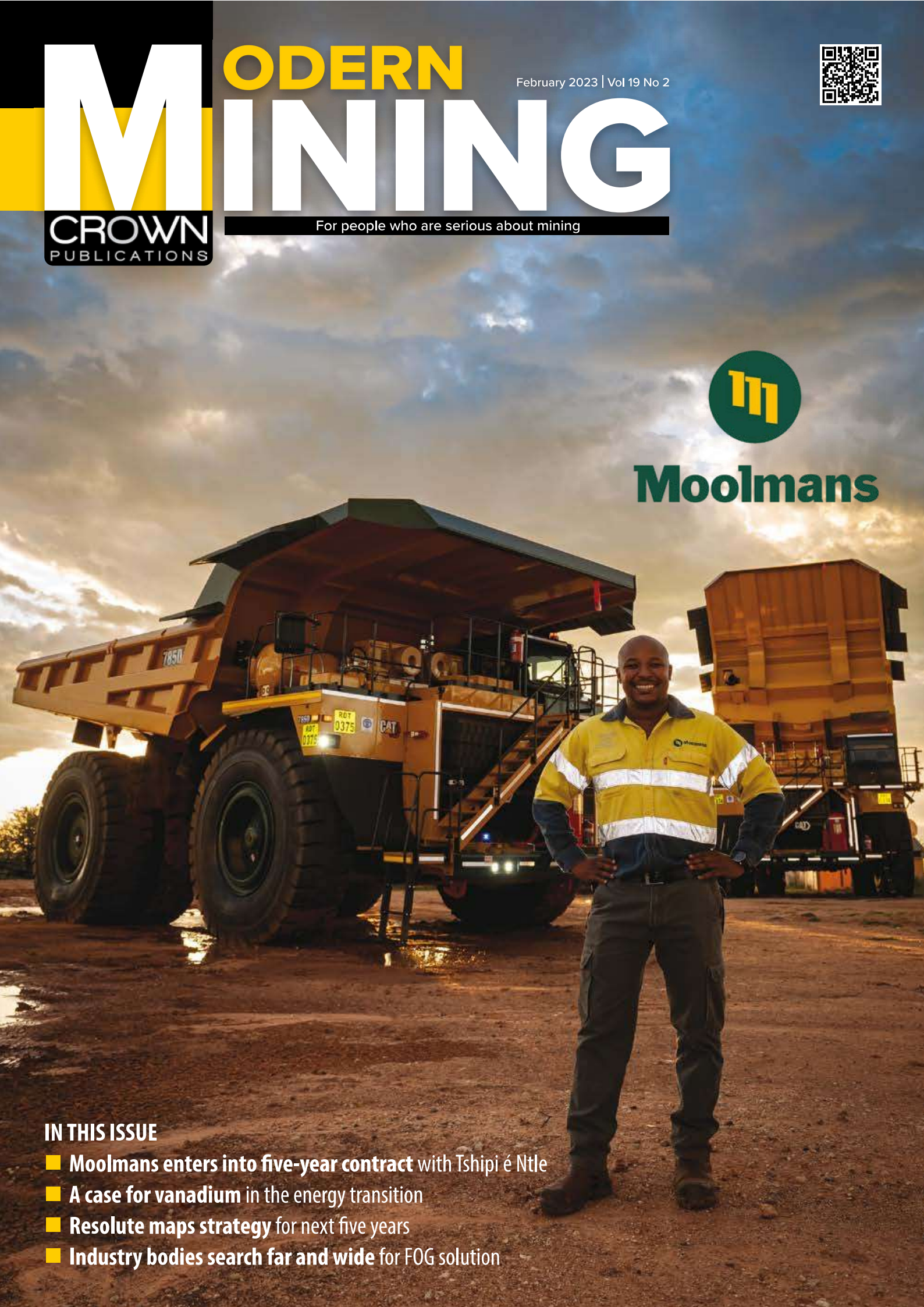
CROWN PUBLICATIONS

MODERN MINING

February 2023 | Vol 19 No 2

For people who are serious about mining



IN THIS ISSUE

- **Moolmans enters into five-year contract** with Tshipi é Ntle
- **A case for vanadium** in the energy transition
- **Resolute maps strategy** for next five years
- **Industry bodies search far and wide** for FOG solution

Critical Minerals outlook

By Alana van Wouw, market analyst at Crane Ridge

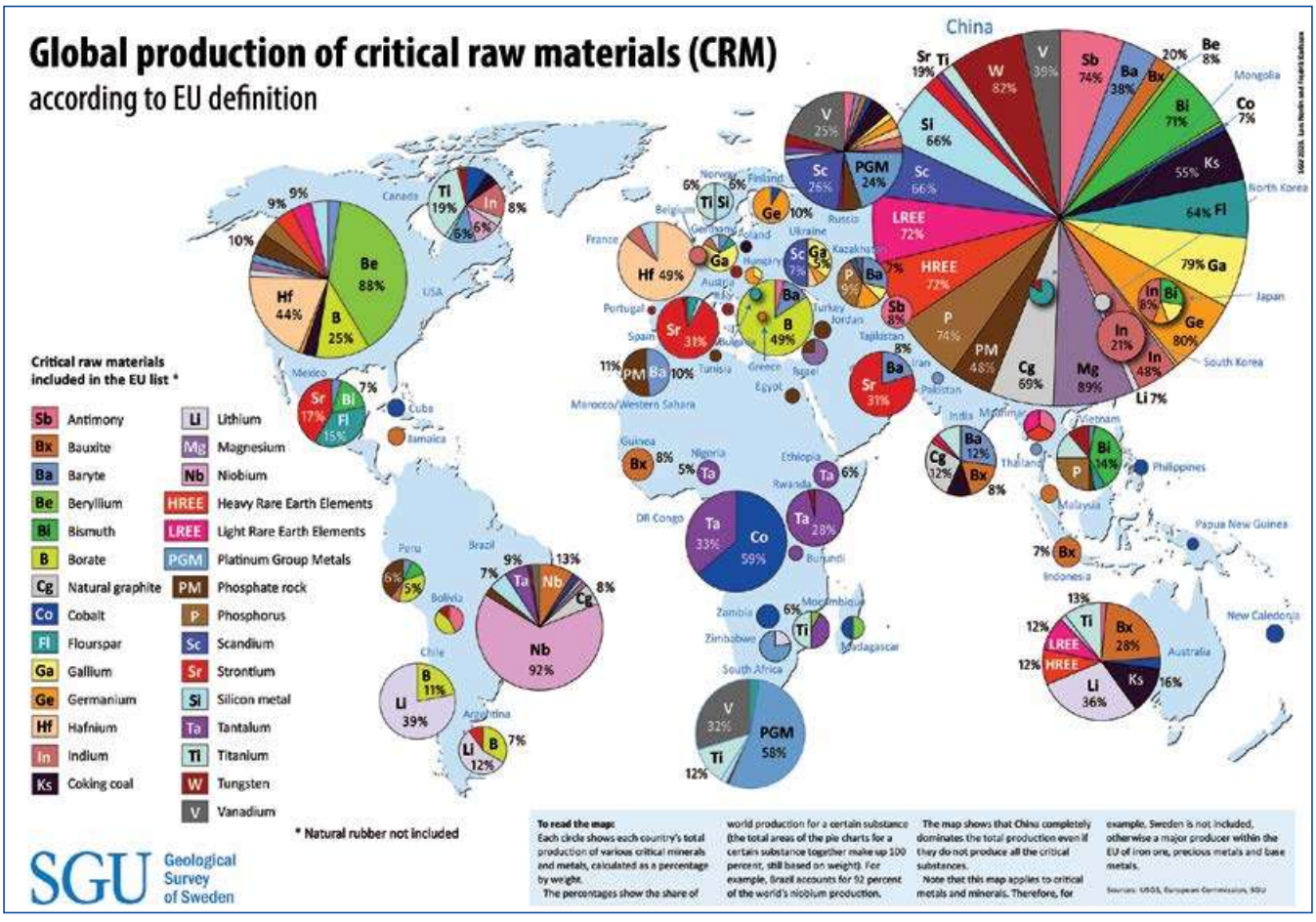
Fashionable as it may be to talk about critical metals in a world migrating towards a clean-energy future it is equally important to ask why some metals are considered critical and others not. A critical metal is one that is essential to produce a critical technology, such as for energy, defence, aerospace or medical technologies. These metals are usually rare and are needed in large quantities, often in the form of alloys, to produce products.

Knowing what is genuinely critical in an economic sense, and not simply rare with limited economic value, could save industries from wasting time and money looking for metals that may not have a big future market.

The critical label applied to some metals can be confusing because scarcity could reflect a situation where demand is so small that there is little incentive to explore for more – but when the hunt does start the scarcity factor fades.

Lithium is a classic case of a metal that had a small market a few years ago when it was mainly used in making glass, ceramics and as a lubricant – and even as a medicine to treat bipolar disorder. But the discovery of its use in batteries – particularly for electric vehicles and other renewable energy applications – has made it a critical metal.

In the case of lithium, geologists and miners need to understand the expected future demand for the metal, which could be very different from what it is today.



Global production of critical raw materials.

Above: Africa has experienced a surge in exploration for critical energy metals.

Centre: Africa is estimated to hold around 10% of global proven and potential reserves of key minerals.

Overall, lithium is an incredibly important metal for the future of energy storage and electric vehicles, but it is not the only metal that is important in this transition. Other metals, such as cobalt, nickel and rare earth elements, are also essential for renewable energy and other applications, and their availability and sustainability must be addressed. By understanding what is critical, industries can be better prepared to meet the needs of a changing economy.

The demand for these metals is expected to increase significantly in the coming years as the world transitions to a low-carbon economy. To ensure there is sufficient supply to meet the growing demand, it is important to promote responsible mining practices, develop recycling and reuse technologies, and ensure that the use of these metals is done in a way that does not harm the environment or local communities. Additionally, it is important to ensure that these metals are priced in a way that reflects their true value, and to promote public-private partnerships to develop new sources of supply.

Critical minerals outlook - The market for rare earth elements

In reality the market for rare earths and other critical metals is far more complex than it appears at first glance. China is the dominant producer of rare earths and other critical metals but it does not control the market, which is highly fragmented with many players and sources of supply. There are, for example, some rare earth deposits outside of China in Australia, India, the United States, Canada, South Africa and elsewhere, some of which are already in production. There is also significant demand for rare earths and other critical metals from other major consumers such as Japan, South Korea and Europe, who are looking for alternative sources of supply. Finally, the development of recycling and substitution technologies could also reduce the demand for rare earths and other critical metals over the long term. In short, although China is the dominant supplier of rare earths and other critical metals, the market is far from controlled by China. This means that other countries and companies can compete for market share and that the supply of rare earths and other critical metals is unlikely to be disrupted by Chinese policies or other geopolitical developments.

Critical minerals - Copper and nickel global demand grows

Copper's role in energy efficiency is just as important as its role in energy generation. Wiring and cabling made of copper are more efficient than those made of other materials, and they are also more reliable. Copper wiring has a much lower resistance to electricity, allowing for lower losses and higher efficiency. In addition, copper is much more durable than other materials, which means it can withstand the harsh conditions of power plants and substations for longer periods of time. Copper further has the ability to dissipate heat more quickly, which is important for the safe operation of electrical equipment.

Copper is also a key component of renewable energy sources such as solar panels, wind turbines and geothermal systems. It is used in the wiring and cabling of solar panels and wind turbines, as well as in the heat exchangers and pumps of geothermal systems. In addition, copper is used in the production of batteries for electric vehicles and in the construction of charging stations. With the increasing importance of renewable energy sources for electricity generation, the demand for copper is also expected to increase. For example, the ICA

Overall, lithium is an incredibly important metal for the future of energy storage and electric vehicles, but it is not the only metal that is important in this transition. Other metals, such as cobalt, nickel and rare earth elements, are also essential for renewable energy and other applications, and their availability and sustainability must be addressed.

New metal production can be more sustainable by taking an environmental approach.

The Global Critical Metals Road Map is a comprehensive effort to ensure access to strategic and critical materials for the world's growing demand for clean energy, sustainable transportation, and green technology.

estimates that the demand for copper for renewable energy applications may quadruple by 2035.

Critical minerals - Environmental cost of new metal production with low-emission energy generation

The environmental cost of new metal production with low-emission energy generation is dependent on the type of energy generation being used. For example, if renewable energy sources are used, such as solar, wind or hydroelectric, the environmental costs are much lower than if fossil fuels, such as coal or natural gas, are used. Renewable energy sources are generally more sustainable and produce fewer emissions than fossil fuels. In addition, many of these renewable energy sources require far less land and water to produce power. The use of renewable energy sources also helps to reduce air and water pollution associated with metal production. Finally, the use of renewable energy sources helps to reduce the amount of global warming potential associated with metal production, as these sources produce far less carbon dioxide emissions than traditional fossil fuels.

New metal production can be more sustainable by taking an environmental approach. This involves implementing measures such as energy efficiency, emissions reduction, cleaner production and resource recovery, as well as investing in renewable energy sources. Additionally, companies should ensure that their production processes adhere to environmental standards, such as those set out in the UN Global Compact. By taking these steps, metal production can become more sustainable and help to reduce its environmental impact.

Critical minerals outlook – Global critical energy-metals roadmap

Globally there are currently five countries that have a Global Critical Metals Road Map: The United States, Japan, Canada, the European Union and Australia. Each of these countries has its own critical metals road map, which outlines the steps needed to secure a sustainable supply of critical metals.

The Global Critical Metals Road Map is a comprehensive effort to ensure access to strategic and critical materials for the world's growing demand for clean energy, sustainable transportation, and green technology. The Road Map provides a framework for governments, industry and other stakeholders to collaboratively develop policies and strategies that will ensure an accessible and secure supply of these essential materials.

The Road Map focuses on both the short-term and long-term needs of the global critical metals industry and provides a blueprint for the development of a secure, responsible and sustainable supply chain. The Road Map outlines the steps needed to secure a reliable supply of these metals and outlines best practices in exploration, extraction, recycling and distribution.

The Road Map also identifies areas of research that should be pursued in order to develop a secure and sustainable supply of critical metals. Finally, the Road Map outlines the potential for public-private partnerships, and the need for increased international collaboration and coordination.

Overall, the Global Critical Metals Road Map provides a holistic approach to securing the future of the global critical metals industry. By providing a road map for governments, industry, and other stakeholders to collaborate, these Road Maps ensure that the world's growing demand for critical metals can be met in a responsible, sustainable and secure manner.

Critical minerals outlook – Africa needs to create a critical energy-metals road map

Africa is abundant in many critical minerals that are essential for a range of industries, including energy, automotive, electronics and telecommunications. However, the continent is not currently exploiting its potential as a supplier of these minerals.

In order to unlock the potential of Africa's critical mineral resources, there is a need to develop a comprehensive strategy and road map. This road map

should outline the steps necessary to identify and develop mining sites, secure necessary infrastructure, and technology, and ensure that the benefits of the mining activities are shared among the different stakeholders.

The road map should also include strategies to ensure the safety and security of the mining operations, as well as measures to mitigate any potential environmental impacts.

In addition, the road map should include strategies to ensure the prosperity of local communities, particularly in terms of job creation, community and infrastructure investment.

Finally, the road map should include measures to ensure the effective utilisation of Africa's critical minerals. This should include policies to encourage the development of value-added processing facilities, as well as research and development to identify new uses for the minerals.

The availability of critical energy metals in Africa is an important factor in the development of the energy sector. These metals, including cobalt, nickel, vanadium and lithium, are essential for the production of batteries, renewable energy storage solutions, and other energy-related technologies.

As demand for these materials is increasing globally, the African continent is making efforts to increase its supply of these critical energy metals. In recent years, the Africa has experienced a surge in exploration and mining activities for critical energy metals.

For example, the Democratic Republic of Congo (DRC) is the world's leading producer of cobalt and is estimated to account for around two-thirds of global production. The DRC also hosts significant reserves of nickel, vanadium and lithium. Elsewhere in Africa, countries such as South Africa, Zimbabwe and Namibia also possess significant reserves of critical energy metals. In addition to exploration and mining activities, some African countries are also exploring other sources of critical energy metals. For example, Ghana and Angola are looking into recycling programmes to recover these materials from discarded electronics and other sources.

It is difficult to provide an exact percentage of critical energy-metals in Africa since this will depend on the specific metals being considered and the geographic scope of the analysis. According to the World Bank, Africa is estimated to hold around 10% of global proven and potential reserves of key minerals and metals, including some that are critical to energy production.

Africa can get involved in the critical metals development by investing in mining operations, expanding research and development of new technologies for mining and refining, and creating opportunities for local entrepreneurs to explore and capitalize on the potential of critical metals.

Furthermore, African nations that have the resources to invest can help to drive the development of critical metals by providing incentives and financial support to start-ups, research facilities and organisations focused on the production and development of the metals. Finally, African governments can help to create a favourable environment for the development of critical metals by providing tax incentives, better regulations and strong support for research and development.

Africa can get involved in the critical metals development by investing in mining operations.

Some of the steps that could help to create an energy-metals industry that is competitive, innovative and sustainable, which will in turn contribute to economic growth and development in Africa include:

1. Identify critical mineral resources within Africa and their potential economic value.
2. Develop policies and regulations to enable private sector investment and promote access to financing to development of these resources.
3. Establish a transparent and accountable licensing and permitting process for mineral development.
4. Establish a training and education programme to ensure that local and regional stakeholders are equipped with the necessary skills to develop and manage mineral resources.
5. Establish a monitoring and enforcement system to ensure that mineral development is conducted in an environmentally and socially responsible manner.
6. Establish an infrastructure development plan to ensure that the necessary infrastructure is in place to support mineral development.
7. Develop a regulatory framework to ensure the equitable distribution of benefits from mineral development.
8. Establish international partnerships to share best practices and develop local capacity for mineral development.
9. Promote research and development of mineral development and technologies.
10. Develop a comprehensive marketing and communications strategy to promote the development of Africa's critical minerals. ■

African governments can help to create a favourable environment for the development of critical metals by providing tax incentives, better regulations and strong support for research and development.