



SADC Futures of Mining: Implications of Large-Scale EV Adoption

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Executive summary

The large-scale adoption of electrical vehicles (EVs) is both an opportunity and threat if SADC member states do not act proactively to adjust to the future of mining. Southern Africa has some of the largest reserves of EV-related minerals and metals (EVMM), but exports most of these raw materials. The development of e-mobility in Southern Africa depends on the regional mining sector's establishing an EVMM industry. The same goes for harnessing the full potential of its rich EVMM deposits. Doing this requires careful navigation of a complex terrain of overlapping and divergent jurisdictions and priorities. This calls for the creation of a public-private EVMM working group through the SADC Business Council to help bridge and guide co-developed responses with business, governments and other stakeholders. Supported by a regional EVMM coalition potentially hosted by the Mandela Mining Precinct – a public-private collaboration between the Department of Science and Innovation (DSI) and the Minerals Council of South Africa focused on revitalising mining research, development and innovation – it would offer a strong knowledge partnership to the EVMM working group. In addition, it is important that SADC and its member states finalise the Africa Mining Vision (AMV), as well as their national mining visions (NMMVs). These are important mineral supply justice frameworks that could guide the coordination of transnational agreements on EVMM mining. Mining community ownership and livelihood dividends in the SADC region could be enhanced by diversifying the EVMM supply chain. The importance of the EVMM mining sector, specifically the interlinkages of low-carbon minerals and metals with global and regional climate change policies, is also highlighted. The policy insight concludes that an overarching regional policy to achieve a just mining transition is crucial. This could include a regional green deal, a circular economy approach to mining, and updated legislation to re-imagine the role of mining waste.

Introduction

The Covid-19 pandemic has irrevocably changed the extractives industry. The ensuing global economic downturn and health crisis have affected the oil, gas and mineral resources sector significantly. Early indications are that the impact of the pandemic is much worse than that of the 2008–09 financial crisis, with the global economy projected to contract by 4.9% in 2020.¹ The coronavirus outbreak has severely hampered global industrial capability to supply EV² components and interrupted the global EV supply chain. On top of this, the mining sector has suffered a decade of market volatility, downturn in commodity prices,

1 International Monetary Fund, "World Economic Outlook, June 2020: A Crisis Like No Other, An Uncertain Recovery", June 2020, <https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020>.

2 In this policy insight references to electric vehicles (EVs) include both battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEV), unless specifically stated otherwise. The acronym also includes, but is not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft, electric/hydrogen fuel cell unmanned aerial vehicles, electric spacecraft, space rovers, electric cars, electric trolleybuses, electric buses, battery and hydrogen fuel cell electric buses, electric/hydrogen fuel cell trucks, electric bicycles, electric motorcycles, scooters and tuk-tuks, personal transporters, neighbourhood electric vehicles, golf carts, milk floats and forklifts. Off-road vehicles include electrified all-terrain vehicles, tractors and heavy-duty hydrogen fuel cell dump/mining haul trucks.

cost cuts, and disruptive technologies that raised significant barriers to growth in the industry. For example, over the past 10 years hard coal mining's revenue compound annual growth rate has fallen by 18.9% and precious metals production by 9.8%³ until 2019-20. A decade of stagnation in the South African mining sector is reflected in a real-term 4% value decline, along with the loss of 50 000 jobs and a productivity drop in operations for key commodities.⁴

The major drivers of change shaping the mining futures of the minerals and metals industry are:⁵

- the global transition to low-carbon economies;
- progress in technological innovations that improve access to resources previously not considered economically viable to extract;
- the push to find alternative funding solutions to mining;
- the need to negotiate new social contracts that benefit mining communities;
- the demand from governments and civil society for big data transparency and access to mining and minerals information for the benefit of local communities;
- navigation of rising geopolitical risk and economic protectionism with increasing enactment of local content laws and regulations; and
- the perpetual demand on mines and their employees to adapt and develop new skills in times of changing business models and technologies.

This policy insight reviews the implications of large-scale EV adoption for the futures of mining in SADC member states. The development of electric mobility (e-mobility) in Southern Africa depends on the regional mining sector's establishing an EVMM industry. Southern Africa has some of the largest reserves of EVMMs, but exports most of these raw materials. While overcoming this dilemma is crucial to the regional mining sector, the policy insight also explores the opportunities to build alliances or use existing platforms to ensure a resilient EVMM supply chain. The diversification of the EVMM supply chain could lead to greater livelihood dividends for mining communities. A call is made for a greater coordination role by the African Minerals Development Centre (AMDC) and SADC member states to pursue transnational agreements on EVMM mining that help to achieve a just mining transition. In addition, the importance of low-carbon minerals and metals in achieving global and regional climate change policies is unpacked for the EVMM mining

3 Lawrence Thomas, "Five Worst Performing Industries of the Decade", IBISWorld Industry, December 19, 2019, <https://www.ibisworld.com/industry-insider/analyst-insights/five-worst-performing-industries-of-the-decade/>.

4 Ziyad Cassim, Stewart Goodman and Agesan Rajagopaul, *Putting the Shine Back into South African Mining: A Path to Competitiveness and Growth*, Report (McKinsey & Company, February 4, 2019), <https://www.mckinsey.com/featured-insights/middle-east-and-africa/putting-the-shine-back-into-south-african-mining-a-path-to-competitiveness-and-growth#>.

5 Nicholas Maennling and Perrine Toledano, "Seven Trends that Will Shape the Future of Mining and Metals", World Economic Forum, March 20, 2019, <https://www.weforum.org/agenda/2019/03/seven-trends-shaping-the-future-of-the-mining-and-metals-sector/>.

sector. It concludes by examining the need for a SADC-wide just mining transition, vision and pathways. These could include a regional green deal, a circular economy approach to mining, and updated legislation to re-imagine the role of mining waste.

The futures of EV-related minerals and metals in SADC

Southern Africa's EVMMs are central to the world's transition to a low-carbon future and societal development. EVMMs include battery minerals such as lithium, graphite, vanadium, manganese, cobalt, nickel, copper, fluorspar, rare earth elements and hydrogen fuel cell EV-related platinum group metals (PGMs). The EVMM supply chain is similar to the internal combustion engine (ICE) supply chain, with one sizeable difference: an EV's principal component and competitive advantage are its rechargeable lithium-ion batteries (LIBs)⁶ or hydrogen fuel cells (HFCs).⁷

Southern Africa stands to benefit from e-mobility – and specifically battery electric vehicles (BEVs) and hydrogen fuel-cell electric vehicles (FCEVs) – because both have unique capabilities. In simple terms, and in line with current technological developments, BEVs are more efficient for short- to medium-distance travel, whereas 'FCEVs are best suited initially to applications where there is a demanding duty cycle that requires prolonged energy output and high asset use'.⁸ A significant take-off in FCEVs would be an important game-changer for the PGM industry, given that it is a substantial input in the catalytic converters used in the ICE industry. South Africa is the largest platinum producer globally, accounting for around 68% of the world's production, while Zimbabwe is the third-largest producer after Russia.⁹

The integration of EVMMs into the production value chain is well on its way with all the major automotive manufacturers moving in this direction. Other actors, including LIB producers,¹⁰ manufacturers and retail businesses, are also adjusting to this new paradigm.

6 Both lead acid batteries and nickel metal hydride (NiMH) batteries are mature battery technologies. These types of batteries were originally used in early EVs such as General Motor's EV1. However, they are now considered obsolete with regard to their use as the main source of energy storage in BEVs. Brian Mok, "Types of Batteries Used for Electric Vehicles", Stanford University, October 6, 2017, <http://large.stanford.edu/courses/2016/ph240/mok2/>.

7 At present, there are four main forms of propulsion available to consumers worldwide, namely hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), FCEVs and BEVs. HEVs and PHEVs both use a combination of internal combustion engines (ICEs) and batteries to propel the vehicles, whereas BEVs and FCEVs only use batteries or hydrogen fuel cells respectively, and do away with all component parts usually associated with ICE vehicles.

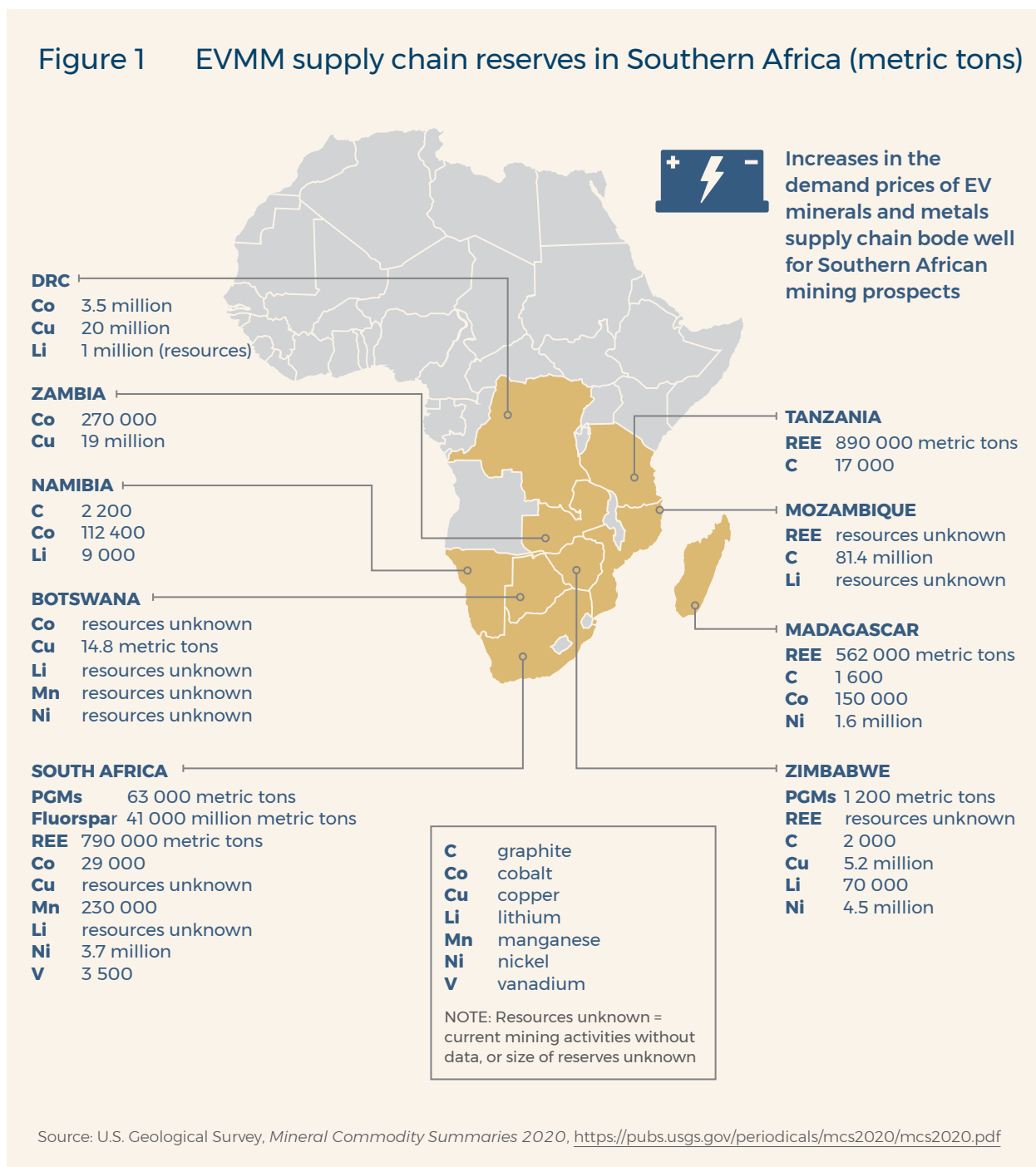
8 Martin Creamer, "Fuel Cells Offer Emission-Free Electricity in Decarbonising World", *Mining Weekly*, September 20, 2019, https://m.miningweekly.com/article/fuel-cells-offer-emission-free-electricity-in-decarbonising-world-2019-09-20/rep_id:3861.

9 Gregory Sousa, "The Top Platinum Producing Countries In The World", *World Atlas*, April 25, 2017, <https://www.worldatlas.com/articles/the-top-platinum-producing-countries-in-the-world.html>.

10 Lithium-ion batteries (LIBs) are starting to take off in South Africa with an investment by Metair resulting in the establishment of a LIB plant at the University of the Western Cape's Energy Storage Innovation Lab. Although the focus is on producing batteries that can store renewable energy, the batteries will be well suited to feed into the EV value chain as well. Metair's investment is partly informed by the fact that South Africa has around 80% of the world's manganese deposits, which is a critical component of these batteries. If this venture is successful, it could demonstrate in-country beneficiation ahead of raw material export to SADC member states that have EVMM deposits.

In the SADC context, to take maximum advantage of this development, the key objective should be to cooperate in a way that supports the establishment of EVMM mines, mega-factories and original equipment manufacturers (OEMs) in SADC. It is equally important to invest in energy generation and regional infrastructure to support the uptake of EVs and development of the mining industry, as well as to create a local market for these minerals, which could lead to downstream mineral value chains.

Figure 1 EVMM supply chain reserves in Southern Africa (metric tons)



UNU-WIDER¹¹ estimates that the bio-physical impact of climate change will affect capital investments, operations and supply chains; gradually place core fossil fuel commodities under pressure as countries adopt cleaner energy generation; cause daily operations to adopt new regulations on water and energy; and increase the demand for certain metals as investments in infrastructure grow towards a 'net zero carbon' future. This complex array of interlocking challenges requires a coordinated and comprehensive response by all stakeholders to reinvent policy, governance and business approaches to create positive and sustainable mining futures. To enable the green transition, global demand requires double of the amount of current mined raw EVMMs. While this bodes well for SADC's mineral-rich countries, SADC member states lack the coordination to create appropriate governance structures, capital or resources to research, develop and systemically manage these resources.

Building a resilient regional EVMM value chain

It is crucial to build partnerships for regional beneficiation infrastructure and cooperation that level the extractives playing field and so prevent power players from exploiting weak governance systems. EVMMs in the Democratic Republic of Congo (DRC) and Zimbabwe could become important economic drivers in SADC. However, both countries are still plagued by unstable governments with little significant reforms to or prospects of stable governance in their mining industries. Conflict-prone areas hamper the potential development of regional EVMM value chains because of global value chain demands that require good governance, increased decarbonisation mining practices, renewable energy transitions, responsibly and ethically mined resources, and a strong focus on the UN's Sustainable Development Goals.

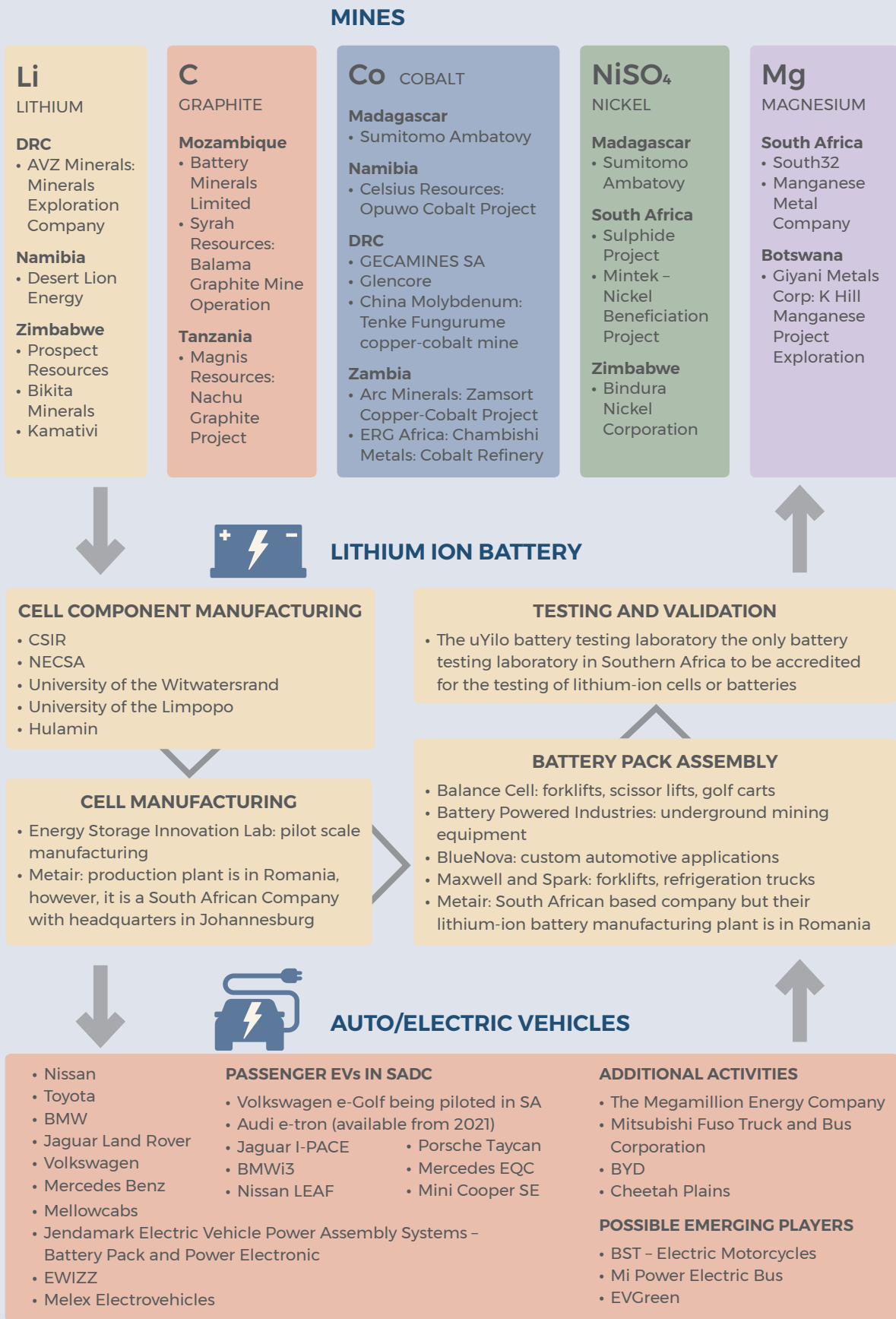
The drastic increase in global demand for and prices of EVMMs bodes well for Southern Africa's mining prospects. However, the impact of the Covid-19 pandemic on the mining industry has proven to be both an opportunity and a threat. China's automotive market is forecast to decline by 15.5% this year,¹² dampening international demand for critical EVMMs. Nonetheless, the pre-existing global shift to EVs – and the marked impact on air quality that the Covid-19 lockdown so clearly illustrated – may unlock opportunities for EVMM-rich SADC countries to become more prominent in the future supply chain.

The successful establishment of an integrated EVMM value chain requires infrastructure, beneficiation and the development of regionally integrated policies to build greater production capacity. EVMM-rich SADC countries should seek closer cooperation and contractual commitments with raw material producers (mines, refineries) and automakers.

11 UNU-WIDER, "The Implications of Climate Change for the Extractive Industries" (WIDER Research Brief 4, UNU-WIDER, Helsinki, April 2017), <https://www.wider.unu.edu/publication/implications-climate-change-extractive-industries>

12 Peng He and Zili Huang, "How China Is Strengthening its Electric Vehicle Market during COVID-19", WEF, May 28, 2020, <https://www.weforum.org/agenda/2020/05/how-china-is-strengthening-its-electric-vehicle-market-during-the-pandemic> (accessed May 29, 2020).

Figure 2 The global EV battery industry supply chain



Source: Simon Moores, Benchmark Mineral Intelligence, <https://www.benchmarkminerals.com>

This could help build a more sustainable and long-term minerals supply chain, both by helping automakers to secure a reliable future supply and/or by reassuring raw material producers and junior producers of the commitment of their investors and future cash flow.

Many global automotive manufacturers are established in South Africa and produce a substantial number of ICE vehicles for predominantly international markets, with some outlet to the South African market. For the region to benefit from EVMMs the SADC leadership – and specifically the South African government, given that South Africa hosts the region’s automotive manufacturing hub – should play critical guiding roles to ensure that regional supply and value chains are created. Where SADC EVMMs have strategic competitive advantages, beneficiation should be incentivised.¹³ The SADC Industrial Development Policy Framework, Action Plan for SADC Industrialization Strategy and Roadmap and adopted Protocol on Industry can provide policy guidelines and the strategic scope within which to develop regional EVMM industries.¹⁴ In fact, the the Regional Indicative Strategic Development Plan (RISDP) 2020–30¹⁵, argues for the development of regional value chains to implement the SADC Regional Mining Vision and Action Plan, review and update the Protocol on Mining to reflect the contemporary landscape, and change the future trajectory in the region towards the AU’s AMV. However, it is important that individual countries also ratify the protocol to ensure its enactment and implementation at a national level. In addition, there is a need to shift away from the current resource-based foreign direct investment (strategic asset investment) approach. Instead, the entire local, national or regional value chain can be packaged as a strategic asset within the global value chain (GVC).

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- 13 South Africa has created two strategic asset investment programmes for both HFC and LIB technologies to transform from a resource-based to a knowledge-based economy. The first is the Department of Science and Innovation’s National Hydrogen and Fuel Cell Technologies (HFCT) Flagship Project, also known as HySA. Promising mining-related innovations are the solar-powered HFC heavy-duty mining haul/dump trucks, with a company like Anglo American aiming to decarbonise heavy-duty mobility in the mining sector. Current additional opportunities for South Africa in HFC technologies are in stationary electricity generators, forklifts and long-distance fuel-cell hydrogen buses, with the continued interest in FCEVs. The second is the national uYilo eMobility Programme, an initiative of the Technology Innovation Agency to enable, facilitate and mobilise electric mobility and renewable energy applications.
- 14 SADC, “Action Plan for SADC Industrialization Strategy and Roadmap”, March 18, 2017, https://www.sadc.int/files/4514/9580/8179/Action_Plan_for_SADC_Industrialization_Strategy_and_Roadmap.pdf.
- 15 Southern African Development Community, “Regional Indicative Strategic Development Plan (RISDP) 2020-30,” <https://www.sadc.int/about-sadc/overview/strategic-pl/regional-indicative-strategic-development-plan/>.

The principal aim should be to build awareness of the benefits of regional cooperation in the EVMM industries rather than pursuing purely national interests. If Southern Africa could muster the wherewithal to pull together the region's mineral resources through regional integration and cooperation, with a focus on collaborative local beneficiation,¹⁶ one could well see the establishment of buoyant EVMM markets that meet the high international demand for low-carbon resources. Current projections point to an exponential demand for low-carbon minerals and metals (ie, EVMMs), and it can be said with some confidence that wind power, solar photovoltaic (PV) and energy-storage technologies are likely to grow dramatically. Although projections are subject to uncertainty, they point to immense demand¹⁷ and substantial growth,¹⁸ with jumps in demand of 87 000% for EV batteries, 1 000% for wind power, and 3 000% for solar cells and PVs between 2015 and 2060.¹⁹ As the World Bank puts it: 'The clean energy transition will be significantly mineral intensive.' It estimates that production of minerals such as graphite, lithium and cobalt could increase by nearly 500% by 2050.²⁰ This underlines the urgency of implementing the African Continental Free Trade Agreement and its importance to the future of Southern African low-carbon minerals and metals.

However, this requires unprecedented national and regional cross-scale cooperation. The first step towards embedding regional EVMMs into GVCs includes partnering national intergovernmental departments with the SADC Industrial Development and Trade (IDT) and Infrastructure and Services directorates, the SADC Business Council, and key stakeholders like the Mining Industry Association of Southern Africa (MIASA). One way to initiate this level of collaboration would be adding EVMMs as an agenda item to the SADC Secretariat thematic group on IDT, connected to the transport focus under the Infrastructure and Services thematic group. The successful establishment of an effective and efficient EVMM coalition on regional value chains in Southern Africa would enable inclusive public-private partnerships that bring together governments, the mining sector, civil society and industry.

The SADC Business Council, with backing from the SADC Secretariat and member states, should develop a public-private EVMM working group with a programme and activities that support the SADC IDT and Infrastructure and Services directorates.

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- 16 Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, *Guidance for Governments on Local Content Policies* (Winnipeg: International Institute for Sustainable Development, July 2018), <https://www.iisd.org/sites/default/files/publications/igf-guidance-for-governments-local-content.pdf>.
- 17 International Resource Panel, *Global Resources Outlook 2019: Natural Resources for the Future We Want* (Nairobi: UN Environment Programme, 2019), <https://www.resourcepanel.org/reports/global-resources-outlook>.
- 18 Elsa Dominish, Nick Florin and Sven Teske, *Responsible Minerals Sourcing for Renewable Energy* (Sydney: Institute for Sustainable Futures, 2019).
- 19 André Månberger and Björn Stenqvist, "Global Metal Flows in the Renewable Energy Transition: Exploring the Effects of Substitutes, Technological Mix and Development", *Energy Policy* 119 (2018), doi:10.1016/j.enpol.2018.04.056, <http://www.sciencedirect.com/science/article/pii/S0301421518302726>.
- 20 World Bank, "Climate-Smart Mining: Minerals for Climate Action" (Brief, World Bank, Washington DC), <https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action>.

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The SADC Business Council has expressed interest in creating a public–private EVMM working group to support the work of the SADC Secretariat. The working group could establish inter- and intra-industry cooperation through the SADC Business Council where mining companies, refineries, OEMs, government sectors and various interlocking departmental representatives could work together on establishing a resilient regional EVMM value chain. The aim would be to:

- coordinate the creation of sustainable battery and hydrogen fuel cell manufacturing;
- ensure ethical supply chains;
- address water shortages, electrification constraints and infrastructure challenges;
- ameliorate political tensions;
- identify future investment opportunities; and
- develop beneficiation strategies to move the region forward.

The EVMM working group, in turn, should be supported by a research, development, skills, infrastructure and technology partner that facilitates a healthy, safe, innovative, transformative and economically viable approach to EVMMs. One of these potential knowledge partners is the Mandela Mining Precinct. The Mandela Mining Precinct is a public–private collaboration between the South African DSI and the Minerals Council of South Africa, focused on revitalising mining research, development and innovation.²¹

It is thus recommended that the Mandela Mining Precinct explore establishing an EVMM coalition that can support the SADC Business Council EVMM working group, while also working with a broader set of knowledge partners from across the region

²¹ See Mandela Mining Precinct, <https://mandelaminingprecinct.org.za/>.

It is thus recommended that the Mandela Mining Precinct explore establishing an EVMM coalition that can support the SADC Business Council EVMM working group, while also working with a broader set of knowledge partners from across the region.

The aims of an EVMM coalition should include:

- instrumentalising the EVMM regional value chain with a regional vision, action plan and strategy aligned with the AMV;
- scoping the need for financial incentives based on low-carbon mineral and metals grants;
- advocating tax rebates for research and development;
- negotiating tax breaks for mining, refineries and manufacturers; and
- fostering an appropriate policy environment for policy coordination and implementation.

Ensuring regional EVMM integration and collaboration

The AU's policy framework guiding the extractives industry is the AMV.²² It aims to ensure that the continent uses its mineral resources strategically for broad-based, inclusive development. Several factors²³ have led to the slow wholesale domestication and implementation of the AMV. In SADC, the AMV is absent in the majority of the region's country mining visions and action plans, even though the SADC Protocol on Mining mandates SADC states to adopt internationally and regionally accepted standards within the mining sector.²⁴

SADC states often view large-scale mining as economically efficient, but recent research²⁵ has shown it has limited employment potential. This situation is set to worsen with the Covid-19 pandemic, the arrival of mining automation and stricter global labour and environmental legislation. In contrast, artisanal and small-scale mining (ASM)²⁶ is labour

22 UN Economic Commission for Africa, "Africa Mining Vision", <http://www.africaminingvision.org/>.

23 These include the lack of: functional support by and leadership of the AMDC; technical support to implement the AMV; research to identify gaps in member states to mobilise support; policy research to develop strategies; advocacy and information dissemination; M&E on activities; think-tanking support on the AMV; support for outputs on knowledge products; support to domesticate the AMV at country and regional level; capacity building for stakeholders on the AMV; outputs by cooperating partners; and conflicting domestic industrial development and local content policies.

24 The Protocol on Mining further implores SADC member states to commit themselves to share information on mining opportunities in the region, enhance the technological capacity of the sector and prioritise opportunities for small-scale mining. SADC, "Protocol on Mining", 2006, https://www.sadc.int/files/3313/5292/8366/Protocol_on_Mining.pdf.

25 Benjamin K Sovacool et al., "Sustainable Minerals and Metals for a Low-Carbon Future", *Science* 367, no. 6473 (2020).

26 It is important to differentiate between artisanal mining and small-scale mining. Artisanal mining refers to informal and subsistence mining activities carried out with little or no mining technology, using semi-skilled labour and hand tools with minimal machinery, if any, to carry out their operations independently. Small-scale mining refers to operations where individuals or small enterprises employ workers who use traditional mining methods with little or no mechanisation. Peter Mugai, "Artisanal and Small-Scale Mining in Africa", *Geology for Investors*, May 8, 2020, <https://www.geologyforinvestors.com/artisanal-and-small-scale-mining-in-africa/>.

intensive, offers more direct and indirect job opportunities, requires less mechanisation and does not need major capital investments. However, ASM is also plagued by poor health and safety practices, the use of child labour, pollution (for example, mercury contamination of water systems by ASM gold miners) and mining in conservation areas.²⁷

The artisanal mining of cobalt in countries like the DRC, for instance, has attracted Amnesty International's attention because of its harmful environmental and health effects. The DRC produces two-thirds of the global output, but artisanal miners are paid 10 times less than the global average by Chinese mining companies and other intermediaries.²⁸ Almost 80% of the DRC's cobalt is exported via Tanzania or South Africa to China for processing.²⁹

Nonetheless, ASM provides a livelihood potential for at least 40 million people worldwide, with an additional three to five times more people indirectly supported by the sector.³⁰ Governments and donors are increasingly realising the benefits of promoting ASM formalisation – it drastically improves governance of the sector, for example managing social and environmental impacts, providing clear property rights and enabling recipients of these rights to capitalise their possessions while embracing social and environmental norms and regulations.³¹

SADC states should enhance community ownership and livelihood dividends, and formalise ASM by diversifying their mineral supply chains to incorporate both ethical, formalised ASM and large-scale enterprises.

Regional integration solutions for the EVMM industry should increase local content procurement and support the socio-economic development of marginalised mining communities, especially in rural areas. However, the greatest barriers to implementation are the coordination of different intra- and inter-governmental departments and winning industry-wide support.

In the private sector, battery manufacturers are calling for a meaningful contribution from mining companies that is not limited to satisfying legal corporate social responsibility requirements. An example of a comprehensive and integrative approach conducive to the demands of the EVMM sector is the FutureSmart Mining blueprint and sustainable mining plan by Anglo American.³² Following on its innovative approach there is a need

27 Alex Benkenstein, "Artisanal and Small-scale Mining in Africa: Opportunities and Challenges", South African Institute for International Affairs, March 1, 2012, <https://saiia.org.za/research/artisanal-and-small-scale-mining-in-africa-opportunities-and-challenges/>.

28 AFP, "Cobalt Prices Soar, but DRC's Small Miners See Little of the Gain", *News24*, February 22, 2018, <https://www.news24.com/Africa/News/cobalt-prices-soar-but-drcs-small-miners-see-little-of-the-gain-20180222>.

29 AFP, "Cobalt Prices Soar".

30 AFP, "Cobalt Prices Soar".

31 Matti Salo et al., "Local Perspectives on the Formalization of Artisanal and Small-Scale Mining in the Madre de Dios Gold Fields, Peru", *The Extractive Industries and Society* 3, no. 4 (2016), doi:10.1016/j.exis.2016.10.001.

32 Its aims include a 30% net reduction in GHG emissions, schools in host communities to perform within the top 20% of state schools nationally, and five jobs created or supported in off-site communities for every on-site job by 2030. Anglo American, *Our Sustainable Mining Plan: FutureSmart Mining™: Our Blueprint for the Future of our Business*, <https://southafrica.angloamerican.com/-/media/Files/A/Anglo-American-Group/South-Africa/our-difference/our-sustainable-mining-plan/our-blueprint-for-the-future-of-sustainable-mining.pdf>.

to re-imagine mining to improve people's lives through systemic innovations such as building trusted corporate leadership, thriving communities and a healthy environment. To genuinely advance the EVMM value chain, SADC member states should join 'ethical mineral' schemes like the World Economic Forum's [Global Battery Alliance](#), and establish homegrown collaborations through a 'SADC EVMM Alliance' as strategic partners to the EVMM coalition and working group.

The SADC EVMM working group and coalition should prioritise and advocate the finalisation of the AMV RMV as a normative framework for SADC states in the creation of NMVs. Finalising and implementing the RMV and NMVs could help SADC governments, the AMDC, MIASA and other key EVMM stakeholders to create a socially and economically sustainable mining industry environment. The effectiveness of an EVMM working group, coalition and local linkage-orientated legislation depends on the creation of³³

multiple interacting governing bodies at different scales; disciplinary focus; forms of organisation and sources of authority to act from, thus improving connectivity and learning across scales, cultures and addressing problems at the right level by the right people at the right time.

However, this would require broadening the range of participants by engaging multiple stakeholders with active interests in the EVMM value chain, while allowing for their involvement in the management and governance process – this builds trust and shared ownership by including a diversity of perspectives. Unfortunately, the reality is that the wide-scale national adoption of the AMV and RMV has stalled in SADC, despite its importance as a guiding normative framework for ethical mining. Given the value that EV end-users and manufacturers place on the ethical sourcing of mineral inputs into vehicle components, this is a serious oversight that requires immediate attention.

Apart from governance and regulatory barriers that would support greater beneficiation in the region through regional collaboration, there is also a lack of integrative energy infrastructure to support the development of EVMM mines and establishment of refineries, as well as transport infrastructure to supply regional OEMs with the required EVMMs.

Other mechanisms to support EVMMs and reduce barriers of change should also be explored. These could be pursued by:

- enhancing the SADC EVMM working group and coalition's economies of scale through joint projects to increase SADC member states' purchasing power to reduce fuel and equipment costs;
- lowering duties, customs and tariffs to enable finishing of minerals and metals closer to mines;

³³ Liza van der Merwe, Reinette Biggs and Rika Preiser, "Building Social Resilience in Socio-Technical Systems through a Participatory and Formative Resilience Approach", *Systemic Change Journal*, 2019.

- improving opportunities for niche mineral beneficiation and manufacturing of end-products;
- sharing innovation around green mining;
- building unified purchase agreements from preferred vendors and arranging common logistics;
- developing peer-learning initiatives to show innovations and shared learning;
- building relationships with the rural councils of mining communities for enhanced coordination, organisation and decision-making; and
- using best practice case studies, such as the [PGM mining value chain in Zimbabwe and South Africa](#).

Towards a just mining transition and low-carbon regional futures

All SADC states have ratified the Paris Agreement³⁴ on climate change, with the exception of Angola, despite its being a signatory. The mining sector has increased its ability to adapt and mitigate the adverse effects of climate change and foster climate resilience to lower greenhouse gas (GHG) emissions.³⁵ However, in general, its focus on the merely physical impacts on mining remains too narrow. The sector often ignores the just transition dynamics that arise from its mode of mining operations and practices.

SADC countries are mainly resource-based economies in which the mining sector plays a vital part and provides a large proportion of direct job opportunities. While South Africa, for example, has many policies and legislation committed to climate change adaptation, mitigation and decarbonisation, there is no a coherent, joined-up regional response. For instance, the South African National Planning Commission is developing the '[Just Transition to a Low-Carbon Future: Vision and Pathways 2050](#)' with broad cross-scale stakeholder input. SADC states need a similar process that could ultimately help to create a regional green deal. They should design these just transition policies to protect the competitiveness of the mining industry while safeguarding the transition to a low-carbon and climate-resilient mining sector.

The SADC region has a responsibility to be proactive and prepare sufficiently for the negative impact on the coal industry that will follow from the shift to global decarbonised economies. It is also important not to lose sight of the many opportunities for the EVMM

34 UN Framework Convention on Climate Change, "The Paris Agreement", <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.

35 Industrial processes, product use in metal production, mineral products and the chemical industry contribute 14% of the total GHG emissions in South Africa.

industry and the mining sector heralded by the shift to green mining and the green economy. This means recognising that achieving a green economy is not possible without mining.³⁶ The development of green industries and services will generate considerable mining-related opportunities in the region because of significant quantities of EVMM reserves. To enhance low-carbon resource security, an EVMM alliance – in coordination with regional supply chain stakeholders – should stipulate a more extended producer responsibility for products that use low-carbon resources. EVMM security should be actively incorporated into formal climate planning, establishing a list of ‘critical minerals’ for low-carbon security. All stakeholders need to ensure responsibility for the entire lifespan of a product, including at the end of its usefulness. This demands a shift from users or waste managers to making the major EVMM mines, producers and manufactures co-responsible.

According to the World Economic Forum, ‘the baseline shows that mining and metals are among the world’s great generators of waste, accounting for around 10 billion tonnes a year, around 40–55% of the global total, and about a tenth of global mining and metals production’.³⁷ The EVMM sector can enhance resource efficiency by greatly expanding recycling and reuse through the adoption of a circular economy³⁸ approach and so extending the lifetime of products and reserves. It is imperative to broaden the definition of ‘waste’ in South Africa’s Waste Act³⁹ and more widely in the region. SADC governments should broaden the definition of ‘waste’ in waste policies beyond the narrow focus on primary production waste to include a circular economy approach guided by the Extractive Industries Transparency Initiative (EITI).

The adoption of ‘circular mining’ approaches, guided by existing protocols such as EITI, would extend resource streams, material substitution or material intensity reductions, and materials recovery and recycling. It also holds promise for diversifying supply chains, as long as they maintain environmental sustainability and protect worker safety while using clean energy infrastructure. Implications are altered product and component designs, as well as repurposing, ultimately extending the usefulness of the original artefacts. This demands regional standardised component designs and specifications, along with close collaboration and cooperation along the value chain. The AMDC and SADC EVMM Alliance should push circularity by using life cycle assessments to measure the true environmental impact of a product or component.

SADC governments should institute legislation for more efficient treatment and measurement of mineral and metals waste, which would also benefit mining companies as it means efficient energy use. However, because of data gaps, traceability schemes may be

36 Ross Harvey, “Mining for a Circular Economy in the Age of the 4IR: The Case of South Africa” (Policy Briefing 181, SAIIA, Johannesburg, May 2019), <https://saiia.org.za/research/mining-for-a-circular-economy-in-the-age-of-the-fourth-industrial-revolution-the-case-of-south-africa/>.

37 WEF, “Mining and Metals in a Sustainable World 2050” (Industry Agenda, WEF, Cologny, September 2015), 22, http://www3.weforum.org/docs/WEF_MM_Sustainable_World_2050_report_2015.pdf.

38 Ellen MacArthur Foundation, “What is the Circular Economy?”, <https://www.ellenmacarthurfoundation.org/circular-economy/concept>.

39 South African Government, “National Environmental Management: Waste Act (No. 59 of 2008)”, <https://www.gov.za/documents/national-environmental-management-waste-act-regulations-waste-classification-and-0>.

impossible to fully enforce in practice. In extreme cases traceability has become an exercise in public relations rather than improved governance and outcomes for miners. Traceability might offer promise through blockchain technology, which uses artificial intelligence algorithms for data processing. Blockchain in mining⁴⁰ has the potential for greater assurance but ultimately relies on the accuracy of data being fed into the supply chain.⁴¹ At present, the mining sector submits data to mining departments. However, there is a clear need for the reporting templates to be revised and to more carefully consider end-user traceability.

SADC governments should broaden the definition of 'waste' in waste policies beyond the narrow focus on primary production waste to include a circular economy approach guided by the Extractive Industries Transparency Initiative

Conclusion

Catalysing a just e-mobility revolution (e-volution) through EVMMs in the mining sector is a considerable challenge and a great opportunity for the SADC region. Working together, the region can transcend protectionist and narrow mining outlooks and co-create a shared regional vision to secure its prosperity and welfare. The SADC Programme on Climate Change Adaptation and Mitigation⁴² does not specifically address the demands of a just transition towards a low-carbon regional future. What is required is developing a pathway strategy to lower mining GHG emissions and so support climate-resilient mining. Given the region's high coal dependence for power generation, one way to counter rising emission levels is to increase the role of low-carbon EVMMs. The post-Covid-19 era might compel SADC governments and companies to question their dependence on fossil fuels and the heavy cost burden of fuel imports, and accelerate their commitment to clean/renewable energy sources. The development of the EVMM mining sector could also hasten the uptake of e-mobility with clear benefits for a Covid-19 green recovery response and addressing

40 Filipe Calvão and Victoria Gronwald, "Blockchain in the Mining Industry: Implications for Sustainable Development in Africa" (Policy Insight 74, SAIIA, Johannesburg, August 2019), <https://saiia.org.za/research/blockchain-in-the-mining-industry-implications-for-sustainable-development-in-africa/>.

41 China has already announced that it will make EV producers responsible for the battery recycling process to ensure that it is carried out in an environmentally friendly way. It has also set up the Responsible Cobalt Initiative (RCI), which aims to set standards for a clean supply chain, improving transparency and governance. This is a positive sign in that China promotes self-regulation in an attempt to give consumers confidence in its products. Other international companies like Apple, Sony and Mercedes-Benz have signed on to the RCI. Rebecca Campbell, John Tivey, and Saghar Khodabakhsh, "Building a Sustainable Battery Supply Chain: Is Blockchain the Solution?", White & Case, June 2018, <https://www.whitecase.com/publications/insight/building-sustainable-battery-supply-chain-blockchain-solution>.

42 SADC, "Programme on Climate Change Adaptation and Mitigation in Eastern and Southern Africa (COMESA-EAC-SADC)", <https://www.sadc.int/sadc-secretariat/directorates/office-deputy-executive-secretary-regional-integration/food-agriculture-natural-resources/tripartite-programme-climate-change-adaptation-and-mitigatio/>.

regional gender inequality, poverty and unemployment.⁴³ Large-scale adoption of e-mobility and associated technologies could significantly impact the development paths of most SADC MS given the dominance of EVMM resources, which are instrumental in the transition to a green recovery and sustainable low-carbon economies.

43 Deon Cloete, Neuma Grobbelaar and Talitha Bertelsmann-Scott, "Introducing Electric Vehicles to Southern Africa: A Systemic Innovation Approach Towards a Green New Deal" (SAIIA Futures Policy Briefing, SAIIA, Johannesburg, December 2019), <https://saiia.org.za/research/introducing-electric-vehicles-to-southern-africa-a-systemic-innovation-approach-towards-a-green-new-deal/>.

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Acknowledgement

SAIIA gratefully acknowledges the support of the Konrad Adenauer Stiftung for this publication.

The author wishes to thank Ms Lesley Wentworth for her review of and input into this paper.

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3D of massive mining truck (Getty Images)

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