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# Uranium Mining in Africa: A Continent at the Centre of a Global Nuclear Renaissance

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*South African Institute of International Affairs*

*African perspectives. Global insights.*

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## **ABSTRACT**

Africa holds 18% of the world's uranium resources. Interest in African uranium initially stemmed from the US's military nuclear ambitions. Exploration and mining began in the DRC. However, expanding demand for energy, rising global oil prices and increased concern for climate change have revived interest in uranium mining and exploration in general. Much of this interest has focused on Africa because of its relatively accessible uranium, flexible regulations and low labour costs. Most uranium mining companies concentrate their efforts on the largest available uranium deposits, in Namibia and Niger. Others are looking into smaller, untapped potential uranium fields (eg. in the Central African Republic).

This paper revisits the growing global interest in Africa's uranium mines and potential uranium deposits. It examines the political, economic, social and environmental impact of current uranium mining and exploration trends in Africa. It looks into examples, frameworks and best practices that might improve the governance of uranium mining and exploration throughout the continent. There is growing demand from nuclear energy worldwide; interest in Africa's uranium is set to grow. Africa should welcome this demand provided that it fits into stronger local and regional political frameworks.

## **ABOUT THE AUTHOR**

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**ABBREVIATIONS AND ACRONYMS**

Afcone	African Commission on Nuclear Energy
CAR	Central African Republic
CSR	Corporate Social Responsibility
DRC	Democratic Republic of the Congo
EIA	Environmental impact assessment
EITI	Extractive Industries Transparency Initiative
EMP	Environment Management Plan
GDP	Gross Domestic Product
IAEA	International Atomic Energy Agency
ICMM	International Council on Mining and Minerals
NGO	Non-Governmental Organisation
NPT	Nuclear Non-proliferation Treaty
tU	tonnes of uranium
WNA	World Nuclear Association

## INTRODUCTION

Contrary to popular belief, uranium mining in Africa<sup>1</sup> did not start with the relatively recent 'nuclear renaissance'. The Shinkolobwe mine in Katanga province in the Democratic Republic of Congo (DRC) first attracted interest from colonial Belgium, when Union Minière du Haut Katanga discovered uranium there in 1915 and Société Générale Métallurgique de Hoboken began extracting uranium in its plant in Olen. At that time, experts used the radium extracted from uranium for a form of radiotherapy against certain cancers. Shinkolobwe was closed briefly in 1937 before the US revived it and bought around 30 000 tonnes of uranium (tU) from the mine between 1942 and 1944. The uranium was used to manufacture the first atomic bombs.<sup>2</sup> The mine was closed when the DRC became independent in 1960 because mining uranium from Shinkolobwe was too expensive and too dangerous.

Although for the next four decades nuclear powers still mined and bought uranium, mining it in Africa attracted less attention. This is not to say that it stopped altogether. In Niger mining began in 1971, with all the output going to French nuclear reactors, and in Namibia, the Rössing mine has been operating since 1976. South Africa's uranium extraction from gold mines in the Witwatersrand area near Johannesburg began in 1951.<sup>3</sup> Yet Africa's share in the global uranium market remained relatively small, for several reasons. These included the low price of uranium worldwide (which reflected low demand, especially after the 1979 Three Mile Island and 1986 Chernobyl nuclear power plant accidents); the high cost of establishing and running a uranium mine; an adequate supply of uranium from mines in the US, Canada and Australia; and the ready availability of uranium from dismantled weapons in military nuclear stockpiles as the Cold War came to a close in the 1980s.

Today, the position is different. Africa accounts for 18% of world uranium production with mining operations taking place in Namibia (8% of global production), Niger (7%), Malawi (1.2%) and South Africa (1%). The other large producers of uranium are Kazakhstan (33% of world production), Canada (18%) and Australia (11%). At respective prices of \$80 a kilogramme of uranium (\$/kgU), \$130/kgU and \$260/kgU, Africa represents 8.5%, 16% and 14.7% of world reserves. The largest are in Namibia, Niger and South Africa.<sup>4</sup> By comparison, the world's main uranium reserves at \$80/kgU, \$130/kgU and \$260/kgU are in Australia.<sup>5</sup> Annex I shows which countries produce the world's uranium and the location of reserves (at different prices).<sup>6</sup>

This paper first examines Africa's place in the global nuclear renaissance through its four current uranium producers, and those African countries where exploration is taking place and where mining is likely in the future. Secondly, it analyses the effects of uranium mining on the African continent at political, economic, social and environmental levels, examining stakeholders' efforts and challenges. Thirdly, the paper looks into international and African tools that either exist or are being set up to improve the governance of uranium mining in Africa. Its conclusion is that improvement requires, in particular, attention to strengthening government capacity and ensuring wider consultative processes.

## THE GLOBAL NUCLEAR RENAISSANCE

Interest in nuclear power has greatly increased over the past decade, for a number of reasons. First, global demand for energy is growing rapidly. World primary energy demand is expected to grow by 40% from 2007 to 2030 and demand for electricity will increase by 76% over the same period. Secondly, rising concern about climate change is encouraging the search for energy sources with lower carbon emissions. At present, nuclear power is the only such source that could adequately meet global demand.<sup>7</sup> Thirdly, the world supply of uranium is sufficient to meet government concerns over security of supply; uranium supply is less uncertain than that of, say, oil and gas. Fourthly, over the past decade fossil fuel price rises and price volatility have increased the relative cost-efficiency of nuclear power. Fifth, because the main cost in producing nuclear power lies in building the power plant itself, not in buying the uranium (as opposed to energy derived from fossil fuels, where the larger investment is in oil or coal as fuels) countries investing in nuclear power are less exposed to long-term raw material price fluctuations.<sup>8</sup>

Although uranium prices dropped after the Fukushima nuclear catastrophe on 11 March 2011 (from \$300/kg in June 2007 to \$110/kg in August 2011), they have since started to rise again, to \$115/kg at the time of writing.<sup>9</sup> As the appeal of nuclear power for governments increases, so does their interest in countries that can supply uranium.

### AFRICA'S FOUR URANIUM PRODUCERS: NAMIBIA, NIGER, SOUTH AFRICA AND MALAWI

In Africa, Namibia's potential as a global supplier of uranium is the most significant, at 8% of world production: its two operating mines – Rössing and Langer Heinrich – between them could provide 10% of global output. In the decade ending in 2010 uranium production in Namibia increased by 60% (from 2 714 tU to 4 496 tU)<sup>10</sup> with an estimated 284 200t/U in reserve, making up 4.5% of the world total.<sup>11</sup> Ownership of Rössing Uranium Ltd (Rössing mine) is shared between the Anglo-Australian multinational Rio Tinto Group (68.6%), the Iranian government (15%), the Industrial Development Corporation of South Africa (10%) and the Namibian government (3%). Paladin Energy Ltd, based in Subiaco, Western Australia owns Langer Heinrich; and the French-owned industrial group Areva NC will extract uranium from the Trekkopje mine from 2013. Namibian uranium deposits are also attracting attention from Chinese, Indian, Russian, and other Australian interests.<sup>12</sup>

Niger is Africa's second largest uranium producer and the world's fifth, with 7% of the world market. Output is increasing rapidly. From 2000 to 2010 annual production rose by 75%, from 3 143 tU to 4 198 tU.<sup>13</sup> Niger's uranium reserves are estimated at 275 500 tU, making up 4.3% of the world total.<sup>14</sup> Until 2007 Areva operated all Niger's mines and is still the most important shareholder in the largest of them. In 2008 Nigerien uranium accounted for one third of French requirements (expected to rise to half by 2015), and 50% of all the uranium Areva extracts comes from Niger.<sup>15</sup> Japan, Spain, South Korea, China, Canada, and Australia are all investing in mining or exploration in Niger, to various degrees (see Table 1).<sup>16</sup>

**Table 1 Companies investing in uranium mining or exploration in Niger**

Country	Company name
Australia	NGM Resources Ltd.
Canada	Global Atomic Fuels Corporation. GoviEx Uranium Inc.
China	China National Nuclear Corporation/China Nuclear International Uranium Corporation. ZXJOY Invest. Trendfield Energy Resources/ Trendfield Holdings Ltd. ZTE Energy Corporation.
Japan	Overseas Uranium Development Co.
Spain	Enusa SA.
South Korea	Korean Electric Power Co.

Source: World Nuclear Association, Uranium in Niger, <http://www.world-nuclear.org/info/inf110.html>.

Although Malawi's uranium was discovered in the 1980s, production began only in 2009, and Malawi is now Africa's third- and the world's eleventh-largest producer, accounting for 1.2% of global output. Paladin Energy is, the only mining company operating in Malawi; it extracted 670 tU in 2010 and expects to produce 1 460 tU by mid-2012. This level of production will not, however, last long because Malawi's reserves are limited (estimates range from 8 100 tU to 15 100 tU).

Most of South Africa's uranium output is a by-product of gold or copper mining. The country is Africa's fourth- and the world's twelfth-largest producer, with 1% of total production. While production fell by 23% between 2000 and 2010 from 758 tU to 583 tU,<sup>17</sup> South Africa contains 4.6% of the world's most accessible uranium, and possesses the second largest reserves in the world.<sup>18</sup> Despite this potential, relatively little extraction takes place: interest in uranium mining in South Africa is confined to domestic (AngloGold Ashanti Ltd), Indian (South African/Indian company Shiva Uranium Pty) and Canadian (Toronto-based First Uranium Corporation) firms.<sup>19</sup>

## EXPLORATION AND INVESTMENT IN OTHER AFRICAN COUNTRIES

One of the countries receiving increasing attention is the Central African Republic (CAR), with reserves of 12 000 tU. Areva intends to start production there in 2016–2017. More tentative exploration is taking place in other countries. In Botswana, Australia's A-Cap Resources Ltd intends to produce 1350 tU a year. Areva signed a uranium exploration agreement with the DRC government in 2009 around the country's estimated 2 700 tU reserves while in Guinea, the Perth-based Forte Energy NL estimates 4 700 tU to be available. Canada's Rockgate Capital Corporation is intending to tap into Mali's 8 533 tU resources; in Mauritania, Forte estimates reserves at 25 500 tU. Russia has signed a co-operation agreement with Nigeria that includes uranium exploration and extraction;

in Tanzania, Canada's Uranium One Inc and two Australian concerns, Uranex Ltd and East Africa Resources Ltd, are investigating reserves of 28 400 tU; in Zambia, Denison Mines Corporation of Toronto, Canadian-Australian Equinox Minerals Ltd and African Energy Resources of Perth are all investing in the country's 45 070 tU known and potential reserves; in Zimbabwe, measured and speculative resources of 26 400 tU will no doubt attract interest when the political situation there stabilises; and though exploration is not expected until the security situation in the country improves considerably, Somalia is thought to have 7 600 tU in resources.<sup>20</sup>

Increasingly, African uranium is attracting interest from emerging economies, in particular China and India. In Niger, China's state-owned China Nuclear International Uranium Corporation (Sino-Uranium) owns 37.2% of the Azelik mine's operating company Société des Mines d'Azelik (Somina).<sup>21</sup> Also state-owned, the China Guangdong Nuclear Power Holding Company is acquiring a 42.7% stake in Extract Resources Ltd of Sydney, which is licensed to explore Niger's Husab deposit (potentially the fourth largest in the world).<sup>22</sup> India recently enquired into ways to acquire South Africa's uranium, the Indian government having formalised its interest in uranium in Namibia through a bilateral agreement in August 2009.<sup>23</sup>

### AFRICA'S ENERGY NEEDS

In the long term there is also talk of African countries and regions building their own nuclear reactors. Currently, South Africa has the continent's only nuclear power plant at Koeberg in the Western Cape Province. Yet Africa's energy situation is dire: less than one third of Africans (30.5%) have access to electrical power.<sup>24</sup> Governments are trying to remedy this situation, and given the continent's considerable uranium reserves it makes sense to consider nuclear power as a possible solution even if building a nuclear power plant is a very costly enterprise. South Africa views its medium-term energy supply as coming in part from nuclear power (13.4% in 2030): Areva, Westinghouse Electric Company of the US, South Korea's Korean Electric Power Corporation, Moscow-based Rosatom Nuclear Energy State Corporation and Chinese interests are still competing for the contract to build another nuclear plant in the country.<sup>25</sup> Namibia is also considering diversifying its energy mix and is investigating the potential of the rest of the nuclear fuel cycle.<sup>26</sup> In Tanzania, Areva is looking into co-operation with Tanzanian authorities to build a nuclear power plant.<sup>27</sup> The Kenyan government has long been considering a regional nuclear power plant,<sup>28</sup> although already investing heavily in hydrothermal energy. In West Africa, Niger has expressed interest in regional co-operation to build an Economic Community of West African States – Ecowas – nuclear power plant.<sup>29</sup> Nigeria is also investigating nuclear power.<sup>30</sup>

### POLITICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS OF URANIUM MINING

Uranium mining in Africa has always been controversial due to political, economic, social and environmental impact. Long before the nuclear renaissance started in 2005,



non-governmental organisations (NGOs) began criticising Areva's relationship with local Tuareg communities in Niger, and Rio Tinto's impact on the environment and the people around its Rössing mine. Since then, however, attention to sustainable uranium mining and its effects has intensified sharply, especially given the significant contribution of mining investment to the economies of Africa's developing countries.

Governments allow and regulate exploration and extraction through legislation (mining codes and agreements with mining companies) and decide on the income the state should receive from mining operations through mining royalties, corporate income tax, and other means. National institutions such as ministries, commissions, and parliaments ensure that companies implement relevant policies and legislation. Government attitudes are key to attracting or deterring investment. Unsurprisingly, African countries such as Namibia, Niger and South Africa with a long mining history are much less lenient with mining companies than those in which uranium mining or exploration is very recent. For example, Niger is taking control of its uranium revenues progressively, partly by acquiring a 33% share in all mines.<sup>31</sup> By contrast, the development agreement between the government of Malawi and Paladin sets out advantageous conditions for the company through an ad-hoc reduction in all relevant tax rates, including corporate and resource rent tax, royalty rates and value added tax (VAT) on imports.<sup>32</sup>

The political consequences of uranium mining in Africa are threefold. First, African governments must draft or adapt relevant policy and legislation on mining, health, labour and the environment. This can be controversial, even if recommendations exist<sup>33</sup> and technical assistance is available.<sup>34</sup> The fact that Africa's uranium deposits are relatively shallow also means that African governments have less time than those of, say, Australia or Canada – where deposits are deeper – to prepare policy and legislation while a mine is being established. Secondly, although governments see taxes accruing from mining operations as a significant source of revenue, sections of the population do not always agree and may see foreign investment in uranium in Africa as exploitation of one of its most strategic minerals: In this context, Tanzanian members of parliament recently requested that policy and legislation on uranium mining ensure that the country benefits from exploration and extraction.<sup>35</sup> In fact, government interest in mining profits ('resource nationalism') is growing throughout the continent, as it is globally.<sup>36</sup> Thirdly, African countries lack the capacity to ensure that laws and agreements are fully respected in regard to uranium mining. Monitoring uranium mining requires great technical expertise and sufficient skilled staff to inspect mines and analyse reports regularly. Such capacity is lacking, even in South Africa, the continent's most developed economy.<sup>37</sup>

Given that uranium is the main element needed for nuclear weapons, the security implications of uranium mining and production are a further political consideration. All African countries that produce, or could produce, uranium are party to the Nuclear Non-Proliferation Treaty (NPT). They have also concluded the Comprehensive Safeguards Agreement (necessary to ensure compliance with the NPT) with the International Atomic Energy Agency (IAEA), and signed the Additional Protocol, which gives the IAEA further inspection powers. All have signed – although not all have ratified – the 1996 African Nuclear-Weapons Free Zone Treaty (the Treaty of Pelindaba) which came into effect in 2009. Malawi is not party to the IAEA Convention on the Physical Protection of Nuclear Material while only South Africa is party to the conventions on the Safety of Spent Nuclear Fuel and the Safety of Radioactive Waste Management. Those conventions are crucial

to the safe management – that is, disposal, transport, health and environment controls, and so on – of uranium. Namibia is not party to the UN International Convention for the Suppression of Acts of Nuclear Terrorism.<sup>38</sup> All these instruments are relevant in the context of alleged attempts by Iran, under international sanctions because of suspected military nuclear activities, to acquire uranium from the DRC<sup>39</sup> and its expressed interest in Zimbabwe's reserves.<sup>40</sup> In Namibia, where Iran holds a 15% share in the Rössing mine, proliferation is not an issue insofar as the Iranian government has access only to the mine's profits and not the uranium itself. (For relevant conventions see Annex II.)

In all African uranium-producing countries barring South Africa, uranium mining revenues represent a considerable share of gross domestic product (GDP) and are set to increase. In 2008, 4% of Namibia's GDP came from uranium mining; a figure that could increase to 13% in 2015.<sup>41</sup> Malawi's total government revenues in 2010 were about \$1.12 billion, of which \$1.6 million (1%) came from uranium mining.<sup>42</sup> Mining companies also provide thousands of jobs. In Niger, Areva's payroll totalled 4 950 in 2010<sup>43</sup> and the company claims to have created 10 000 jobs in all.<sup>44</sup> Furthermore, either through contributions to government budgets or direct investments from the industry, uranium mining often improves local infrastructure. In the CAR Areva intends to invest in roads, health and education facilities and electricity supply, although whether or not all these investments materialise and directly benefit the population remains to be seen.<sup>45</sup>

The economic impact of uranium mining is controversial, however, precisely because most African countries are at a relatively early stage of development. Niger stands at 186 out of 187 on the UN Development Programme Human Development Index and even South Africa ranks only at 123.<sup>46</sup> Revenues from uranium mining depend on market price, and governments are exposed to price fluctuations. At the moment the uranium market price is stable around \$115/kg, despite the Fukushima catastrophe. Global demand for nuclear power should result in price stability but another accident that might affect uranium prices and, therefore, government revenues from uranium mining cannot be excluded. Most single commodity-dependent economies are grappling with similar issues of how to manage potential commodity price fluctuations.<sup>47</sup>

Furthermore, the transparency of financial flows from mining companies to the host country can be a source of concern for civil society. Neither companies nor governments publish mining agreements and the industry is free to decide which financial information it shares with the public. Niger, the only African country compliant with the World Bank's Extractive Industries Transparency Initiative (EITI), has published revenues from uranium mining for 2007–2009.<sup>48</sup> In spite of the attention uranium mining attracts, some companies choose to share hardly any information. The same companies that create employment sometimes also drastically reduce payrolls when investments are too high or profits too low, as did First Uranium in South Africa in December 2011.<sup>49</sup> African countries in which uranium mining is taking place, or might take place, have economic redistribution policies but not the capacity to ensure the population benefits from the resultant income stream. NGOs also criticise governments for corruption. Overall, however, it is fair to say that African parliaments are becoming more aware of the need to monitor the national economic impact of uranium mining.<sup>50</sup>

The social impact, however, arouses much debate among experts. All countries have health and labour laws that mining companies must obey, and possess more (South Africa) or less (CAR) powerful mining unions. Mining is a dangerous activity; and

certain companies openly report deaths on mines. Uranium miners are naturally exposed to radiation, which can cause cancer. Mining companies tend to respect international standards against radiation and their dose limits for employees and the public,<sup>51</sup> and sometimes use stricter standards than those laid down: in 2010 only one worker at the Rössing mine was exposed to more than ten millisieverts (mSv: the international standard unit of radiation dosage) and anyone exposed to more than 5mSv in one year is closely monitored.<sup>52</sup>

Yet in Africa only the industry itself is capable of monitoring the social impact of uranium mining. National and local governments do not have the medical resources to check whether or not radiation standards are being respected, or if illnesses are treated adequately by mining companies' medical staff. When uranium was discovered in drinking water in the Bahi District in the Dodoma Region and Manyoni in the Singida Region in Tanzania, where Uranex is exploring, the government acknowledged that it had inadequate resources to address the issue.<sup>53</sup>

Mining companies also have corporate social responsibility programmes on health or education: in South Africa, AngloGold Ashanti runs health programmes against HIV/Aids and tuberculosis<sup>54</sup> and First Uranium has an Adult Basic Education and Training Programme that benefits employees and non-employees.<sup>55</sup> Companies do not, however, always deliver on their promises regarding social responsibility: for example, Namibians of the Erongo Region recently complained that Areva was the only mining company in the area that responded to a call to support local development initiatives.<sup>56</sup>

Furthermore, uranium mining can be a source of conflict, as it is in Niger where Areva's activities became an excuse for the Al-Qaeda organisation in the Islamic Maghreb to kidnap seven of the company's employees, thereby causing significant delays in the construction of the new Imourarem mine.<sup>57</sup>

Uranium mining in Africa can have serious environmental consequences. Uranium becomes more radioactive after it is separated from its ore. If released into the environment, some of the atoms involved (for example, radium-226 with a 1 600 year half-life) can last for thousands of years. Namibia's 'Uranium Rush' environmental assessment' lists three cumulative impacts of uranium mining that appear to be valid for the rest of the continent: they are 'deterioration of water quantity and quality for biodiversity and ecosystem functioning; habitat loss, degradation and fragmentation caused by mines and infrastructure; [and] threats to specific plants and animals'.<sup>58</sup>

Governments of those African countries in which uranium mining takes place, or could take place, have specialised institutions for environmental protection and all require that mines undertake environment management plans (EMP) and environmental impact assessment (EIA). Uranium mining companies in Africa are under close scrutiny from international and local civil society organisations in the context of environmental protection. The idea of sustainability is gaining ground as interest in uranium grows, which has prompted the African uranium mining industry to explain its policy on the environment surrounding the mines. Many mines are certified to standards laid down in ISO 14001,<sup>59</sup> which encourages companies to set environment management standards and goals that auditing firms monitor, and several are members of the International Council on Mining and Metals (ICMM), established in 2001 by 18 leading mining companies 'to improve sustainable development performance in the mining and minerals industry'.<sup>60</sup> Uranium mining companies seeking to improve their environmental management image

set even more ambitious standards: Rio Tinto has its own biodiversity strategy and aims 'to have a 'Net Positive Impact' on biodiversity'.<sup>61</sup>

In practice, however, uranium mining has a considerable impact on Africa's environment. Governments sometimes care more about the income generated from mining operations than about the environment in which those operations take place; and African governments generally lack the institutional capacity to implement adequately legislation and regulations on uranium mining. For their part, communities are sometimes unaware of the potentially negative effect of uranium mining waste on the environment and on their livelihood; for example in 2010, farmers in South Africa requested information to establish whether uranium mining had contaminated their produce but received no response from government.<sup>62</sup> Similarly, the reasons for granting an exploitation licence to a particular company are sometimes obscure and NGOs, experts and local communities find it difficult to bring about change to processes they consider flawed.<sup>63</sup> The Namibian environmental lobby, for example, does not have the capacity to contribute actively to reviewing EIAs<sup>64</sup> and experts and local communities in Malawi have expressed concern over the validity of Paladin's EIA.<sup>65</sup>

It is possible for companies to offset carbon emissions from their mining operations; Areva, for example, buys carbon credits to fund environmental and regional development projects in India.<sup>66</sup> Yet the people whose environment is affected by mining operations rightly claim that the positive impacts of such projects in another country or region do not address or offset the local environmental issues that arise directly from mining activity.

## INTERNATIONAL, AFRICAN AND INDUSTRIAL BEST PRACTICES.

The challenges of uranium mining are not peculiar to Africa. Canada and Australia have long been confronted with its political, economic, social and environmental consequences. There is still much controversy surrounding the industry's activities. For example, tailings from Ranger Uranium Mine in Australia's Kakadu National Park have been leaking underground since 1981.<sup>67</sup> Important and powerful anti-uranium mining movements exist in Canada, where the Campaign for Nuclear Phaseout brings together 300 public interest groups<sup>68</sup> and in Australia, where the Labour Party is sceptical about uranium mining and several provinces have banned it altogether.

Given their considerable experience in uranium mining and its consequences, Australia and Canada have developed best practices to limit negative effects. Politicians seem as aware of possible damage to human health and the environment caused by uranium mining, as they are conscious of its economic benefits. Extensive legislation and regulations exist that cover all aspects of uranium mining, from royalties to corporate social responsibility (CSR). Canada and Australia's federal and provincial authorities are able to implement uranium mining-related policies and legislation, and possess the expertise to monitor the health and environmental impact of mining activity. In both countries the public is actively engaged in debate, while mining companies are themselves attentive to the concerns employees express through their trade unions. NGOs also have sufficient knowledge and influence to bring issues to the right ears.<sup>69</sup>

There are documented examples of good practice with regard to uranium mining in Australia and Canada. In Canada's uranium-rich Saskatchewan province, a series of

measures raised public confidence in uranium mining in the province from 10% in 1977 to 87% in 2003.<sup>70</sup> The process included broad public consultation through tripartite planning – involving the industry, governments and local communities – the creation of environmental quality committees, and the negotiation of an impact management agreement between the industry and communities (addressing environmental protection and compensation; employment, training and business development opportunities; and benefits sharing). In Australia, public consultation mechanisms are institutionalised, in that nuclear activities are regarded as a topic of ‘National Environmental Significance’. BHP Billiton’s Olympic Dam operations has an advanced outreach programme that includes newsletters, communication with pastoralists in the area ‘to discuss issues of concern, such as water management and uranium production’,<sup>71</sup> efforts to ensure that the public, NGOs and tourists visit the site, and published environmental information and incidents.<sup>72</sup>

Apart from Australia and Canada, various international guides to best practices for uranium mining are available. In 2008 the UK-based World Nuclear Association (WNA)<sup>73</sup> published a policy document on ‘Sustaining Global Practices in Uranium Mining and Processing’<sup>74</sup> for the uranium mining industry. All WNA members (more than 150 entities accounting for 85% of global uranium mining production, including Areva, AngloGold Ashanti, Paladin, Rio Tinto and Uranium One) subscribe to this document, which propounds 11 principles: They deal with:

- adherence to sustainable development;
- health, safety and environmental protection;
- compliance with conventions, laws, regulations and requirements;
- social responsibility;
- managing hazardous materials;
- employing a recognised quality management system;
- accidents and emergencies;
- transporting hazardous materials;
- adopting a systematic approach to training;
- ensuring the security of sealed radioactive sources and nuclear substances; and
- decommissioning and site closure.<sup>75</sup>

The same companies and organisations adhere to a charter of ethics<sup>76</sup> and principles of uranium stewardship.<sup>77</sup> Furthermore, the 21 ‘leading mining and metals’ member companies of the ICMM, as well as 31 national and regional mining associations and global commodity associations, implement a sustainable development framework based on 10 general sustainable development principles,<sup>78</sup> report on their implementation publicly,<sup>79</sup> and ‘obtain independent third party assurance of their sustainability performance’.<sup>80</sup> Since 2009 the ICMM has itself assessed this performance.<sup>81</sup>

Encompassing government, private sector and civil society, the EITI offers information and recommendations to challenges linked to the economic management of mineral resources, including uranium.<sup>82</sup> It covers policy, payments, redistribution and stakeholder engagement. The African press is increasingly interested in EITI reports, though as yet, little of this reporting concerns uranium mining. As previously mentioned, of the four current African uranium producers, only Niger is fully EITI-compliant.<sup>83</sup> It is important

that more uranium-rich African countries become involved with the EITI. Mining companies can also choose to support the EITI (among other things they would then publish details of their payments to government) as most major, established uranium mining companies, including AngloGold Ashanti, Areva and Rio Tinto already do.<sup>84</sup> It is to be hoped that companies from emerging-country miners in African uranium, such as Guangdong Nuclear Power, will follow suit.

As the global umbrella organisation for co-operation in the peaceful uses of nuclear energy, the IAEA has also developed recommendations for uranium mining, including the reference text 'Best Practice in Environmental Management of Uranium Mining'.<sup>85</sup> The IAEA recognises that recommendations need to be adapted to local circumstances. Nevertheless, its document provides useful general principles for sustainable uranium mining, including working towards sustainable development; keeping worker exposure to radiation as low as is 'reasonably achievable'; and anticipating, preventing and correcting the causes of environmental degradation.<sup>86</sup> It also suggests a detailed method for sustainable uranium mining (baseline data collection; public and other stakeholder involvement; impact assessment; risk assessment; operational design; operations; waste management; and closure).<sup>87</sup> Furthermore, in 2010 the IAEA spent \$30 million on its technical co-operation programme,<sup>88</sup> which spans a range of issues from technical projects on waste management<sup>89</sup> to political projects, assisting countries to update their legislation on uranium mining.<sup>90</sup>

### **Building on existing good practices**

Although no single African government holds the key to sustainable uranium mining on the continent, several of them follow good practices that can be adapted to situations in which uranium mining is taking place. On political issues, South Africa has by far the largest array of laws, regulations and institutions.<sup>91</sup> In the economic sphere the government of Niger has managed to renegotiate mining contracts with Areva, issue new mining licences and reserve the right to sell part of the uranium produced in Nigerien mines.<sup>92</sup> It is clear, however, that although there is interest from African parliaments and civil society in uranium mining, capacity lies mostly with the industry and not with governments.

The African Union's African Commission on Nuclear Energy (Afcone) was created in May 2011 as a direct result of the Pelindaba Treaty, which establishes Africa as a nuclear weapons-free zone. One of Afcone's objectives is to promote co-operation in the peaceful, safe and secure uses of nuclear science and technology.<sup>93</sup> There is nothing to stop this aim being interpreted as also applying to uranium mining. Afcone is being put together in South Africa<sup>94</sup> but is not yet completely operational and although the Pelindaba Treaty is in force, not all African countries have ratified it.<sup>95</sup> Similarly, the Forum for Nuclear Regulatory Bodies in Africa, launched in 2009, gathers nuclear regulatory bodies from 31 African countries for technical discussions on issues related to peaceful nuclear applications.<sup>96</sup>

In essence, good practice in uranium mining in Africa comes mostly from three mining companies: Rio Tinto in Namibia, AngloGold Ashanti in South Africa, and Areva in Niger, Namibia and the CAR. All three companies seem to make an effort to make sure the economic, social and environmental impacts of their activities are positive. For

example, 3% of the pre-tax profits of Rössing Uranium Ltd go to the Rössing Foundation on local development<sup>97</sup> and the company implements detailed environment-protection policies.<sup>98</sup> For its part, AngloGold Ashanti has extensive labour policies complementing South African legislation, including compensation following the death of an employee, programmes to reduce occupational diseases, improving local hospitals, fighting HIV/Aids and tuberculosis, and, of course, monitoring and reporting worker exposure to radiation.<sup>99</sup> Areva undertakes social development projects in areas neighbouring its Arlit and Akikan mines.<sup>100</sup>

## CONCLUSION

Uranium from Africa currently represents almost one fifth of global production but could be far more, given the reserves on the continent. Although uranium mining in Africa is not new, it is attracting attention and investment from non-traditional (for which read ‘non-Western’) partners, including China. As the world becomes increasingly interested in nuclear power, Africa’s untapped and accessible uranium resources appear more and more attractive. Furthermore, there are various concrete and hypothetical projects to build nuclear reactors in African countries, which could make the continent’s uranium resources even more appealing.

Uranium mining in Africa is, however, riddled with challenges. At a political level, laws and regulations are not adapted to uranium mining, and even if they were, institutions would not have the capacity to ensure adequate implementation by mining companies. The latter’s economic contribution to African GDP can be compromised by a lack of financial transparency, doubts regarding local benefits and the risk of corruption. Uranium mining affects local communities through labour policies – including sporadic hiring and firing – and detrimental effects on the health of workers over-exposed to uranium’s intrinsic risks. If not properly managed, it can have devastating consequences for local ecosystems and biodiversity. Taken as a whole, the industry is far more powerful than either government or civil society; hence sustainability depends heavily on a mining company’s goodwill. This situation is far from ideal.

Best practices exist in countries such as Australia and Canada, where institutions are stronger and laws and regulations match the issues. Companies mining uranium in Africa can also follow international sustainable guidelines from organisations to which they belong, such as the WNA. The IAEA promotes its own set of best practices in uranium mining, but perhaps closer to Africa’s current challenges are the examples set by Rio Tinto, AngloGold Ashanti and Areva in overcoming specific issues, related mainly to health, labour and the environment, in their mines in Namibia, Niger and South Africa respectively

Company practices differ from one to another; African governments’ capacities to monitor uranium mining vary; countries in which uranium mining takes place are at contrasting stages of development; ecosystems and biodiversity around uranium mines are never the same. Yet it is likely that African governments and civil society will remain relatively weak and that mining companies will remain relatively independent in the governance of uranium mining for years to come. This also applies to companies exploring Africa for uranium and future extraction activities. Pressure on companies to develop



CSR programmes and increase transparency in their activities will, however, probably encourage some new and future uranium mining companies to look at best practices and implement those they consider appropriate.

Ultimately, uranium mining in Africa is a development issue. Clearly, stronger and more transparent institutions are needed to balance the influence of mining companies. Until this happens, however, civil society experts can play a useful role in bringing pressing issues to government attention. Some already do so and specialised NGOs on labour, health and environment are active in their respective domains. There does not, however, seem to be a coherent, organised, uranium mining NGO lobby that could assist and advise African governments on scientific, economic, social and environmental issues. Such co-ordination would be the more likely if African governments were readier to include civil society in uranium mining oversight processes such as commenting on EIAs, but this would need them to acquire an understanding of which constituency each NGO represents. Lastly, uranium mining issues would greatly benefit from closer attention from general media, rather than only from industry specialist or business publications.

The international community could also pay more attention to African uranium mining. Sufficient guidelines exist on sustainable uranium mining for African countries to establish basic standards and practices, for both uranium mining companies (eg ICMM) and for general mining frameworks (eg IAEA best practice). Reporting on implementation of these guidelines is incomplete, however, when in fact it might give governments, civil society, the media and citizens a good idea of a mine's basic operating standards. IAEA member states ought to encourage the organisation to take a closer look at ways to best ensure that African governments take an appropriate level of interest in the positive and negative impacts of uranium mining. IAEA's technical co-operation projects could be a useful tool in this regard and sufficient funding for it should be made available.

Afcone is another source of advice and information for governments on pressing issues regarding uranium mining. That Afcone is multilateral should give it considerable legitimacy and authority. Initially, Afcone will have little staff because it has still to assess how many requests for information or technical advice governments are likely to submit. Nevertheless, it will stand as a high-level political forum for African leaders to discuss issues related to nuclear energy, including uranium mining. Considering the specifics of uranium mining on the continent and the capacity-related challenges governments face, this is not to be taken for granted. At a more technical level, there is no reason why Afcone should not put relevant government departments and technical experts in touch with each other. Eventually, it may even have the capacity to provide governments with expertise and advice directly upon request. Of course, it will need adequate funding to perform such tasks adequately.

Uranium mining in Africa is set to increase gradually. There is no reason why in doing so it should not benefit industry and governments alike.



## ANNEX I

AFRICA'S SHARE OF GLOBAL URANIUM PRODUCTION  
AND RESERVES <sup>101</sup>**Table 1 Global uranium production, 2010**

Country	Production (tU)	Percentage of total
Kazakhstan	17 803	33
Canada	9 783	18
Australia	5 900	11
<b>Namibia</b>	<b>4 496</b>	<b>8</b>
<b>Niger</b>	<b>4 198</b>	<b>7.8</b>
Russia	3 562	6
Uzbekistan	2 400	4
United States	1 660	3
Ukraine	850	1.5
China	827	1.5
<b>Malawi</b>	<b>670</b>	<b>1.2</b>
<b>South Africa</b>	<b>583</b>	<b>1</b>
India	400	0.7
Czech Republic	254	0.4
Brazil	148	0.2
Romania	77	0.1
Pakistan	45	0.08
France	7	0.01
<b>Africa total</b>	<b>9 947</b>	<b>18</b>
<b>World total</b>	<b>53 663</b>	<b>100</b>

Note: percentages calculated by the author and are not exact.

Source: World Information Service on Energy Uranium Project, Uranium Maps, <http://www.wise-uranium.org/umaps.html>, accessed 15 January 2012.

**Table 2 Identified resources 2010 at less than \$80/kg**

<b>Country</b>	<b>Resources (tU)</b>	<b>Percentage of total</b>
Australia	1 612 000	43
Kazakhstan	475 500	13.7
Canada	447 400	12
<b>South Africa</b>	<b>232 900</b>	<b>6.2</b>
Brazil	231 300	6.1
Russia	158 100	4.2
China	150 000	4
Jordan	111 800	3
Uzbekistan	86 200	2.3
<b>Niger</b>	<b>73 400</b>	<b>2</b>
Ukraine	53 600	1.4
Mongolia	41 800	1.1
US	39 000	1
Argentina	11 400	0.3
<b>Malawi</b>	<b>8 100</b>	<b>0.2</b>
Portugal	4 500	0.1
Spain	2 500	0.06
<b>Namibia</b>	<b>2 000</b>	<b>0.05</b>
Czech Republic	500	0.01
<b>Africa total</b>	<b>316 000</b>	<b>8.5</b>
<b>World total</b>	<b>3 741 900</b>	<b>100</b>

Note: percentages calculated by the author and are not exact.

Source: World Information Service on Energy Uranium Project, Uranium Maps, <http://www.wise-uranium.org/umaps.html>, accessed 15 January 2012.

**Table 3 Identified resources 2010 at less than \$130/kg**

Country	Resources (tU)	Percentage of total
Australia	1 673 000	31
Kazakhstan	651 800	12
Canada	485 300	9
Russia	480 300	8.8
<b>South Africa</b>	<b>295 600</b>	<b>5.4</b>
<b>Namibia</b>	<b>284 200</b>	<b>5.2</b>
Brazil	278 700	5.1
<b>Niger</b>	<b>272 900</b>	<b>5</b>
US	207 400	3.8
China	171 400	3.1
Uzbekistan	114 600	2.1
Jordan	111 800	2
Ukraine	105 000	1.9
India	80 100	1.4
Mongolia	49 300	0.9
<b>Algeria</b>	<b>19 500</b>	<b>0.3</b>
Argentina	19 100	0.3
<b>Malawi</b>	<b>15 100</b>	<b>0.2</b>
<b>CAR</b>	<b>12 000</b>	<b>0.2</b>
Spain	11 300	0.2
Sweden	10 000	0.2
Slovenia	9 200	0.2
Turkey	7 300	0.1
Portugal	7 000	0.1
Romania	6 700	0.1
Japan	6 600	0.1
<b>Gabon</b>	<b>4 800</b>	<b>0.08</b>
Indonesia	4 800	0.08
Italy	4 800	0.08
Peru	2 700	0.05
Finland	1 100	0.02
Czech Republic	500	0.001
France	100	0.0002
<b>Africa total</b>	<b>884 600</b>	<b>16.3</b>
<b>World total</b>	<b>5 404 000</b>	<b>100</b>

Note: percentages calculated by the author and are not exact.

Source: World Information Service on Energy Uranium Project, Uranium Maps, <http://www.wise-uranium.org/umaps.html>, accessed 15 January 2012.

**Table 4 Identified resources 2010 at less than \$260/kg**

Country	Resources (tU)	Percentage of total
Australia	1 679 000	26.6
Kazakhstan	832 100	13.2
Russia	566 300	9
Canada	544 600	8.6
US	472 100	7.4
<b>South Africa</b>	<b>295 600</b>	<b>4.6</b>
<b>Namibia</b>	<b>284 200</b>	<b>4.5</b>
Brazil	278 700	4.4
<b>Niger</b>	<b>275 500</b>	<b>4.3</b>
Ukraine	223 600	3.5
China	171 400	2.7
Uzbekistan	114 600	1.8
Jordan	111 800	1.7
Denmark	85 600	1.3
India	80 100	1.2
Mongolia	49 300	0.7
<b>Tanzania</b>	<b>28 400</b>	<b>0.4</b>
<b>Algeria</b>	<b>19 500</b>	<b>0.3</b>
Argentina	19 100	0.3
<b>Malawi</b>	<b>15 100</b>	<b>0.2</b>
<b>CAR</b>	<b>12 000</b>	<b>0.2</b>
Spain	11 300	0.2
Slovakia	10 300	0.2
Sweden	10 000	0.2
Slovenia	9 200	0.1
France	9 100	0.1
Hungary	8 600	0.1
Somalia	7 600	0.1
Turkey	7 300	0.1
Germany	7 000	0.1
Greece	7 000	0.1
Portugal	7 000	0.1
Romania	6 700	0.1
Japan	6 600	0.1
Vietnam	6 400	0.1

Country	Resources (tU)	Percentage of total
Italy	6 100	0.1
Indonesia	6 000	0.1
<b>Gabon</b>	<b>5 800</b>	<b>0.1</b>
<b>Democratic Republic of Congo</b>	<b>2 700</b>	<b>0.04</b>
Peru	2 700	0.04
Iran	2 100	0.03
<b>Egypt</b>	<b>1 900</b>	<b>0.03</b>
Mexico	1 800	0.03
Chile	1 500	0.02
<b>Zimbabwe</b>	<b>1 400</b>	<b>0.02</b>
Finland	1 100	0.01
Czech Republic	500	0.008
<b>Africa total</b>	<b>928 300</b>	<b>14.7</b>
<b>World total</b>	<b>6 306 300</b>	<b>100</b>

Note: percentages calculated by the author and are not exact.

Source: World Information Service on Energy Uranium Project, Uranium Maps, <http://www.wise-uranium.org/umaps.html>, accessed 15 January 2012.

## ANNEX II

**AFRICAN COUNTRIES WITH ACTUAL OR POTENTIAL URANIUM  
RESOURCES: COMPLIANCE WITH THE NUCLEAR  
NON-PROLIFERATION REGIME**

	Nuclear Non-Proliferation Treaty	African Nuclear-Free Zone Treaty (signed/ratified)	Convention on the Physical Protection of Nuclear Material	Joint Convention on the Safety of Spent Nuclear Fuel and on the Safety of Radioactive Waste Management	International Convention for the Suppression of Acts of Nuclear Terrorism	International Atomic Energy Agency
Botswana	X	Signed	X			X
CAR	X	Signed	X		X	X
DRC	X	Signed	X		X	X
Gabon	X	Signed	X	X	X	X
Guinea	X	Ratified	X		X <sup>102</sup>	X
Malawi	X	Signed			X	X
Mali	X	Ratified	X		X	X
Mauritania	X	Ratified	X	X	X	X
Namibia	X	Signed	X			X
Niger	X	Signed	X		X	X
Somalia	X	Signed				
South Africa	X	Ratified	X	X	X	X
Tanzania	X	Signed	X			X
Zambia	X	Signed				X
Zimbabwe	X	Ratified				X

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102 Signed, not ratified.







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