy is a technology that must continue. In short, the potential gains accruing from civilian nuclear energy—in Africa and other developing economies—far outweigh the losses. As noted above, a new generation of advanced nuclear reactors will likely address several—though not all—of the issues, fears, and challenges raised in this volume. At the heart of ensuring a safe and successful African nuclear future, I argue, are the twin

requirements of a community of scholars willing to lay bare the benefits, opportunities, and dark side of nuclear energy, and African leaders devoted to managing the continent's nuclear future with the necessary (technical) care, wisdom, and strategic foresight. This book represents a step in that direction.