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Growth potential, opportunities and resilience within an advancing bioeconomy across Southern African Development **Community (SADC) countries**

* This document is part of ongoing research, mapping initial findings for feedback and input from the G20 Initiative on Bioeconomy, May 2025. Please do not share this document as it is a draft and we will share the final version once all G20 member feedback has been incorporated.

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The bioeconomy is a rapidly evolving economic paradigm that is globally recognised as a key driver for sustainable development, reducing dependence on fossil resources and promoting the use of biomass alternatives and a circular approach across a range of sectors, as well as promoting biodiversity conservation (NatureFinance & Getúlio Vargas Foundation, 2024). In this way, it presents a set of viable economic opportunities for a just transition.

The global bioeconomy is currently valued at approx. USD 4-5 trillion, with significant growth potential projected to reach USD 30 trillion (NatureFinance, 2024). In Africa, the bioeconomy is seen as a vital tool for economic growth and job creation, with several countries and regions developing dedicated strategies to harness its potential (Virgin et al., 2022).

The Southern African Development Community (SADC) region has been actively developing policies and regulatory frameworks to advance the bioeconomy, broadly encompassing the sustainable use of biological resources and biotechnology for economic development. The bioeconomy is increasingly integrated into national development plans, such as Namibia's National Bioeconomy Strategy (2024–2029) and South Africa's Biodiversity Economy Strategy, aiming for economic growth, social inclusion, and environmental sustainability. The policy and regulatory frameworks governing the bioeconomy in the SADC region emphasise sustainable agriculture, biotechnology, biofuels, the blue economy, the circular economy, and biodiversity-based industries.

SADC priority sectors by country

Preliminary research has identified priority bioeconomy sectors in the SADC countries as per Table 1.

COLOUR CODING FOR TABLE 1

Agriculture Biotechnology Biodiversity Health/ pharmaceuticals Bioenergy

TABLE 1: PRIORITY BIOECONOMY SECTORS FOR SADC COUNTRIES

COUNTRY	PRIORITY SECTOR 1	PRIORITY SECTOR 2	PRIORITY SECTOR 3
Angola	Agriculture Source: https://documents1. worldbank.org/curated/en/ 099150012022242096/pdf/ P1769171f457c3010198d 31b375aaddd937.pdf	Biodiversity economy aquaculture & fisheries Source: https://international -partnerships.ec.europa.eu/ countries/angola_en	Bioenergy: hydropower plant, solar parks Source: https://international-partnerships.ec. europa.eu/countries/angola_en
Botswana	Agriculture: Livestock and crop production Source: National Policy on Agricultural Development (Revised 2014) and National Master Plan for the Arable Agriculture and Dairy Development (NAMPAADD)	Bioenergy: Diversified and renewable energy Source: Botswana Biomass Strategy	Biodiversity economy: ecotourism Source: The National Biodiversity Strategy and Action Plans (NBSAP) of 2007 and 2016
Comoros	Blue economy Source: https://documents1. worldbank.org/curated/en/ 099060223143537610/pdf/ P1770330b8805207d0beae 0241f893ad463.pdf	Biodiversity economy: ecotourism Source: https://international -partnerships.ec.europa.eu/ countries/comoros_en	Agriculture Source: https://www.undp.org/africa/stories/ protecting-biodiversity-comoros-vital-priority -country-africa-and-world
DRC	Biodiversity economy: forestry Source: https://www.fao.org/ forestry-fao/49214-0b4fa2db 2fe1650bee0794eca598d0b37. pdf	Agriculture Source: https://international -partnerships.ec.europa.eu/ news-and-events/news/ global-gateway-green- corridor-preserving-last- lungs-earth-through-green- economic-growth-2025-01- 22_en	Biodiversity Source: Democratic-republic-of-congo -streamlining-biodiversity-monitoring
Eswatini	Agriculture Source: https://international -partnerships.ec.europa.eu/ news-and-events/news/ global-gateway-green- corridor-preserving-last- lungs-earth-through-green- economic-growth-2025-01- 22_en and Eswatini Agenda 2063 Report	Bioenergy Source: http://www.gov.sz/ images/Media/WEB_ KINGDOM_OF_ESWATINI_ ENERGY_MASTERPLAN_ 2034-1.pdf	Biodiversity Source: biodiversity-and-ecosystems- conservation-framework-eswatini-launched

COUNTRY	PRIORITY SECTOR 1	PRIORITY SECTOR 2	PRIORITY SECTOR 3
Lesotho	Agriculture: Crop and livestock Source: National Strategic Development Plan (NSDP) II and https://www.trade.gov/country-commercial-guides/lesotho-agricultural-sector	Bioenergy: hydropower, wind, and solar energy Source: Lesotho Energy Policy 2015–2025 and https://www.trade.gov/country-commercial-guides/lesotho-renewable-energy	Biodiversity economy: sustainable use Source: National Strategy on Lesotho's Biological Diversity: Conservation and Sustainable Use
Madagascar	Biodiversity economy: ecotourism & fisheries and aquaculture Source: https://www.cbd.int/ countries/profile?country=mg	Biodiversity economy: medicinal plants Source: https://www.cbd.int/ countries/profile?country=mg	Agriculture Source: https://www.biodev2030.org/en/pays/madagascar/
Malawi	Agriculture and Fisheries: Cash crops (Tobacco, tea, sugar, cotton) Source: https://www.mccci.org/business/agricultural-sector/	Bioenergy: Renewable energy Source: Malawi Renewable Energy Strategy 2017–2030 and https://www.policyfellowship.org/wpcms/wp-content/uploads/2022/12/transitioning-renewable-energy-malawi-04-10-2022.pdf	Biodiversity economy: forestry Source: https://mitc.mw/invest/index.php/investment-opportunities/priority-sectors
Mauritius	Agriculture: The Mauritius Institute of Biotechnology highlights the importance of agricultural biotechnology, including genetic engineering, molecular markers, and tissue culture, to enhance agricultural productivity and sustainability Source: Mauritius Institute of Biotechnology	Marine Biotechnology: Marine biotechnology is a promising sector in Mauritius, focusing on transforming marine resources into valuable products and services Source: Mauritius Institute of Biotechnology	Waste Management and Bioenergy: Mauritius is actively exploring waste-to-energy (WtE) and anaerobic digestion technology (ADT) to convert waste into bioenergy Source: An evaluation of the policies, strategies and legal framework for sustainable waste management in Mauritius Journal of Material Cycles and Waste Management and Energy from Biomass in Mauritius: Overview of Research and Applications SpringerLink
Mozambique	Agribusiness (main value chains: sugar; cotton; poultry; fruits Source: https://openknowledge.worldbank.org/entities/publication/3d062dfc-4710-59f8-8bda-368456570483	Biodiversity economy: ecotourism, fishing, hunting, wildlife ranching Source: https:// openknowledge.worldbank. org/entities/publication/ 3d062dfc-4710-59f8- 8bda-368456570483	Bioenergy Source: Bioeconomy Policy (Part II) – Synopsis of National Strategies around the World
Namibia	Biodiversity economy: ecotourism, hunting, ranching Source: NATIONAL BIOECONOMY STRATEGY - 2024-April Eddit.cdr	Biodiversity economy: Biotrade and biopharmaceuticals Source: NATIONAL BIOECONOMY STRATEGY- 2024-April Eddit.cdr	Bioenergy: The development of bioenergy from biomass, such as wood pellets and biochar* Source: NATIONAL BIOECONOMY STRATEGY-2024-April Eddit.cdr

COUNTRY	PRIORITY SECTOR 1	PRIORITY SECTOR 2	PRIORITY SECTOR 3
Seychelles	Biodiversity economy: ecotourism Source: Seychelles Investor Map highlights need for green power production, ecotourism, agricultural expor-Seychelles Broadcasting Corporation	Biodiversity economy: fisheries & also circular economy models to produce omega oil, animal feed inputs or fertilizers from fish processing waste Source: Invest in Seychelles- SDG Investor Map	Agriculture: Set up distilleries to produce high-value-added products from Seychelles tropical cash crops, including cinnamon, vanilla, copra, and Coco de Mer for dietary, cosmetic, and medicinal use Source: Invest in Seychelles-SDG Investor Map
South Africa	Agriculture: This sector is crucial for enhancing food security and promoting sus-tainable agricultural practices. Efforts are being made to increase agricultural productivity and resilience through biotechnology, including crop and livestock improvement (GE), agro-processing initiatives, and biocontrol Source: minister-steenhuiseng20-bioeconomy-a-priority.	Health: The health sector is a priority for developing biotechnological solutions to address public health challenges. This includes the development of vaccines, diagnostics, and biopharmaceuticals to improve healthcare outcomes Source: Bio-economy Strategy	Industrial Biotechnology: This sector focuses on the development of bio-based products and processes to enhance indus-trial competitiveness. It includes the production of biofuels, bioplastics, and other bio-based materials Source: Bio-economy Strategy
Tanzania	Agriculture: This sector is crucial for enhancing food security and promoting sustainable agricultural practices. Efforts are being made to increase agricultural productivity and resilience through biotechnology Source: Bioeconomy Policy (Part II) – Synopsis of National Strategies around the World	Health Biotechnology: Development of vaccines, diag-nostics, and bio-pharmaceuticals to improve healthcare outcome Source: Bioeconomy Policy (Part II) – Synopsis of National Strategies around the World and BIOTECHNOLOGY POLICY Cover_FRONT	Biodiversity economy ecotourism Source: Bioeconomy Policy (Part II) – Synopsis of National Strategies around the World
Zambia	Agriculture Source: Trade-Investment- Ptospects-with-ZDA-Priority- Sectors-Investment- Opportunities.pdf	Biodiversity economy: ecotourism Source: Trade-Investment- Ptospects-with-ZDA-Priority- Sectors-Investment- Opportunities.pdf	Health biotechnology Source: Trade-Investment-Ptospects-with-ZDA-Priority-Sectors-Investment-Opportunities.pdf and 2NATIONAL-GREEN-GROWTH-STRATEGY-2024-2030-6.pdf
Zimbabwe	Agriculture Source: Key Economic Sectors–ZimTrade–Zimbabwe Trade Information Portal	Biodiversity economy: ecotourism Source: Key Economic Sectors-ZimTrade-Zimbabwe Trade Information Portal	Bioenergy Source: Key Economic Sectors–ZimTrade–Zimbabwe Trade Information Portal

As can be seen from $\underline{\text{Table 1}}$, agriculture is a key priority sector in many SADC countries, with the biodiversity economy, bioenergy and biotechnology also playing an important role.

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Financing policy and regulatory frameworks

This table maps key national policies and regulatory frameworks that support the development of bioeconomy sectors across SADC countries, with a particular focus on their financing dimensions. It highlights how countries are using targeted strategies; ranging from public-private partnerships (PPP) and investment incentives to dedicated funding mechanisms and concessional finance; to mobilise capital for bioeconomy activities. While countries like South Africa and Tanzania have introduced structured financing tools to support innovation and commercialisation in sectors such as biotechnology and biofuels, others focus on improving credit access and leveraging donor or climate finance in agriculture and conservation. However, the uneven depth and scope of financial provisions suggest a need for more coordinated regional approaches to de-risk investments and scale private capital flows into emerging bio-based industries. Table 2 shows examples of regulation in various countries across the bioeconomy spectrum, including the nature-intensive bioeconomy, advanced bioeconomy and the hi-tech bioeconomy.

TABLE 2: EXAMPLES OF REGULATION IN VARIOUS COUNTRIES ACROSS THE BIOECONOMY SPECTRUM

SECTORS	COUNTRY	REGULATION	DESCRIPTION
Nature-intens	ive bioeconomy		
Wildlife	South Africa	National Biodiversity Economy Strategy	Supports wildlife-based tourism and conservation finance, including PPP models and private investment in ecotourism
	Namibia	Community-based Natural Resource Management Program	Grants use rights to community conservancies, attracting eco-tourism investments
	Botswana	Tourism Policy (1990, Revised 2021)	Encourages private investment and FDI in high-end tourism with wildlife-based eco-lodges
	Zambia	National Forest Policy 2014	Emphasizes attracting private sector investment and fostering public-private partnerships to finance sustainable forest management
Agriculture	Angola	Development Policy Financing	Emphasizes improving agricultural financing by expanding climate-resilient insurance markets and investing in rural electrification and water resource management.
	Lesotho	Climate Smart Agriculture Investment Plan	Identifies a need for investment worth US \$208–268 million over 5 years, and highlighting limited access to credit as a major barrier (71% constraint level) despite CSA practices offering 3–5 times higher household income than conventional approaches and significant job-creation potential
	Botswana	Sustainable financing strategy	Aims at improving access to financing and introducing innovative financing instruments, prioritizing the agriculture sector. Focuses on domestic and international, public and private financing measures
Advanced bioeconomy			
Biofuels	South Africa	Biofuels Industrial Strategy, 2007	Emphasis on fiscal incentives, such as tax reductions, and mandatory blending targets to encourage investment in biofuel production and use

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SECTORS	COUNTRY	REGULATION	DESCRIPTION
Biofuels	Mozambique	Strategy for New and Renewable Development 2011–2025	Works towards accelerating private investments in renewables
	Tanzania	Guidelines for sustainable liquid biofuels development	Biofuels One Stop Center under the Tanzania Investment Centre coordinates the biofuel investments, while taxation and incentives follow standard financial laws
	Malawi	National Energy Policy (2018)	Promotes private sector participation through frameworks like the Independent Power Producer framework and public-private partnerships. It also highlights the need for investments in renewable energy technologies, rural electrification and waste-to-energy projects, aiming to achieve universal energy access by 2030
Hi-tech bioeco	onomy		
IPLC medicinal flora	Lesotho	Drug of Abuse (Cannabis) Regulations Act of 2018	The regulation makes it illegal to cultivate cannabis yet, Medigrow was the first company to get a license, setting up legal plantations for medical and scientific purposes, invested US \$19.3 million. Overall the market is dominated by foreign companies
	South Africa	Bio-economy Strategy (2013)	Supports through benefit sharing agreements and funding via the <u>Technology Innovation Agency (TIA)</u> a government/public agency, providing <u>funding</u> in the form of <u>grants</u> and complementary services to <u>Indigenous Knowledge Systems</u> (IKS)
	Tanzania	National Biotechnology Policy (2010)	Encourages increased public investment in R&D and outlines the need for dedicated biotechnology funding mechanisms, including incentives for private sector participation and the establishment of a national biotechnology fund to support innovation and commercialization
	Zimbabwe	Dangerous Drugs (Production of Cannabis for Medicinal and Scientific Use) Regulations, 2018	Permits the cultivation, production, and possession of cannabis only for medicinal and scientific purposes facilitating companies like Swiss Bioceuticals Limited, to invest US \$27 million. Recently Amatheon Agri also received regulatory approval for cultivation.

Private investment landscape

Private sector engagement in bioeconomy financing across the SADC region is in its early stages, with investments primarily focused on sectors with clear commercial viability and quick returns such as agriculture and biofuels. The bioeconomy investment landscape is largely fragmented and characterised by uneven resource allocation and inconsistent policy frameworks. Overall, a cohesive, region-wide financing strategy for the bioeconomy remains absent across the SADC region.

In general, private investment, while growing, remains relatively small and concentrated. It includes impact investors focusing on sustainable agriculture or ecotourism, commercial investors in sectors such as timber or nutraceuticals, and increasingly, venture capital in emerging areas such as medicinal cannabis. <u>Table 3</u> illustrates emerging opportunities and instruments by sector.

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TABLE 3: EMERGING OPPORTUNITIES AND INSTRUMENTS BY SECTOR

SECTORS EMERGING OPPORTUNITIES INNOVATIVE MECHANISMS Nature-intensive bioeconomy Wildlife a. Ecotourism - Private investment in a. Rhino Bond – a blended finance model worth US \$150 million issued by the World Bank ecotourism (especially high-end lodges, economy wildlife estates, and nature-based and the capital was raised from institutional experiences) has expanded steadily, Other investors. This initiative was to help increase examples exist in Botswana, Namibia, and the population of the endangered Black South Africa's Greater Kruger Area attracting Rhino species in South Africa equity and impact investors Section 37C(1) of South Africa's Income b. Eco trade - Eco trade ventures, such as Tax Act is an environmental tax incentive honey production, sustainable harvesting that allows for a deduction of qualifying of edible insects, or indigenous flower conservation and maintenance expenses cultivation are gaining traction but still lack from the taxable income of eligible taxpayers, structured investment frameworks. Publiceffectively reducing tax payable and private partnership projects for beekeeping releasing additional finance for conservation in Zambia and Zimbabwe have shown strong efforts. Not only does this tax incentive provide for a reduction in tax paid, but a potential for job creation, biodiversity Candidate Other Effective Area-based conservation, and women's economic inclusion Conservation Measure (OECM) is created. The creation of Candidate OECMs and use of the tax incentive will contribute to South Africa's targets committed to under the Global Biodiversity Framework (GBF) Target 3 (i.e., 30×30 area-based conservation target), and Target 18, and species protection goals under Sustainable Development Goal 15-Life on Land. Sustainable a. Regenerative practices have seen a 13% a. The OPEC Fund for International increase in crop yield across Sub-Saharan Development's sustainability-linked loan agriculture African region opening doors to smallholder to the ETC Group aims to improve farmer farmers and agribusinesses to receive livelihoods and reduce environmental additional funding and access to financing. impacts for over 600,000 smallholder farmers across sub-Saharan Africa b. Sustainable fish farming – Freshwater and coastal aquaculture are underutilised in the b. Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved SADC bioeconomy but present significant Private Sector and Smallholder Skills project opportunities for enhancing food security and the blue economy. While donor-funded (AQ TEVET), - capacity development. Funded projects have initiated some hubs, private by NORAD is a PPP for capacity building of investment is nascent. There is a need to SMEs in Zambia attract more private capital and supportive c. GCF Regenerative and Agro-ecological policies to scale up the aquaculture sector Landscapes Acceleration Facility supports c. Agroforestry - Countries like Tanzania, the design of a blended finance and TA Malawi and Mozambique hold potential in facility to enhance adaptation and food coffee production. The awareness and security for smallholder farmers across adoption of the agroforestry sector are regenerative and agroecological landscapes increasing slowly, and private investments in Zambia and Tanzania, among other

countries. Includes grants, technical support, investment in agribusiness and funding for

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nature-based solutions

can be a catalyst in such a scenario

Advanced bioeconomy

Bio-based products

- a. Biofuels Advanced bioeconomy sectors such as biofuels are emerging fastest where value chains are clear, and technology is more mature. For example, biofuels derived from macadamia nuts are attracting interest from energy and logistics firms seeking decarbonisation options
- b. Textiles Sustainable textiles and biodegradable packaging from hemp, pineapple leaves, and cactus are entering global niche markets such as textiles, packaging, several South African startups are developing hemp-based composites for the automotive sector, drawing early-stage equity and accelerator funding
- c. Seaweed/kelp farming/processing into fertiliser is also a growing bioeconomy sector in the bioeconomy

- a. Venture capital firms invest in startups in South Africa developing biodegradable and compostable packaging solutions.
 For example, Unruly Capital invests in biotechnology in South Africa, Twynam Agricultural Group invests in biotechnology, agriculture and seafood in South Africa
- b. <u>GIZ and UNEP Collaboration, in South Africa</u> supports circular economy projects through green bonds to enhance sustainability
- c. The SADC trade-related facility provides financial and technical support to boost intra and inter-regional trade, benefiting bio-based consumer goods. Improving trade facilitation processes to enhance the competitiveness of bio-based exports by reducing customs and bureaucratic hurdles

High-tech bioeconomy

Biotechnology

- a. CBD oils, health supplements, and therapeutic products – The most technologically advanced segment—biotech solutions rooted in <u>CBD</u>, medicinal flora, and health supplements—is receiving increased attention in <u>South Africa</u>, <u>Zimbabwe</u>, and Lesotho
 - With rising global demand for plant-based wellness and phytomedicine, private equity firms, pharma companies, and wellness brands are showing interest in CBD oils, nutraceuticals, and IPLC medicinal knowledge. Publicly available data does not show that this interest has translated into investments.
- b. IPLC medicinal flora These ventures face IP, regulatory, and benefit-sharing <u>complexities</u>
 —requiring safeguards and partnerships with Indigenous Peoples and Local Communities (IPLCs).

- a. South Africa's innovation hubs, such as the one in <u>Gauteng</u>, support <u>biotech startups</u> through incubation and funding. Venture capital firms such as <u>Future Growth Asset Management and Unruly Capital</u> are key investors in the country's biotech sector
- b. South Africa uses social impact bonds to finance social welfare projects, with investor returns linked to achieving outcomes like job placement. This model, though not yet applied to biotech, could be adapted to support community beneficiation in related sectors

The nature-intensive bioeconomy offers strong local development and conservation benefits but remains underfinanced, especially for community-led ventures in ecotrade such as honey, edible insects, and indigenous flora. These sectors lack formal investment frameworks, preventing private capital from flowing at scale. Expanding performance-based instruments like biodiversity credits, eco-certification incentives, and trade finance, alongside harmonised regional investment policies, could help de-risk these sectors and attract cross-border financing.

The advanced bioeconomy is growing rapidly, driven by clear value chains and decarbonisation targets. Biofuels and sustainable biomaterials are drawing private interest, particularly in South Africa, where feedstock security and policy incentives exist. However, inconsistent regulations, lack of enabling policy environment for small SME development, poor manufacturing infrastructure, and weak intra-regional trade remain key constraints. Scaling green bonds and incentivising regional bio-based manufacturing hubs could catalyse broader investment across the SADC region.

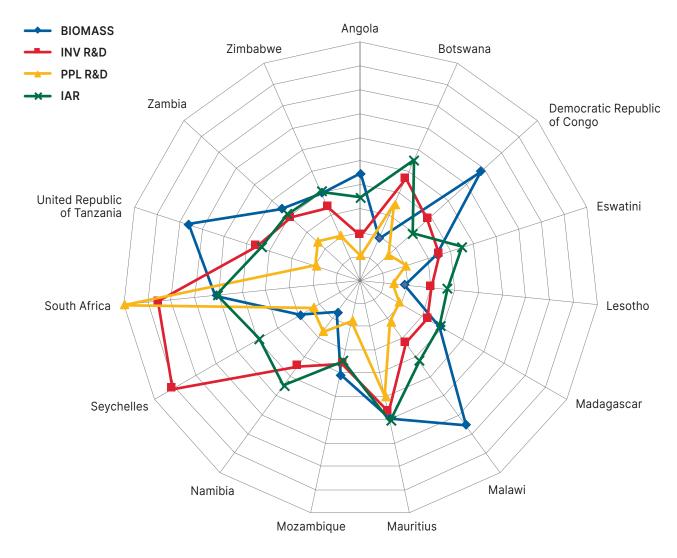
Despite high potential, the high-tech bioeconomy remains underfunded due to regulatory, intellectual property, and benefit-sharing challenges. While South Africa shows early progress in biotech investment, most SADC countries lack structured financing pathways. Regional initiatives like the SADC Pharmaceutical Plan and the African Pharmaceutical Technology Foundation are steps forward, but further tools—such as social impact bonds, tax incentives, and outcomelinked finance—are needed to mobilise capital for IPLC-driven and biotech innovation across the region.

Bioeconomy readiness assessment of the Southern African Development Community

Source: Pers. comm. authors of https://link.springer.com/content/pdf/10.1007/978-3-030-45106-6_82.pdf, which also contains the full methodology for developing the BRI

The Bioeconomy Readiness Index (BRI) for each of the member states of the Southern African Development Community (SADC) was derived from their respective production determinants of bioeconomy. The BRI reflects the overall performance of a country across these four production determinants. Figure 1 shows the bioeconomy production determinants for each SADC country, where the four primary production determinants of the bioeconomy are sources of biomass (BIOMASS), investment in R&D (INV RD), people in R&D (PPL RD), and institutional arrangements (IAR). The focus in the BRI is on production and does not include the extent of recycling/circularity of the economy.

FIGURE 1: BIOECONOMY PRODUCTION DETERMINANTS IN SADC COUNTRIES

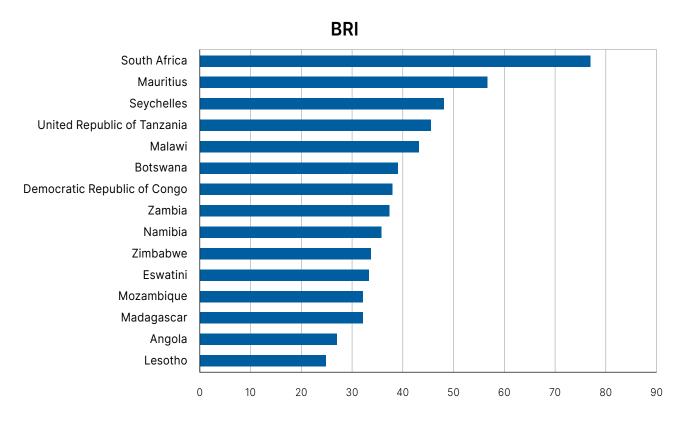


Key: sources of biomass (BIOMASS), investment in R&D (INV RD), people in R&D (PPL RD), and institutional arrangements (IAR)

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Figure 2 shows the overall standing of the SADC countries in terms of bioeconomy readiness/potential.

FIGURE 2: SADC COUNTRIES' BIOECONOMY READINESS/POTENTIAL



For Africa as a whole, the top countries in terms of readiness to adopt bioeconomy as climate action are South Africa, Kenya, Mauritius, Rwanda, and Morocco (Oguntuase & Adu, 2021).

According to <u>Oguntuase & Adu (2021)</u>, strategies to promote the bioeconomy in Africa must focus on targeted investments to support R&D activities, building efficient innovation systems, improving the level of education, training, and skills related to the bioeconomy and supporting market development to enhance competitiveness. African countries also need to improve general governance, the quality of their infrastructure, and the rule of law, to attract foreign investment into the bioeconomy sectors (Oguntuase & Adu, 2021).

Overall, in order to unlock and grow the bioeconomy in SADC, there is a need for supportive regulatory frameworks, institutions and financing mechanisms.

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