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SADC Industrialisation Futures: Towards Economic Wellbeing

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African perspectives
Global insights

Executive summary

The Southern African Development Community (SADC) is to transform the region as per SADC Vision 2050, which seeks to build a competitive middle- to high-income industrialised society. Historically, technological progress has been a crucial driver of transformation. We are now at the cusp of the Fourth Industrial Revolution (4IR) or Industry 4.0, which is bringing forth technologies that provide an opportunity to leapfrog and transform southern Africa's industries to evolve into uniquely African expressions of the fourth iteration of the revolution.

However, the futures of industrialisation in SADC require an in-depth understanding of Industry 4.0 and other important drivers. These include the greening of economies; urbanisation and rising incomes; the shift towards decentralisation, especially in energy; and the shift of geopolitical power as China rises. The main uncertainties that will shape SADC's industrialisation are the governance of Industry 4.0 on the one hand and the shift towards sustainability or GEs on the other. Multinational technology companies are already exerting significant control over Industry 4.0 technologies, as emerging platform economies give them significant political and financial power, such that they can fend off government regulation that might be to the benefit of the poor and marginalised. On the other hand, a shift towards sustainability is gaining impetus on the back of global treaties to combat climate change among other things. However, legacy industries vested in carbon-based economies are putting up significant resistance.

The interaction of the two uncertainties discussed above provides several probable futures, many of which have already started emerging in present-day Southern Africa. A future already emerging is the use of 'cobots', robots that complement humans, therefore posing less of a threat to job availability. At another extreme, Industry 4.0 platform economies are breaking traditional jobs into small gigs that are creating the equivalent of modern-day sweatshops.

Achieving a desired future and fulfilling the SADC Vision 2050 will crucially depend on nurturing the pockets of the future while ensuring we do not break the present.

Introduction

Southern Africa has a serious poverty and job challenge, and there is a need to transform the underlying principles of many of its economies. Economic transformation and new-technology adoption can increase productivity and unleash more dynamic sectors that absorb labour; it is seen as the way forward in creating sustained, high-growth

and also decent jobs.¹ Various transformation pathways have been proposed including: (i) agriculture-driven transformation via agro-processing;² (ii) local content and local participation to capture greater value from commodities;³ (iii) modernisation of the services sector to increase productivity;⁴ (iv) export-oriented manufacturing;⁵ (v) infrastructure enhancement to enable agglomeration and jobs;⁶ (vi) creative economies by leveraging African culture and creativity as a unique selling point;⁷ and (viii) tourism.⁸

The transformation imperative for Southern Africa is captured in the SADC Vision 2050, which seeks to build a competitive middle- to high-income industrialised region that guarantees its citizens sustainable economic wellbeing as well as peace, justice and freedom by 2050.⁹ One of the core pillars of this vision is Industrial Development and Market Integration.¹⁰ Further, the SADC regional strategic plan¹¹ seeks to promote technological driven economic transformation that will see the region shift from comparative to competitive advantage through modernisation, upgrading, skills development, science and technology, financial strengthening and deeper regional integration.¹²

As SADC seeks to emulate the transformation experienced by the so-called Asian Tigers the principal transformation ingredients remain supportive infrastructure and diversification away from primary commodities. However, the actual strategy needs to reflect the changing landscape and also local context. While lessons from the past can give some insight, it is vital to examine the emerging landscape and craft a strategy that will anticipate potential futures and identify opportunities (and also potential pitfalls) – and thus map desirable outcomes.

Historically, technological progress has been a crucial driver of transformation. While technological progress is continuous, an occasional breakthrough occurs that leads to a new trajectory of productivity. These breakthroughs have been referred to as industrial revolutions. The World Economic Forum (WEF)¹³ argues that recent breakthroughs

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- 1 The International Labour Organization defines decent jobs as opportunities for work that are productive and deliver a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organise and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men, see International Labour Organization, "Decent Work".
 - 2 African Centre For Economic Transformation, African Transformation Report 2017: Agriculture Powering Africa's Economic Transformation (Accra: ACET, 2017).
 - 3 ACET, 2014 African Transformation Report (Accra: ACET, 2014).
 - 4 Simbanegavi et al., World of Work in the 4th Industrial Revolution: Inclusive and Structural Transformation for a Better Africa (Argentina: G20, 2019).
 - 5 ACET, 2014 African Transformation Report; H Bhorat & F Tarp (eds) Africa's Lions: Growth Traps and Opportunities for Six African Economies (Washington DC: Brookings Institution Press, 2016).
 - 6 ME Freire, S Lall & D Leipziger "Africa's Urbanization: Challenges and Opportunities", Working Paper No. 7 (Washington DC: The Growth Dialogue, 2014).
 - 7 African Development Bank, Investing in the Creative Industries: Fashionomics (Abidjan: AfDB, nd).
 - 8 ACET, 2014 African Transformation Report.
 - 9 Southern African Development Community, Vision 2050 (Gaborone: SADC, 2020).
 - 10 The others are Infrastructure Development in Support of Regional Integration, and Social and Human Capital Development, anchored in a firm foundation of Peace, Security, and Good Governance.
 - 11 SADC, "Regional Indicative Strategic Development Plan (RISDP) 2020–2030" (Gaborone: 2020).
 - 12 SADC, "Industrialization Strategy And Roadmap 2015–2063" (Gaborone: July 2015).
 - 13 World Economic Forum, "Mastering the Fourth Industrial Revolution" (Davos-Klosters: WEF, 2016).

in information and communication technologies (ICTs),¹⁴ which are unleashing new capabilities that are increasingly making machines available to replace (or complement) workers at all levels and reshaping the nature of work, constitute a new revolution. This technological revolution is being referred to as the Fourth Industrial Revolution (4IR) or Industry 4.0. It has been accelerated by COVID-19, which has forced the rapid adoption of 4IR technologies. The pandemic has led to further enhancement of these technologies and, importantly, also changed our perception of work and therefore acceptance of new ways of working.

Industry 4.0 will not be the only megatrend playing a crucial role in shaping industrialisation. Therefore, an anticipation of industrialisation futures within SADC will require an in-depth understanding of Industry 4.0 and its interactions with the other drivers. This understanding is pivotal to modelling probable – and indeed desirable – futures and crafting an Industry 4.0 strategy for the region. This paper explores SADC’s industrialisation futures by analysing the possible scenarios arising from the region’s strategy and the megatrends that have an impact on it. Furthermore, it reimagines potential and unpacks alternative and desired futures to transform and shape SADC’s industrialisation in the 4IR.

Industrialisation futures for SADC: Possible scenarios

SADC has developed an industrialisation policy¹⁵ and SADC Vision 2050,¹⁶ which provide an industrialisation roadmap. The SADC Green Economy Strategy¹⁷ further elaborates this roadmap for sustainable industrialisation. However, industrialisation will take place in the context of large megatrends shaping the global development trajectory. The interaction of the SADC strategy and the global megatrends provide space to develop probable industrialisation futures for the region. This is explored below.

SADC’s industrialisation strategy: An overview

SADC’s industrialisation strategy is premised on the conviction that strong regional integration will boost and enable enduring conditions for competitive advantage at enterprise level. The strategy primarily relies on: (i) agro-processing, (ii) mineral beneficiation and (iii) regional value chains. The strategy also looks beyond production and exchange of physical goods and sees services linked to industrialisation as important constituents.

14 The key technologies driving the Fourth Industrial Revolution are: (i) machine learning/artificial intelligence/robotics; (ii) devices linked to the internet (Internet of Things); (iii) data-mining technologies/data science; (iv) blockchain or trust technologies; and (v) renewable energy and related technologies.

15 SADC, “SADC Industrialization Strategy and Roadmap 2015–2063”.

16 SADC, “Vision 2050”.

17 SADC, “Green Economy Strategy And Action Plan For Sustainable Development” (Gaborone: July 2015).

SADC's industrialisation strategy is premised on the conviction that strong regional integration will boost and enable enduring conditions for competitive advantage at enterprise level

The strategy recognises the potential impact of the emerging global technological evolutions on trade patterns and calls for technological upgrading and innovation to stay competitive. The strategy sees ICT as playing a pivotal role as an enabler of industrialisation, for example by enhancing links between research and development institutions and industry. Also regarding ICT as a catalyst to industrialisation, the strategy calls for mainstreaming ICT in all aspects of the economy. The strategy also calls for a high level of science, technology, engineering and mathematics (STEM) training and proposes a reshaping of the education system and the creation of regional centres of excellence and specialisation.

Sustainability also plays a central role in SADC's vision of the future, which emphasises the adoption of resource-efficient, waste-reducing technologies and modes that minimise greenhouse-gas emission. Under SADC's green economy (GE) strategy, policies and investments are expected to (i) mitigate climate change by reducing greenhouse-gas emissions and promoting a low-carbon economy; (ii) adapt to climate change by managing natural resources sustainably; and (iii) develop sustainably by promoting inclusive and sustainable growth, creating employment and improving overall quality of life.

Key megatrends that have an impact on SADC's industrialisation

Five big trends – (1) 4IR, (2) the sustainability movement and GE, (3) socio-economic drivers, (4) the rise of China (and the rest of the world), and (5) movement from a hierarchical to decentralised energy society – relevant to understanding SADC industrialisation futures are briefly discussed below.

The Fourth Industrial Revolution

4IR technologies present new opportunities and challenges. Businesses will benefit and achieve a competitive advantage from automation technologies, not just from labour cost reductions, but also from enhanced performance. At the same time, automation creates significant anxieties with likely loss of jobs.¹⁸ 4IR also enables the emergence of

¹⁸ E Brynjolfsson & A McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (New York: WW Norton & Company, 2014). Early estimates had put jobs susceptible to automation at 47% in the US. Recent research estimates only 5 to 10% of jobs are susceptible to automation, though for 60% of jobs, at least 30% of the tasks can be automated. See McKinsey Global Institute, "A Future That Works: Automation, Employment, And Productivity" (Washington: McKinsey Global Institute, 2017). McKinsey's latest estimate puts global job losses due to automation at 15% through to 2030. See J Manyika, S Lund, M Chui, et al., "What the Future of Work Will Mean for Jobs, Skills, and Wages", McKinsey Global Institute (November 28, 2017).

new platforms that are morphing into monopolies; Amazon, for example, has been able to capture tremendous value created in economic activity, while at the same time going to great lengths to root out smaller competitors through suspect business practices.¹⁹

While automation is seen as a threat to labour, labour itself is perceived as cheaper in Africa compared to developed countries, which means that it will take more time before robots replace people

What Industry 4.0 means for SADC needs to be further interrogated.²⁰ While automation is seen as a threat to labour, labour itself is perceived as cheaper in Africa compared to developed countries,²¹ which means that it will take more time before robots replace people.²² Automation, however, also means that the prospects are dim of manufacturing jobs moving from Asia to Africa as labour costs in Asia rise. Therefore, export-oriented manufacturing that powered growth in East Asia is a problematic transformation pathway. All the same, many of the transformation pathways proposed can be energised by the 4IR. For instance, 4IR technologies can improve productivity in agriculture (crop surveillance by drones) and formalise the informal sector (the platform business model can link service providers to buyers, who can then rate and pay for services and so forth). The potential of the 4IR to drive transformation in Africa is summarised in Table 1. Indeed, SADC sees immense potential in the 4IR as a dynamic force for future economic, social, cultural and political development.²³ It is expected to reduce trade costs, especially for small companies, and create new niches and markets. It is in addition hoped that new technologies will improve access to public services and quality of public policies.²⁴ But SADC is also aware that the developments associated with the 4IR make it a double-edged sword. The risks include automation, reshoring manufacturing operations to advanced economies, a potentially unprepared skills base and outdated technology, and illicit financial flows. 4IR technologies could simultaneously eliminate and deepen inequality, thus underscoring

19 M Stoller, "At Last, The Regime that Enabled Amazon's Monopoly Power is Crumbling", *The Guardian* (February 4, 2021).

20 On the one hand, the growing digital economy provides an opportunity for developing and emerging economies to leapfrog and achieve economic and technological catch-up through using digital technologies and building capacities in the digital economy. On the other hand, these technological shifts threaten to widen the technological divide, with advanced economies making ongoing catch-up efforts ineffective. See C Foster and S Azmeah, "Bridging the digital divide and supporting increased digital trade: Scoping study", South African Institute of International Affairs (20 August 2018).

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22 Using the wage rate of a high-end robot (costing \$28 per hour) that can be used to make furniture, and assuming an annual decline in the cost of robots of 6.5%, an Overseas Development Institute study finds that it will take until 2032 for robots to take over this sector in Kenya. Thus, a significant window of opportunity exists before robots take over; see K Banga & DW Te Velde, "Digitalisation and the Future of Manufacturing in Africa", Overseas Development Institute, March 2018.

23 SADC "ICT Ministers: SADC Declaration on the 4th Industrial Revolution" (Zimbali: 7 September 2017).

24 SADC, "Vision 2050".

the need for a well-thought out strategy.²⁵ SADC has strongly emphasised STEM skills in preparation for Industry 4.0 and called for ICTs to be fully integrated into all sectors.²⁶

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The sustainability movement and green economy

Growing concerns over climate change has placed sharp focus on sustainability. These concerns have galvanised the global community to adopt the UN Sustainable Development Goals (SDGs) as the new global agenda and, perhaps more bindingly, greenhouse-gas-reduction targets as outlined in the Paris Agreement (COP21).²⁷ Further, the sustainability agenda is boosting a GE²⁸ that has significant potential to create jobs. In this regard, there is a shift to a new energy regime. The rapid deployment and falling costs of clean-energy technologies is one of the defining trends in the world energy outlook.²⁹ In general, renewables are likely to be the least costly source of new energy generation by 2040. All the same, the key impact will come from the radical change of economic models. Other emerging green-energy paradigms gaining traction include the bioeconomy (using renewable biological resources) and circular economy (re-using waste).

The sustainability agenda has been adopted and the vision captured under the African Union's Agenda 2063 – the blueprint and masterplan that aims to deliver inclusive and sustainable development on the continent. SADC has cascaded this into its 2050 vision. At the global level, SADC's development agenda is also guided by the SDGs³⁰ as reflected in the specific objectives of the regional strategic plan, the RISDP.³¹

Producing cobalt, platinum, lithium, copper and other essential GE commodities, SADC is particularly well positioned to benefit from the shift. Many of the economies on the continent are agriculturally based, which means that an emphasis on bioeconomy provides an important transformation pathway; the RISDP recognises this, and agro-processing is

25 SADC, "Declaration on 4th industrial Revolution".

26 SADC, "Vision 2050".

27 See UNFCCC, "The Paris Agreement" (Le Bourget: UNFCCC, April 22, 2016).

28 The United Nations Environmental Programme defines the green economy as: 'low carbon, resource efficient and socially inclusive... [where] growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services'. See United Nations Environmental Programme, "Green Economy", UNEP (January 2022).

29 International Energy Agency, "World Energy Outlook, 2017" (Paris: International Energy Agency, 2017).

30 The Sustainable Development Goals encompass four key pillars, namely Social Inclusion (Goals 1-7), Economic Growth (Goals 8-11), Environmental Responsibility (Goals 12-15) and Governance (Goals 16 and 17).

31 SADC, "Regional Indicative Strategic Development Plan (RISDP) 2020-2030".

seen as a key pillar of SADC Vision 2050. As pointed out, SADC has developed a GE strategy that aims to catalyse socio-economic transformation to become resource efficient and environmentally sustainable.

Socio-economic drivers

Societal change in terms of structure, incomes, behaviours and perceptions will shape consumption and thus demand-and-supply responses. Shifts in demography and the socio-economy are expected to have nearly as strong an impact as technological change on business models and organisational structures.³² Socio-economic drivers include: (i) a changing work environment and flexible work arrangements; (ii) the rise of the middle class in emerging markets; (iii) climate change, natural-resource constraints and the transition to a greener economy; (iv) rapid urbanisation; and (v) income uncertainty.³³

For Africa and SADC in particular, the fundamental relevant driver is demographics. The vast youth population provides potential for demographic dividends but could also be a source of instability, especially the lack of skilled youth in emerging high value areas, if economies do not generate jobs.³⁴ Urbanisation and the rising middle class create dynamic new markets but also the emergence of slums, which problematise urbanisation as an engine of growth.

The rise of China (and the rest of the world)

A major geopolitical development with significant implications is the rise of emerging economies and especially China and the expanding Middle East region. As China seeks to become a dominant power, and the West seeks to keep this aspiration in check, new global dynamics are emerging and will shape the trajectory for the immediate short term. China's quest to be a leader in Industry 4.0 is accelerating innovation, while America's desire to limit this movement from Asia – for instance by outlawing leading Chinese 5G technology company Huawei – is creating roadblocks.³⁵ The geopolitical risks a powerful China is seen to pose also call for global value chains to be re-ordered to reduce dependence on the Asian country, and this has led to the reshoring of manufacturing plants, made possible through greater investment in robots.

For Africa, China's geopolitical quest and its ramifications poses both opportunities and threats. For example, Africa could leverage China's Belt and Road Initiative (BRI), perhaps the country's most ambitious geopolitical one, especially in the context of the African

32 WEF, "Mastering the Fourth Industrial Revolution".

33 Others include: rising geopolitical volatility, new consumer concerns about ethical and privacy issue, longevity and aging societies, the rising aspiration and economic power of women; and the growing desire for better work-life balance.

34 African Development Bank, "Growth and Job Creation: Policy Options for Pro-Employment Growth", background paper for the "African Economic Outlook 2018" (Abidjan: African Development Bank Group, 2018).

35 D Strumpf & KS Ferek, "U.S. Tightens Restrictions on Huawei's Access to Chips", *The Wall Street Journal* (August 17, 2020).

Continental Free Trade Area (AfCFTA) to develop the necessary infrastructure.³⁶ As the world's largest manufacturing hub, China has an incentive to be a part of the AfCFTA and to sell goods into this market – and maybe even move manufacturing to Africa. In addition, as we see a transition in payments infrastructure innovations, with many Chinese companies leading the way, these firms will explore opportunities in Africa. However, there are also concerns that China could undermine the AfCFTA by flooding it with cheap goods and its own currency and payments offerings. Thus, proactive integration of the BRI and AfCFTA should be prioritised to ensure that they complement each other,³⁷ especially in terms of facilitating and supporting established relevant regional strategies such as the SADC industrialisation vision.

From hierarchical to decentralised energy society

Political power is likely to dissipate from centralised to local levels and also to regional and global governance systems. Power is also dissipating from corporates to consumers as sustainable consumption gains traction. The decentralisation process is perhaps most advanced in the energy sector. One example is the potential impact of renewable energy, which has could shift paradigms in power generation from a centralised-utility model (one large generator supplying to many consumers) to a distributed-generation model (consumers also generating power). In the latter model, any consumer with a roof is potentially a generator of solar power. To accelerate the decentralisation, blockchain has been nominated as a solution to current challenges³⁸ impeding the shift to distributed energy systems. It is hoped that this opportunity will be unlocked by bringing together dozens of stakeholders and building an open-source blockchain platform.³⁹ Thus the shift to renewable energy sources will have significant implications on geo- as well as local politics, as power is literally moved to the people, leading to a more decentralised (as opposite to a hierarchical) industrialised society.

36 Y Fu & O Eguegu, "China's BRI and the AfCFTA: Potential Overlaps, Complementarities and Challenges", SAIIA Policy Insights 113 (Johannesburg: South African Institute of International Affairs, 2021).

37 Fu & Eguegu, "China's BRI and the AfCFTA".

38 The Energy Web Foundation writes the following: i) Controlling demand is difficult. Customers are concerned about privacy and sometimes loathe to share data; ii) Tracking flows of energy is imperfect. It can be expensive to run and can usually be accessed only via intermediaries; iii) Not everyone can participate in the grid's evolution; only large, sophisticated businesses are able to enter into off-site power-purchase agreements for renewables. In emerging economies, access to capital is a major barrier to accessing renewable energy; iv) Putting customers and distributed energy resources first is challenging. The entire grid was originally designed from the top down, making it challenging to put customers and distributed energy resources first. See N Nhede, "New Energy Consumer Demands and How to Fulfil Them", Smart Energy International (April 3, 2020).

39 J Morris, "The Energy Web Foundation: Bringing Blockchain Technology to the Grid", *Renewable Energy World* (February 23, 2017).

TABLE 1 POTENTIAL APPLICATION OF 4IR IN DRIVING TRANSFORMATION

Transformation strategy	4IR technology					
	AI/Machine Learning	Internet of Things	Big Data/Data Science	3D Printing	Blockchain Technologies	Net Impact on competitiveness
Agricultural transformation	<ul style="list-style-type: none"> Application in breeding to speed varietal selection Intelligent robots are reducing inputs applications by over 90% 	<ul style="list-style-type: none"> Use of drones for crop monitoring Internet-enabled irrigation systems 	<ul style="list-style-type: none"> Telephone farming E-extension Inputs-as-service business models Big Data for credit scoring 	Locally fabricated agricultural machines	Food traceability system for international trade	Very High – Agriculture has potentially many entry points and little downside in terms of job losses
Modernised services	<ul style="list-style-type: none"> Driverless cars will kill jobs in transportation Potentially very many applications, eg. credit scoring using non-standard data 	M-KOPA selling solar power as utility/service through internet-enabled cookers and solar panels	<ul style="list-style-type: none"> Shared economy eg. AirBnB Financial inclusion eg. Micro-insurance E-commerce eg. Jumia, iRoko 	<ul style="list-style-type: none"> Toll/contract manufacturing Community workshops 	<ul style="list-style-type: none"> Numerous trust-based applications (land registries, contracting) Crypto-currency-based transactions 	Very High – This sector is already very dynamic. An e-commerce company, M-Pesa, valued at \$1 billion, is the biggest money transfer service in the world
Local content	Potential for development of sophisticated machine-learning algorithms for interpretation and/or exploration data	Drone-based services, eg. facilities inspection, mapping etc.	Geological data mining may create new opportunities	<ul style="list-style-type: none"> Locally manufactured parts Scope for small scale, flexible production 	Through provenance and auditability, boost local content and recording of data onto blockchain systems	High to Moderate – Much potential here but will require much support to build new capability, especially in AI, data science and 3D printing
Export-led manufacturing	Advanced robots will kill cheap labour advantage		Will enable fine-grained market segmentation and kill mass markets	Will kill the mass production manufacturing model. But can bring back craft-based manufacturing, allowing for creation of niche export markets	Will improve inefficiencies, reduce cost and enable greater value addition of commodities	Moderate – will require significant efforts to create niche products and niche markets

	Smart metering and smart grid technologies	Alternative infrastructure eg. drones	Smart cities and other tools to help optimise infrastructure	On site manufacture of parts		
Creative industries	New tools		Platforms for distribution	Ability to convert designs to products	Rise innovations such as avatars, NFTS linked to blockchain will boost creativity	Very high – products highly amenable to digitalisation
Tourism	New tools to showcase eg. virtual reality		<ul style="list-style-type: none"> • Better targeting of marketing efforts • New platforms eg. AirBnB expanding potential tourist 			High – 4IR can help create new experiences and improve service delivery
Overall impact of 4IR technology	Will kill traditional paths to industrialisation		The most dynamic of 4IR technology for Africa. Potential to create many jobs	Presents great opportunity for leapfrogging into manufacturing	Potential to formalise the large informal sector	

Source: African Development Bank Group, Asian Development Bank, European Bank for Reconstruction and Development & Inter-American Development Bank, "The Future of Work: Regional Perspectives" (May 2018)

SADC's industrialisation futures and Industry 4.0: Potential futures

One could argue that SADC's industrialisation strategy recognises the global megatrends that will shape the future. Yet the existing documents do not elaborate what this means in terms of probable futures.

Re-imagining SADC industrialisation futures

The mapped megatrends are likely to interact in very interesting ways, opening the potential for a variety of alternative futures. The key impacts include (i) digitising economies and transitioning to GEs; (ii) re-organising social structures, including business and politics

(including geopolitics); and (iii) leapfrogging and decolonising economies.⁴⁰ The transition to industrialisation has the further potential of helping emerging economies leapfrog legacy industries, as 4IR technologies provide totally new ways of working that create whole new industrial sectors, such as 3D-centric distributive manufacturing and the future green hydrogen economy.

Digitising and greening economies and impacts for informality

A key feature of Africa's economies is informality.⁴¹ Sub-Saharan Africa's share in informal economic activity remains among the world's largest. Informality tends to be a drag on economies due to low productivity and the low-paying and vulnerable jobs associated with the sector.⁴² The 4IR has the potential to 'formalise' informal economies as indeed many informal activities, such as taxi driving, are increasingly becoming organised by digitising⁴³ services on platforms enabling innovative African responses in the age of digital disruption. Informal motorcycle deliveries are increasingly being linked to formal business as the last-mile delivery link on platforms such as Uber. This is further deepened through platforms organising the informal sector. For example, Lynk is a platform that connects households and businesses with verified domestic workers, artisans and blue-collar professionals in Nairobi.⁴⁴ The key to success will hinge on effective platforms that not only help formalise the sector but also improve its productivity. More crucially, once informal workers are put on a platform, other services – like social security, skills upgrading and so forth – can easily be provided there, as the transaction costs are much lower.

The 4IR also holds significant potential in deploying renewable energy through smart-grid technologies that connect intermittent renewable-energy power sources to existing grids. Crucially, these technologies can enable completely new business models through decentralised, off-grid energy, especially solar. For example, M-KOPA uses the Internet of Things (IoT) to sell solar power to customers in East Africa. It has 1 million poor households using an IoT platform that connects solar panels and cooking stoves to the internet.⁴⁵ As already pointed out, blockchain technology could change the energy-generation landscape

40 Decolonising economies refers to engaging with the global economy's underlying connecting structures and their effects on developing economies that are embedded in systemic inequality. Decolonisation explores the notion of power relations as a precondition for economic wellbeing and just transitions in the context of environmental breakdown and its effects.

41 Specifically, the informal sector emphasises self-financed, under-capitalised, small-scale, unskilled-labour-intensive production. An alternative definition is a 'process of income generation' that is 'unregulated by the institutions of society, in a legal and social environment in which similar activities are regulated'. From S Pratap & E Quintin, "Are Labour Markets Segmented in Developing Countries? A Semiparametric Approach" *European Economic Review* volume 50, issue 7, 2006, 1817-1841.

42 There is significant heterogeneity in the size of informality in sub-Saharan Africa, ranging from a low of 20 to 25% of formal sector output in Mauritius, South Africa and Namibia to a high of 50 to 65% in Benin, Tanzania and Nigeria. See L Medina, A Jonelis & M Cangul, "The Informal Economy in Sub-Saharan Africa: Size and Determinants" International Monetary Fund Working Paper 17/156 (Washington: International Monetary Fund, 2017).

43 M Chivunga & A Tempest, "Digital Disruption in Africa: Mapping Innovations for the AfCFTA in Post-COVID Times" SAIIA Occasional Paper 317 (Johannesburg: Institute of International Affairs, January 2021).

44 According to its LinkedIn profile, Lynk envisions 'a world in which informal sector workers can enjoy job security, fair wages, a safe work environment, and the opportunity for career growth. Additionally, for households and businesses, hiring someone should be safe, convenient, and fair. Our platform is designed to address each of these issues, offering a network of professionals that grows and improves over time'.

45 See About - M-KOPA.

by solving many of the issues impeding current centralised energy systems and ensuring a transition to fully decentralised energy systems. For example, blockchain can enable a just energy transition in SADC by providing privacy and enhancing cybersecurity. Blockchain provides a low-cost way to manage transactions focused on distributed energy resources at the edge of the distribution grid, and a transparent and secure way of tracking energy flows. Enabling small-scale and low-credit customers to participate in business models focused on distributed energy resources and renewable energy, blockchain balances and manages the grid from the bottom up, as opposed to today's top-down approach.⁴⁶

Leapfrogging and decolonising

4IR platforms produce opportunities for leapfrogging. Some examples include:

- The 4IR has the potential to bank many unbanked through fintech innovation, especially mobile money. The exemplar of this is the M-Pesa platform in Kenya.
- The leading e-commerce platform in Africa, Jumia, is seeing more and more of its sales come from mobile platforms as opposed to computers.⁴⁷ With the advent of 5G networks – which are expected to outperform broadband and indeed usher in a whole new range of possibilities, especially in IoT – Africa's laggard position should no longer be an issue.
- 3D capabilities open the potential to totally change manufacturing in Africa. Malawi's first 3D-printed house has been completed. A joint venture currently operating in Kenya and Malawi is able to build a 3D-printed house in just 12 hours at a cost of under \$10 000. 3D technology promises to revolutionise the housing industry, potentially cutting costs by more than 60%.⁴⁸
- Decentralised renewable-energy systems serving the poor, for example those available through M-KOPA, also present a leapfrogging opportunity.

New business model

4IR is already reshaping business, as the platform model⁴⁹ is increasing its dominance. Businesses are likely to undergo further profound re-organisation due to 4IR technologies. Blockchain allows transactions between two or more parties without a neutral central authority. Simply put, it is a machine for creating trust.⁵⁰ Crucially, blockchain technologies

46 J Morris, "The Energy Web Foundation: Bringing Blockchain Technology to the Grid", *Renewable Energy World* (February 23, 2017). For more, see: D Cloete, N Grobbelaar & T Bertelsmann-Scott, "SADC Futures of e-Mobility: EVs as Enablers of a New Energy Paradigm" SAIIA Special Report (Johannesburg: Institute of International Affairs, December 2020).

47 J Ngunjiri, "Kenya Tops in Phone Internet Traffic Globally", *Business Daily* (March 20, 2018).

48 S Fleming, "The Affordable 3D-printed Home That Could Transform African Urbanization" World Economic Forum (June 30, 2021).

49 Supported by global digital infrastructure, the platform model creates value by facilitating (typically short-term) exchanges between two or more interdependent groups, that is, producers and consumers. Like Amazon, Uber or Airbnb, these businesses do not directly create and control inventory via a supply chain the way linear businesses do but rather create or facilitate connections between groups. See J Hagel, "The Power of Platforms" (Westlake, Texas: Deloitte University Press, 2015).

50 "The Promise of Blockchain: The Trust Machine", *The Economist* (October 31, 2015).

can drastically reduce transactions time, from weeks or months to days, hours or minutes. With blockchain, the economies are poised to undergo a radical shift, as new, blockchain-based sources of influence and control emerge.⁵¹ As contracts or relationships are central to business, the blockchain will have an extensive impact on how businesses are structured. The traditional organisation as we know it may be drastically altered even the rationale of the business organisation may cease to exist.⁵²

Alternative SADC industrialisation futures

The megatrends sketched above and their potential for reshaping society and leapfrogging provide a good canvas for re-imagining and anticipating SADC's industrialisation futures. Two uncertainties will play a fundamental role in formulating future scenarios. On the one hand, the governance of 4IR will be key. Currently, a few industrial giants are carving out various spheres of control, as platforms tend to morph into natural monopolies. More crucially, due to the possibility of amassing vast quantities of data, platform owners can easily move to new business arenas. For example, Google's (Alphabet) move to self-driving cars came about due to its expertise in maps derived from the ability to track people's movements. There have been attempts to regulate this sector, but the key players are powerful and adept at fending off tightening government regulations.⁵³

The other key uncertainty is the evolution of the sustainability movement and shift to GE. While many countries have committed to reducing greenhouse gases and the SDGs and put in place GE strategies, there is still hesitancy, especially from the big economies with significant legacy fossil-fuel-based industrial infrastructure. While consumers are showing significant interest in sustainable consumption, and there have been positive developments in labelling standards, the proliferation of standards bodies has created opportunities for businesses to falsely claim sustainability, so-called 'greenwashing'.⁵⁴ Some have argued that the latest form of greenwashing, or rather 'carbonwashing', can be witnessed in the new investment strategy gaining traction worldwide known as environmental, social and governance (ESG) investing, or sometimes also referred to as sustainable investing, responsible investing, impact investing or socially responsible investing.⁵⁵ ESG investing can become a powerful force for creating meaningful change in the financial and asset management sector, depending on the influential supporters or disruptors who invest and regulate it. Or it could become a new trend co-opted by big business without enacting new trading practices such as shorting stocks or active ownership of poor-scoring ESG investments (as opposed to negative screening). Greenwashing through ESG investing will

51 R Marvin, "Blockchain: The Invisible Technology That's Changing the World", PC (August 29, 2017).

52 M Lansiti & KR Lakhani, "The Truth About Blockchain", *Harvard Business Review* (January-February 2017).

53 K Berjikian, "AB 5: California Follows in Europe's Footsteps in Bid to Regulate Apps Like Uber", *EuroNews* (September 13, 2019); N Scheiber, "Uber and Airbnb Are Waging a Libertarian War on Regulators", *New Republic* (May 20, 2014).

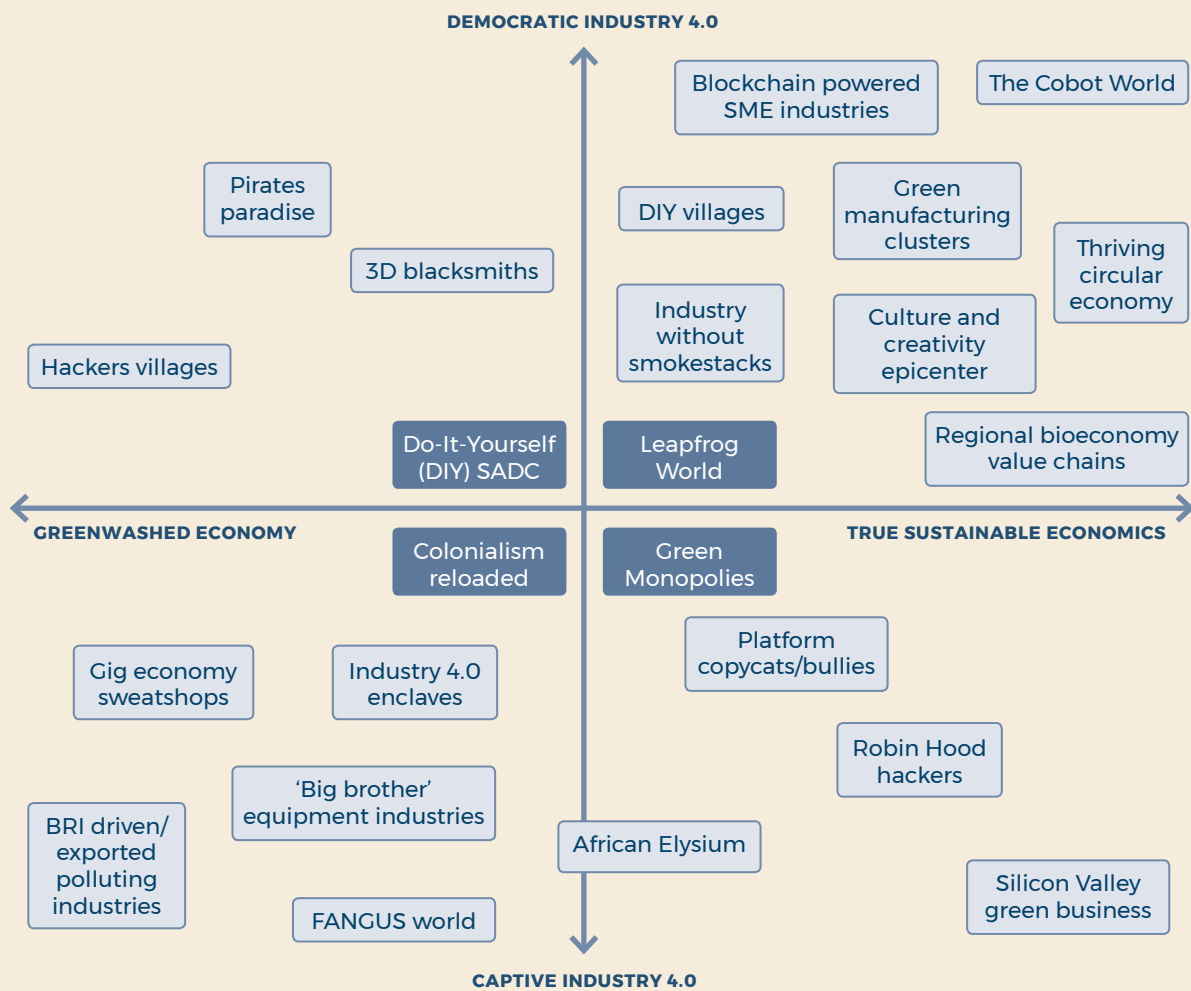
54 D Robinson, "What Is Greenwashing?", *Earth.Org* (July 23, 2021).

55 SY In & K Schumacher, "Carbonwashing: A New Type of Carbon Data-related ESG Greenwashing", *SSRN* (April 25, 2021); T Fancy, "Financial World Greenwashing the Public with Deadly Distraction in Sustainable Investing Practices" *USA Today* (March 16, 2021).

become more prevalent 'without the development of clear processes to follow in order to deem a fund, strategy or asset class as having sufficiently incorporated ESG factors into its responsible and sustainable investing practice'.⁵⁶

Uncertainties are exacerbated by the ongoing competition between the US and China to take leadership in both the 4IR and GE. Figure 1 sketches the SADC industrialisation scenario space using the two uncertainties. The scenario space presents potential industrialisation pathways, some desirable and some not.

Figure 1 SADC industrialisation scenarios



Source: Compiled by the authors

56 S Banks, "ESG – Progress and Pitfalls" Alternative Investment Management Association (AIMA), (INDOS Financial Limited, June 19, 2019).

Desirable futures

In the most desirable scenarios, Industry 4.0 is fully democratised with no global monopolies, and the sustainability agenda has been taken up. This throws up a number of possibilities that are discussed below.

The green economy

Mining companies, of which SADC has many, could re-invent themselves as materials companies that recycle not only a particular metal but all components in a product; this is called a product-centric approach to recycling.⁵⁷ For the regional economy to truly be green, waste-tracking and mapping technologies need to be developed,⁵⁸ which is the first step in reorganising mining value chains. Blockchain technologies can play a decisive role in this transition, especially in helping with mapping.⁵⁹

A bioeconomy powerhouse

The bioeconomy presents another industrialisation pathway in the wake of Industry 4.0. The bioeconomy goes beyond agro-processing to encompass much broader industrialisation potential for biological resources, including chemical, energy and construction products. For instance, bio-plastic derived from plants such as cassava can largely replace plastics. Biofuels can replace fossil fuels. The shift to a bioeconomy requires significant attention to innovation and the advancement of the biotechnology sector. Industry 4.0 provides many tools for accelerating the bioeconomy, including tools to support and upgrade agricultural value chains (to ensure adequate and diversified feedstock) and artificial-intelligence tools to support biotechnology development. For example, [Twiga Foods](#), utilising blockchain and other emergent technologies within the 4IR toolkit, will lead to improvements in agriculture supply chains.⁶⁰

Industries without smokestacks

'Servitisation' sees equipment manufacturers moving from selling a product to selling machine hours, as they are best placed to monitor and interpret data from their machines. There has been at least one mining-equipment producer in South Africa that has developed an 'intelligent' machine that can provide real-time data on aspects such as production, machine availability and loading capability, and hours of use. The deployment of these services has, however, been hampered by lack of infrastructure (5G) and skills.⁶¹

57 Ayuk et al., "Mineral Resource Governance".

58 SADC, "Green Economy Strategy".

59 D Miller, "Blockchain Is Reimagining the Rules of the Game in the Energy Sector", *RMI* (August 28, 2017).

60 M Chivunga & A Tempest, "Why Regional Value Chains in Africa Need to go Digital" SAIIA Occasional Paper 331 (Johannesburg: Institute of International Affairs, September 2021).

61 Lorenz & Mbula-Kraemer, "The Impacts of Adopting 4IR-related Technologies".

Blockchain-powered small and medium enterprise industries

Blockchain is likely to redefine organisations (and indeed make large firms obsolete). With its added ability to support the emergence of distributed energy systems, blockchain has the potential to completely reconfigure manufacturing so that small and medium enterprises with access to cheap, renewable energy and Industry 4.0 tools (including 3D printers) can take advantage of a new high-quality, highly customised system (similar to what we see in Germany today). Blockchain can be a catalyst to strengthen regional infrastructure and connectivity. In particular, blockchain can boost intra-regional trade by opening up supply chains and providing better transparency.

Do-it-yourself villages

Industry 4.0 tools enable self-sustaining villages not connected to the larger economies. 3D printing allows the manufacture of all the necessary tools. Citizens of these villages can get all the information and knowledge they need and home-school their children. Some big religious organisations, especially in Nigeria, are creating housing compounds and also setting up universities. The building blocks are there to make use of the opportunities.

Creative economies epicentre

Tools and networks available in a democratic 4IR can spur on the explosion of cultural goods and creative products. The potential for the creative industry is extensive. Aided by 4IR technologies, the components of market success are starting to come together. Rising smartphone and tablet ownership is creating a foundation for digital content development and dissemination. It is thought that the estimated 4.4% growth the South African music economy experienced between 2015 and 2020 was fuelled by surging digital music streaming revenue.⁶²

Undesirable futures

The scenario space also presents potential undesirable industrialisation futures. The combination of monopoly powers and unsustainable business models masked through greenwashing can produce very poor outcomes. Some of the more egregious include:

Industry 4.0 enclaves

As in mining, Industry 4.0 can create high-technology enclaves. Industry 4.0 upgrades could take place through multinational corporations transferring skills to local affiliates. For example, the automobile industry in South Africa has been adopting robots with the support of multinationals; however, only first-tier suppliers have been able to benefit from

62 A Hruby, "Tap Creative Industries to Boost Africa's Economic Growth", *The Financial Times* (March 22, 2018).

the upgrade. Without support, other suppliers may be cut off from future Industry 4.0 enclaves.⁶³ The negative feedback loop on employment through the adoption of robots and AI in specialised industry enclaves reinforces the challenges Africans face, namely poor infrastructure for all, and low skill levels. Transversal skills need to be developed, and a skills mix is required to counter Industry 4.0 enclaves.

A FANGUS world

The rise of big technology companies presents a significant threat of global monopolies. This is already happening, as all the big tech companies are present in SADC and positioning themselves strategically to capture emerging markets. For example, Netflix is making inroads in Africa and is positioning itself to capture the nascent creative sector. The resourcefulness of big tech companies means that these companies can escape regulation. For example, Uber has captured the majority share of the taxi market without having to adhere to the regulations governing regular taxis.⁶⁴ Possessing significant data, the FANGUS⁶⁵ cartel can manoeuvre into new industries and create even bigger monopolies. Monopolies limit the productive and growth capabilities of small, medium and micro enterprises struggling to access market share.

Surveillance society/big brother equipment industries

Emerging platform economies are perfectly placed to collect and mine vast amounts of data and thus better predict and even influence behaviour. This raises serious ethical concerns regarding privacy as most people are unaware of the amount of personal data being collected about their activities. New capabilities to combine disparate sources of data including privately collected and publicly gathered data leading to a surveillance society are being developed. This is being further fuelled by security and safety concerns that is seeing police and other government agencies installing surveillance instruments and developing powerful applications to predict and pre-empt crime. South African cities, especially Johannesburg and Cape Town, are already at the forefront of this.⁶⁶ In 2011, the city of Johannesburg announced a partnership with IBM where IBM was to offer 'integrated intelligence' for 'crime prevention and investigation - including increased police presence and visibility, better coordination amongst agencies, and a data centre with predictive analytics', as well as 'intelligence sharing'. The partnership concluded with little publicity or transparency. At present, the city of Johannesburg hosts several disparate CCTV networks powered by a mix of Western and Chinese corporations. It has been pointed that the technologies used for safe city surveillance undermines civil rights and liberties, and

63 Lorenz & Mbula-Kraemer, "The Impacts of Adopting 4IR-related Technologies".

64 K Berjikian, "California Follows in Europe's Footsteps in Bid to Regulate Apps Like Uber", *Euronews* (September 13), 2019; N Scheiber, "Uber and Airbnb are Waging a Libertarian War on Regulators", *The New Republic* (May 21, 2014). The key argument is that Uber is a technology and not a taxi company and thus falls outside of regulatory authority. Uber has also hired experience lobbyists to blunt any regulation proposed.

65 FANGUS stands for the big tech platforms companies including Facebook, Amazon, Netflix, Google, Uber and Spotify.

66 M Kwet, *The City Surveillance State: Inside Johannesburg's Safe City Initiative*, SAIIA Policy Briefing 231 (Johannesburg: South Africa Institute of International Affairs, October 2019).

that historically surveillance has been marshalled against oppressed and marginalised communities, a practice that continues into the present.⁶⁷ It is important to build up a pipeline of local businesses that can support the development of local intelligence and cyber systems. A local business pipeline is critical to safeguard and enhance privacy, which is significant. The question is whether the road to disastrous data collection (biometric) is paved with good intentions.⁶⁸

Gig-economy sweatshops

Related to the FANGUS world is the emergence of gig-economy sweatshops. In a gig-economy sweatshop scenario, workers are poorly paid via powerful labour-technology platforms that capture all employment offerings. Already many drivers complain about the low share Uber drivers get from the platform,⁶⁹ and at the same time Uber has successfully fought regulation meant to improve the welfare of its drivers.

The gig economy's disruption will only be accelerated post- COVID-19. Many people who lost their jobs are now turning to self-employment, selling their labour in the gig economy. This is further exacerbated by companies becoming increasingly reticent to quickly fill vacancies.

In a gig-economy sweatshop scenario, jobs are low-paying and working conditions are poor. Permanent employment (and its benefits including medical aid, training, life insurance and retirement contributions) is scarce. Post-COVID-19, this trend has only been reinforced, and these sweatshops have proliferated out of necessity, not out of preference. The wage variability, job insecurity and exploitation of workers common to gig-economy sweatshops manifests in unfair dismissals and the absence of minimum basic benefits (paid vacation, sick leave and minimum working hours) and leads to workers becoming increasingly desperate, depressed – and physically and mentally ill.

Belt and Road industrialisation

The BRI can be leveraged to develop needed connectivity (including 5G) in the region and at the same time encourage investment from China to capture the new AfCFTA market. However, China may shift its unsustainable industries⁷⁰ to Africa as it seeks to reduce pollution and transition to new Industry 4.0 driven sectors. COVID-19 has also forced African governments to cede control of key assets as Beijing swops African defaults on infrastructure debt loans for equity. China's 'debt-trap diplomacy' may lure poor countries into industrial debt that leads them to seize control of state assets once they fall into debt distress.⁷¹

67 Kwet, *The City Surveillance State*.

68 L-N Lundbæk, "The road to disastrous biometric data collection is paved with good intentions", *Techcrunch* (January 11, 2022)

69 K De Freytas-Tamura, "Kenya's Struggling Uber Drivers Fear a New Competitor: Uber", *New York Times* (May 22, 2017).

70 Fu & Eguegu, "China's BRI and the AfCFTA".

71 C van Staden, "China Holds all the Cards as Pandemic Pushes African Countries to Default on Loans", *Business Day* (September 29, 2020)

Other probable futures

In between desirable and undesirable futures, there are other probable SADC futures. We may have a democratised – and empowering – Industry 4.0, but its associated industries may be unsustainable. We may also shift to a sustainable SADC, which may be dominated by Industry 4.0 monopolies. Some of these probable futures are discussed below.

Pirate paradise

A democratised SADC Industry 4.0 provides many tools and knowledge platforms that may lead to the creation, design and manufacturing of many new things. These new industry opportunities open the potential for the production of counterfeit goods (with the help of AI-disinformation bots) including pharmaceuticals and health products and so forth. This could lead to innovation in this industry being stifled and the region being locked into low-value goods, which could potentially attract retaliation from trading partners.

3D blacksmiths/artisans

Related to the idea of the ‘pirate’s paradise’ is the probability that artisans will gain access to new production methods through 3D printing.⁷² However, adding 3D technology to an unsustainable business may just make things worse and inflict more damage on the economy, society or the environment. For example, carpentry already using wood derived from unsustainable sources just becomes more unsustainable and environmentally exploitative when it is given an efficiency boost through 3D technology.

Hacker villages

Industry 4.0 could lead to the creation of whole hacker villages – enclaves dedicated to the small-scale production of goods through hacking.⁷³ These enclaves are unlikely to care about sustainability or cybersecurity and could slip into organised crime.

Platform copycats/bullies

Industry 4.0 giants build platforms that support the informal economy, increase its efficiency, improve the skills of its workers and the quality of its products/services (the so-called modernisation and formalisation of the informal sector). However, since platform owners control the business processes, they can capture, copy, outprice, re-contract or

⁷² M Nichols, “What Are the Environmental Impacts of 3D Printing?”, *Fabaloo* (December 12, 2017).

⁷³ A hacker uses technical knowledge to achieve a goal or overcome an obstacle within a computerised system by non-standard means, which may include using exploitative methods to break into computer systems and access otherwise-unavailable data. Not all hacker villages or enclaves can be associated with illegal activities, however. The [Defcamp Hacking Village](#), for instance, is a safe and educational environment where cybersecurity skills can be acquired and practised.

demote services/products and develop rival products/services of their own. This equates to corporate bullying,⁷⁴ which implies the unfair sharing of proceeds and inequality.⁷⁵

Silicon Valley green industries

With access to both Industry 4.0 resources and finances, Silicon Valley entrepreneurs may leverage their financial, technological and political power to capitalise on the shift towards GEs. Many African-based innovation hubs are already not lead by local residents and funded from outside Africa. Mentioned before, the M-KOPA innovation headquartered in Nairobi, Kenya is a Silicon Valley-funded start-up,⁷⁶ for instance, and the Silicon Cape Initiative in South Africa also has international funders.

African Elysium⁷⁷

Through Industry 4.0 technologies, humans can in a sense be replaced. Advanced robotics can take over our work. This is a potential future where industries are run successfully without jobs for humans and are dominated by robots. At the same time, Industry 4.0 creates highly sustainable industries (from an environmental and economic perspective). Unless progressive measures are taken, for instance to ensure a universal basic income, Industry 4.0 could result in an even more unequal society than our current one.

'Robin Hood' hackers

With access to 4IR resources in Southern Africa being limited and unequally distributed, a scenario may emerge in which hackers circumvent inequality and seek to distribute resources more evenly through for example hacking design blueprints and other data and providing it to all at no or very low cost. Another potential future may unfold in a similar fashion to the Robinhood⁷⁸ Gamestop Wallstreet⁷⁹ stock-trading saga, during which a coalition of small individual investors – or perhaps even trading bots – 'hacked' the US stock market, causing billions in losses for extremely well-funded financial firms and transfer the gains into untraceable cryptocurrencies made available to everyday people. 'Robin Hood' hackers could create havoc.

74 A Palmer & J Novet, "Amazon Bullies Partners and Vendors, Says Antitrust Subcommittee", *CNBC* (October 6, 2020).

75 G Crouth, "Franchisee Accuses Online Retail Giant Takealot of Corporate Bullying", *MSN* (August 23, 2021).

76 S Faris, "The Solar Company Making a Profit on Poor Africans", *Bloomberg Businessweek* (December 2, 2015).

77 It is the kind of landscape that plays out in *Elysium*, a 2013 American science-fiction action film depicting a world where the rich live in a luxurious space station (Elysium), industries are run by robots, and where the poor live on a heavily polluted Earth, mostly in poverty.

78 The US company and stock and trading app should be distinguished from Robin Hood, the heroic outlaw originally depicted in English folklore who stole from the rich to give to the poor.

79 R Mac, "The Robinhood and GameStop Stock Saga Explained By Former Wall Street Professional Ross Mac", *Black in America* (February 4, 2021).

Towards a reimagined SADC industrialisation strategy

It has been argued that how we behave now gives us evidence about the future in how people (including ourselves) are behaving now.⁸⁰ Indeed, many of the desirable and undesirable scenarios painted above are already here in some form. For example, blockchain-powered Twiga Foods signals the rise of the desired bioeconomy powerhouse scenario. These are pockets or seeds of the future in the present. In moving towards desirable futures, the objective should be to nurture these seeds. But this requires readiness for Industry 4.0 in the first place.

Getting ready for Industry 4.0

Developing preparedness in SADC for Industry 4.0 does not mean desirable Industry 4.0 futures will catalyse and propel the region towards favourable outcomes that achieve industrialisation pathways. As pointed out, many SADC industrialisation futures are probable. For a desired future to be achieved, a broad strategy and accompanying policies to support development pathways need to be identified. There is clearly a need to update and better integrate the region's 4IR and GE strategies. These strategies should be two sides of the same coin. As explored here, they should underpin the SADC industrialisation strategy. Thus these documents need to be closely aligned. Indeed, an integrated document, rather than three standalone documents, will help to spell out the needed innovations and the policies to accelerate them.

Developing preparedness in SADC for Industry 4.0 Industry 4.0 does not mean desirable Industry 4.0 futures will catalyse and propel the region towards favourable outcomes that achieve industrialisation pathways

Industry 4.0 will have a profound impact on the transformation trajectory of the SADC 4IR and GE strategies, especially if regional value chains are boosted with 4IR technologies.⁸¹ The SADC industrialisation strategy should be revisited to explore how Industry 4.0 can energise the existing plan. However, more crucial is the potential for Industry 4.0 to indicate new ways of industrialisation by providing models that blaze pathways leading away from past approaches and legacy systems that are no longer fit for purpose. Charting new

80 DC Wahl, "The Three Horizons of Innovation and Culture Change", *Activate The Future* (June 7, 2017).

81 Chivunga & Tempest, "Why Regional Value Chains in Africa Need to go Digital".

The SADC industrialisation strategy should be revisited ... However, more crucial is the potential for Industry 4.0 to indicate new ways of industrialisation

industrialisation pathways will depend, on the one hand, on how 4IR is governed and the shift towards sustainable economic models takes place globally and, on the other hand, on how countries re-imagine their futures and craft new strategies.

Our analysis has pointed to many potential futures of industrialisation with much leeway for SADC to shape these to achieve a desirable outcome. While re-imagination is pivotal, being ready for Industry 4.0 is the first pre-requisite. Many SADC (and African) countries are not well prepared for 4IR.⁸² There is low awareness of 4IR and its meaning among policymakers, which underscores the challenge of preparing Africa for the techno-digital revolution. Awareness of 4IR has been raised at the highest level.⁸³ However, to prepare SADC, it will be a requirement to plan and build an effective Industry 4.0 ecosystem that is trans-contextual, interconnected and interdependent. Getting ready for Industry 4.0 will demand concerted efforts in four domains: (i) skills development, (ii) 4IR infrastructure development, (iii) dynamic innovation ecosystems; and (iv) effective regulatory framework and investment climate.

Getting ready for Industry 4.0 will demand concerted efforts in four domains: (i) skills development, (ii) 4IR infrastructure development, (iii) dynamic innovation ecosystems; and (iv) effective regulatory framework and investment climate

Although some of the readiness issues are being attended to, SADC has acknowledged the need to shore up education systems to better respond to Industry 4.0 and has stressed the need for strengthening STEM education. This approach misses the point because beyond

82 C Markowitz, "Harnessing the 4IR in SADC: Roles for Policymakers" (Johannesburg: South African Institute of International Affairs, 2019); EK Brown, "The Fourth Industrial Revolution: Will Africa be Ready?" (Accra: The African Centre for Economic Transformation).

83 Specifically, SADC ministers adopted a communique on 4IR in Zimbali, KwaZulu-Natal, South Africa, in September 2017. The communique identifies six priority areas: infrastructure and connectivity, affordability, skills and awareness, entrepreneurial development, and local content.

STEM,⁸⁴ what will be required is complex problem solving, critical thinking, creativity, coordinating with others, emotional intelligence, judgment and decision making, service orientation, negotiation and cognitive flexibility.⁸⁵ Weak 4IR infrastructure also means 'industries without smokestacks' opportunities are being missed. Improving the readiness of the region for Industry 4.0 can lead to transformative change, boosting opportunities for intra-regional trade and socio-economic development if acted upon the desired futures trajectories.

Improving the readiness of the region for Industry 4.0 can lead to transformative change, boosting opportunities for intra-regional trade and socio-economic development if acted upon the desired futures trajectories

Beyond these broad approaches to better drive desirable SADC industrialisation futures, some policy recommendations to support the transition are discussed below.

Policy recommendations

Develop a regional framework for Industry 4.0

The SADC secretariat should develop a comprehensive regional strategic framework for Industry 4.0. Building on the SADC communique on 4IR, the strategy should address the four pillars building effective 4IR ecosystems. The strategy should seek to establish regional centres of excellence in various 4IR technologies – for example artificial intelligence, IoT, blockchain and so forth – to support countries in implementing the Industry 4.0 strategy.

Mobilise funding for 4IR business

The Development Bank of Southern Africa should create a futures fund. Working in collaboration with local and international groups, this fund should incentivise big corporations to build strategic foresight capabilities in small, medium and micro enterprises and other suppliers to adopt anticipatory governance capabilities and strategic planning capacities to integrate 4IR applications and thus pre-empt the emergence of 4IR enclaves.

84 D Kupfer, J Ferraz & J Torracca, *A Comparative Analysis On Digitalization In Manufacturing Industries In Selected Developing Countries: Firm-Level Data On Industry 4.0*, Inclusive And Sustainable Industrial Development Working Paper 16 (Vienna: UN Industrial Development Organization, 2019).

85 A Gray, "The 10 Skills You Need to Thrive in the Fourth Industrial Revolution", *WEF* (January 19, 2016).

Ensure skills for Industry 4.0

The Unesco Regional Office for Southern Africa's Education Unit, in cooperation with SADC member states and other specialist 4IR and emergent technology education providers, should strengthen education systems in line with the Industry 4.0 strategic framework, to reform them and develop skills critical for the 4IR world. This includes STEM skills, which are foundational, but also skills in business, entrepreneurship, complex problem solving, processes (critical thinking, active listening) and systems (judgment), as well as social and cognitive skills (logical reasoning and creativity).⁸⁶

Foster innovation ecosystems

SADC member states and the SADC Business Council should strengthen the innovation and incubator ecosystem so that local innovators can incubate ideas and have them funded to scale up. Innovation systems should also be incentivised to search and scale up innovations. This will require sensitising the ecosystem (and policy makers) to the three horizons and other foresight frameworks. Stronger links between industry, research/academia and policy actors – or so-called triple helix platforms – can further strengthen the innovation system.

Incentivise local industrial development

SADC member states along with SADC Business Council and the Development Bank of Southern Africa (DBSA) should establish a truly regional industrial-development corporation to incentivise local venture capitalists and ensure the commercialisation of ideas without too much reliance on foreign capital in line with strengthening innovation ecosystems. Building internal capital markets will strengthen the local investment climate and drive investments into small, medium and micro enterprises.

Establish an industrial innovation fund

The DBSA should establish an industrial innovation fund to move investors towards the more risky venture capitalist world. This fund can be used to absorb some of the risks and allow experimentation and learning as this sector develops. The fund should invest in pathways to regenerative cultures,⁸⁷ regenerative economies,⁸⁸ and bioregional regeneration.⁸⁹

86 Gray, "The 10 Skills You Need to Thrive in the Fourth Industrial Revolution".

87 'Regenerative cultures are unique expressions of the potential inherent in the people and places of a given bioregion. They add value and health to the nested wholeness from local, to regional, to global in the understanding that human thriving critically depends on healthy ecosystems and a life-supporting biosphere'; DC Wahl, "Regenerative Cultures, Regenerative Economies, and Bioregional Regeneration", *Activate the Future, Medium* (February 11, 2020: 1).

88 "Regenerative economics is the restoration of intelligent and wise management of our global planetary ecosystem whilst re-igniting a spiritual renewal or developmental growth stage of the human species"; Regenerative Centre, "What is regenerative economics?", (December 31, 2020:1).

89 Bioregional regeneration is about refitting human patterns to the bio-geo-physical patterns through which life creates conditions conducive to life and re-fitting human cultures to the unique bio-cultural conditions of place. DC Wahl, "Bioregional Regeneration for Planetary Health: Scale-linking Human Systems Back Into the Pattern of Health", *Medium* (December 5, 2020).

Use data to jumpstart 4IR platforms

The UN Industrial Development Organization and other data-led institutions should work with SADC member states to leverage government data to jumpstart 4IR platforms. Governments are the biggest repositories of data. Making this data available can spur the building of many applications with the potential to create new jobs and services. Such platforms will not only improve service delivery (as many government services go online) but also see the emergence of entrepreneurs and create new jobs for information brokers to assist with e-government services. SADC should adopt an open-data policy and also encourage its governments to shift towards e-governance.

Strengthen internet infrastructure

The DBSA, working in partnership with internet institutions, should strengthen and expand the internet infrastructure by improving access speed and lowering costs. Currently, the region has low access, especially in rural areas, and internet connection costs are high. Part of this can be attributed to low competition levels. Of vital importance will be incentives to help the shift to 5G technologies, so that mobile phones become the chief entry point to the internet. This will help much of the region shift to broadband. Incentives could include tax breaks and duty-free imports of 5G telecommunication equipment including telephones.

Strengthen regulatory capacity

SADC member states should strengthen regulatory capacity by applying to the Anticipatory Innovation Governance project of the OECD's Observatory of Public Sector Innovation. The project involves developing and testing new approaches and conducting action research with governments and partners in this emerging area of innovation research and practice. The shift to a sustainable and equitable 4IR world will require significant attention to regulation to make the landscape competitive and also pre-empt the tendency for green- or carbon washing. Strong anti-monopoly laws will ensure large platforms do not exercise undue power and capture all the benefits from these new business models. The internet-infrastructure playing field is already dominated by two or three companies in the region, which has been given as one of the reasons for high data costs.

Develop circular economy and bioeconomy strategies

SADC member states should develop circular economy and bioeconomy strategies with the UN Environment Programme to complement the region's GE strategy. These three strategies should become the fundamental pillars for sustainable development in the region. The SADC Secretariat's sustainable development committee, which is responsible for disseminating the regional GE strategy, should add circular- and bioeconomy to its mandate.

Support the repositioning of the mining sector

SADC member states should work with the UN Economic Commission for Africa and the African Minerals Development Centre to support the mining sector in repositioning itself as the leader in the circular economy sector. Local content policies can be refashioned so that mining suppliers include waste management companies. There is need for a fund to support mining companies to reengineer themselves so that they can use their own as well as waste inputs.

Hasten servitisation models in mining

The Mining Industry Association of Southern Africa should hasten servitisation models⁹⁰ emerging in the mining sector. Further expansion of these models in the sector and beyond will see the emergence of high-value service industries or ‘industries without smokestacks’. Policies can include tax breaks to allow companies to further develop the servitisation business model and apply it to other industries.

Develop GE clusters

The SADC Business Council should lead the establishment of a clear plan to support the development of GE clusters. The region has many commodities that are important to GE including cobalt, platinum, gold, copper and iron. These minerals can serve as the basis for developing GE clusters, for example the production of windmills and batteries and so on. This will require an extension of the GE and the industrialisation strategy and the development of a roadmap for these clusters. Local content policies on value addition can support the development of the GE clusters. The local content policies should include funding to support the development of the clusters, for example, developing the capacity of small, medium and micro enterprises to engage in GE, build the needed infrastructure and so forth.

Empower disenfranchised women and youth

Develop decentralised technology milieus for disenfranchised women and youth to create just transitions. Decentralisation of learning and innovation ecosystems will ensure broader access, local procurement, job creation, employment networks, and economic resilience. Various grassroots groups, women’s organisations, youth groups and social movements are demanding greater climate ambition and protection of the environment. These grassroots groups and movements should be provided with funds and time to foster research and innovation capabilities through broad coalitions of private, public and academic actors to grow domestic technological innovation and skills. Governments and other institutions would be wise to support them to engage with development processes, to avoid responses likely to increase insecurity, poverty and intergenerational inequality.

90 Servitisation is the process of developing capabilities to provide services and solutions that supplement traditional product offerings and provide additional revenue streams.

Towards economic wellbeing

The global adoption of 4IR manifestations, such as automation, and the anticipated type of growth is likely to lock in the business-as-usual dynamics and features of economic growth that are no longer fit for purpose. If not carefully anticipated and proactively governed by SADC decisionmakers, the drivers of change and characteristic features of Industry 4.0 are likely to exacerbate the region's impoverished and uneducated citizens' exclusion from participation pathways to prosperity. It has been argued that 'any technology-infused growth must therefore be complemented by investment in human resources and a strategy to protect and develop labour-intensive industries for workers whose skills are not required in high-tech environments'.⁹¹ Similarly, it has been said that 'vibrant economies arise not from jobs and the market alone, but from the caring work of households, from the infrastructure and investments of the state and from the collective resources of the commons'.⁹² The fusion of technology and investment into the development of human resources is critical particularly for the African market and SADC region with its youthful population.

The drivers of change and characteristic features of Industry 4.0 are likely to exacerbate the region's impoverished and uneducated citizens' exclusion from participation pathways to prosperity

In the context of SADC industrialisation and the long-term functioning of economies, the purpose of flourishing individuals and communities should not be lost. There should be a turn away from a narrow focus on how industrialisation will affect jobs towards a concern for the broader implications of economic wellbeing. Economic wellbeing here refers to the personal and collective ability to mobilise economic, social and material resources to achieve personal and collective wellbeing. Economic wellbeing depends on the following four provisions: (i) paid work – the economy, (ii) household provisioning – care for persons; (iii) provisioning of the commons – viable ecosystems; and (iv) provisioning by the state – infrastructural resources for the other three. For economic wellbeing to be achieved, the following is required: (i) the conditions for dignified labour need to be created; (ii) the capacity for care and material autonomy need to be strengthened; (iii) the local and global commons need to be defended and cared for; and (iv) state provisioning practices need to be put to work for human dignity and planetary flourishing. It has been argued that economic wellbeing 'is not something that can be achieved – either for individuals or states – by thinking about jobs alone'.⁹³

91 N Moleko & M Swilling, "New Wine in New Wine Skins: An Alternative Economic Strategy for South Africa's Economic Reconstruction", *USB Management Review* (October 2020) p. 43.

92 K Facer, "It's Not (Just) About Jobs: Education for Economic Wellbeing", Education Research and Foresight Working Paper 29 (Paris: UNESCO, April 2021) p. 1.

93 Facer, "It's Not (Just) About Jobs", p. 3.

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Cover image

Engineers working with a robotic arm (Krittanut Unsombut/ iStock)

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