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## SADC Futures of Green Infrastructure: Visionary Scenarios and Transformative Pathways to Regeneration

MARIUS OOSTHUIZEN & JOHANN SCHUTTE

African perspectives  
Global insights

# Abstract

In terms of infrastructure, SADC has historically been locked into a pattern of development defined by the confluence of geography, ecology, political economy and, later, colonial systems of commerce. These effects resulted in an infrastructure destiny in SADC today that is for most of its inhabitants either inaccessible or undesirable when looked at from a socio-economic and ecological point of view. A new approach to infrastructure is required in the region, both because infrastructure is at present unevenly distributed, ageing and inaccessible and because of the hydrocarbon-dependent infrastructure development patterns that have persisted owing to industrialisation-orientated development. As SADC nations respond to the climate emergency and persistent social vulnerability while improving the economic conditions of their people, regenerative approaches to circular economies may offer an alternative way forward. These approaches should be rooted in local and innovative production and consumption as well as conservation. Such a transformation, centred on a new pathway towards SADC's infrastructure destiny, would require a responsive adjustment to policy approaches, placing sustainability, human development and innovation at the centre of how infrastructure is imagined. Three visionary scenarios explore how SADC could shift from an extractive towards a regenerative logic in how infrastructure is imagined. The scenarios examine the role of the drivers of market change, global and domestic policy environment and community-based innovation as the basis for a new regenerative approach.

# Background to the green infrastructure opportunity

The state and prospective future of infrastructure in SADC are well documented.<sup>1</sup> However, most of the literature takes a rather conventional view of infrastructure as an enabler of economic growth and industrial activity, examined within the context and constraints of government capacity, regulatory enablement and foreign direct investment (FDI).<sup>2</sup> This traditional approach is certainly valid for policymakers, development practitioners or investors interested in industrial and special planning and development finance.<sup>3</sup> However, it fails to take account of the deep-seated social and special inequities inherent in the SADC built environment and the long-term future trajectory in which these problems are likely to persist.<sup>4</sup>

The dire state of government incapacity, lacklustre economic progress and endemic social difficulties in the region mean that SADC's infrastructure legacy represents a future that is untenable. On its current path, SADC's existing problems with poor and unsustainable water provision and sanitation; inefficient transport, mobility and logistics; and carbon-heavy energy systems will prevail.<sup>5</sup>

It is the contention of this paper that infrastructure can be approached instead from a societally regenerative<sup>6</sup> or restorative perspective, placing human and economic wellbeing rather than gross domestic product (GDP) growth at the core of the agenda.<sup>7</sup> It should be noted that the approach of this paper does not lose sight of the long-run lock-in effect typical of large-scale infrastructure development patterns and the myriad economic, policy and spatial realities that define the status quo. On the contrary, it is in response to the undesirable consequences of these lock-in effects, especially as they relate to socio-economic exclusion, poverty and deprivation,<sup>8</sup> and ecological degradation, that this paper departs from a conventional view in search of creative alternatives.

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- 1 Lesley Wentworth and Deon Cloete, "SADC Infrastructure Futures: Pathways to Complementary Regional Interconnectivity" (Policy Insights 124, South African Institute for International Affairs, Johannesburg, 2022), 24.
  - 2 Robert Bergkvist, "Considerations of Commitment and Capacity: A Study of the SADC Infrastructure Regulation Environment" (Master's Thesis, Stockholm University, 2021), 65; Chelsea Markowitz, Lesley Wentworth and Neuma Grobbelaar, "Operationalising the SADC Regional Development Fund" (Policy Briefing, Global Economic Governance Africa, 2018), 6; Beauty Vambe, Amos Saurombe and Leon Rodney Kenny, "Challenges and Opportunities of Implementing the SADC Legal and Institutional Framework for Disaster Risk Reduction During Cyclone Idai: Case of Zimbabwe and South Africa", in *Cyclones in Southern Africa*, eds. Godwell Nhamo and Kaitano Dube (Cham: Springer Nature, 2021), 133-150; Alexis Habiyaemye, "Fast Tracking the SADC Integration Agenda to Unlock Regional Collaboration Gains Along Growth Corridors in Southern Africa" (Working Paper 2020/95, UNU-WIDER, Helsinki, 2020), 23.
  - 3 SADC, *SADC Regional Indicative Strategic Development Plan (RISDP) 2020-2030* (Gaborone: SADC Secretariat, 2020).
  - 4 Senia Nhamo and Godwell Nhamo, "Mainstreaming Green Economy into Sustainable Development Policy Frameworks in SADC", *Environmental Economics* 5, no. 2 (2014): 55-65.
  - 5 Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper, World Bank, Washington DC, 2011).
  - 6 Giles Thomson and Peter Newman, "Cities and the Anthropocene: Urban Governance for the New Era of Regenerative Cities", *Urban Studies* 57, no. 7 (2020): 1502-1519.
  - 7 Jessica Bunning, "Governance for Regenerative and Decarbonised Eco-City Regions", *Renewable Energy* 67, (July 2014): 73-79.
  - 8 SADC, *SADC Selected Economic and Social Indicators 2019* (Gaborone: SADC Secretariat, 2020).

What is needed is a reimagining of the role of infrastructure in overcoming the challenges of social deprivation and ecological unsustainability. It is in support of this that this paper takes a visionary and transformative perspective of the potential future role of infrastructure in altering SADC's societal and ecological wellbeing.

## Drivers and causes of the historical development of infrastructure in SADC

To depart from the conventional view of infrastructure towards a visionary approach, one might have to consider the current baseline infrastructure future that is undesirable, but likely to emerge on the basis of historical development patterns. This is important since the future of infrastructure in SADC will not proceed from a vacuum, but rather emerge in a somewhat evolutionary form, based on historical legacies and patterns that are resistant to change.

To some extent, the ongoing integration of SADC<sup>9</sup> at regional institutional levels, via the gradual implementation of the African Continental Free Trade Agreement and through formal and informal trade and migration,<sup>10</sup> will continue to create interlinkages between member states. However, these interlinkages in SADC are likely to be based on patterns already inherent in the current distribution of infrastructure, as governments and investors prioritise what they consider to be fundamental factors for development. One such factor is state-led infrastructure that expands along established economic corridors.

This paper proceeds from the conceptual perspective that infrastructure – especially conventional forms such as road, rail, air transport, ports or information and communication technologies (ICTs) – has in the past two centuries followed a distinct macro-social pattern of development (see Figure 1). It is necessary to set out this perspective briefly to help explain the rationale for exploring alternative and distinct, visionary and transformational imaginaries (or scenarios) for the future of infrastructure in SADC.

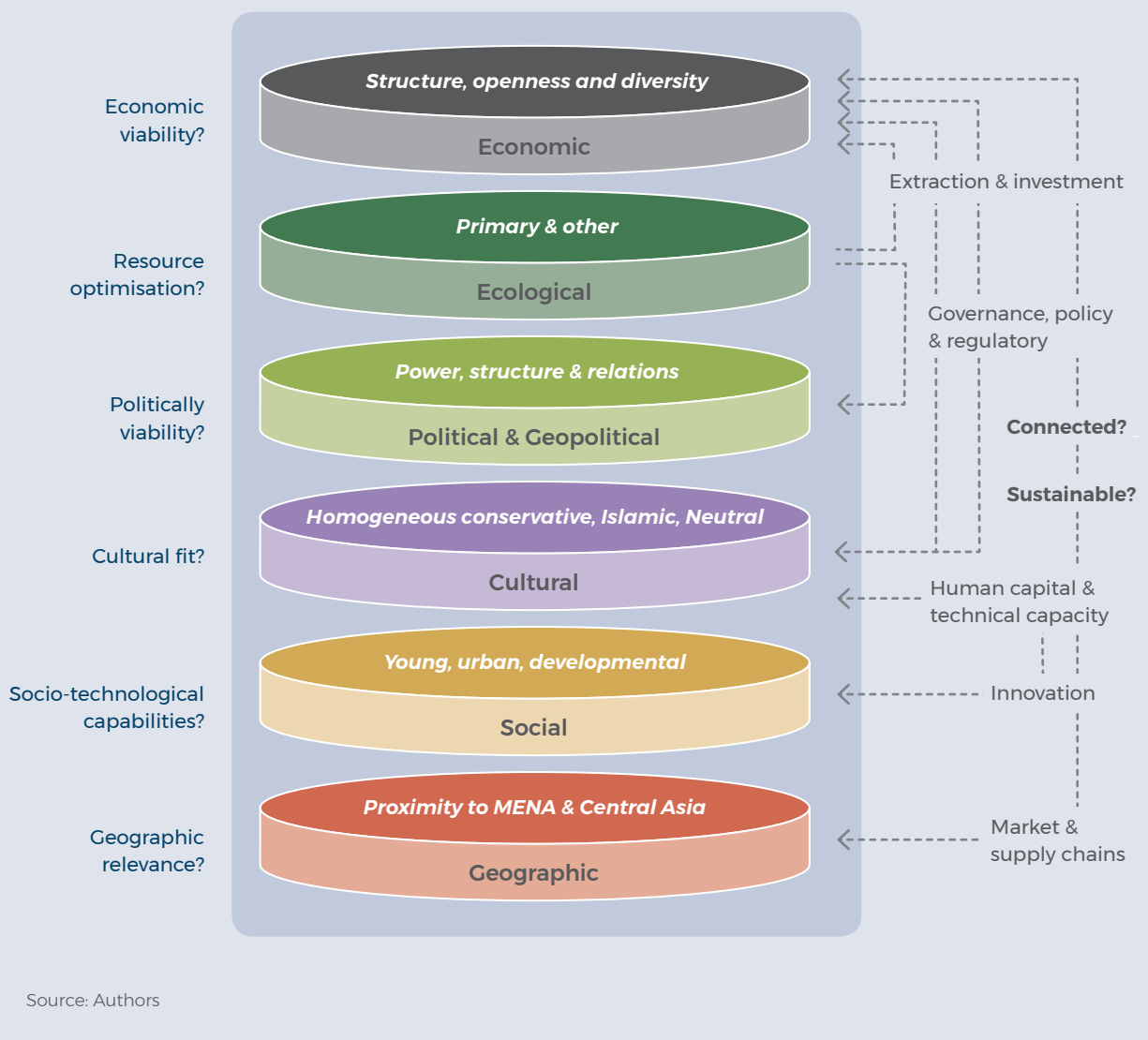
Broadly speaking, societies in SADC have experienced the evolutionary interplay of geographical and socio-cultural factors that, along with the influences of politics and geopolitics, shaped the historical development of the region's infrastructure. Simultaneously, infrastructure has bi-directionally given rise to patterns of economic development and in turn been shaped thereby, all within the contours of ecological pre-conditions. As depicted in Figure 1, infrastructure can be understood to emerge, in some instances in a planned and coordinated manner and in other instances in a haphazard fashion, from the confluence of multiple systemic factors. The relationships between these factors over the past 200 years of industrial development have been rather persistent. However, the potential exists in the coming century to upend these relationships and imagine new forms of infrastructure that enable human communities and their thriving, while also being ecologically sustainable.

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9 Innocent Moyo, "On Decolonising Borders and Regional Integration in the Southern African Development Community (SADC) Region", *Social Sciences* 9, no. 4 (2020): 32.

10 Andrew O Enaifoghe and Toyin C Adetiba, "South African Economic Development in SADC Sub-Regional Integration", *Journal of Economics and Behavioral Studies* 10, no. 1(J) (2018): 135-145.

**Figure 1** A nested-systems perspective of societal evolution: the interchange of multi-system co-evolution



From this perspective it can be argued that the current and baseline trajectory of infrastructure in SADC has been and will continue to be shaped by these deeply entrenched patterns - unless they are intentionally disrupted.

In practical terms, the type and distribution of infrastructure in SADC (ie, its current built environment, be it roads, rail, ports, air transport, power, ICT, etc.) arose from various interactions that created the built environment. These include interactions of the incidental constraints and situational choices of the region’s inhabitants, colonial and mercantile powers, governments and state actors, and the communities themselves emerging from such exchanges. As the current form of SADC’s infrastructural evolution is undesirable, we will first examine the underlying drivers and causes, and then investigate how these might be altered.

## Historically, ‘geography is destiny’ as far as infrastructure in SADC is concerned

In his popular book *Prisoners of Geography*, Tim Marshall argues that in societal terms, ‘geography is destiny’.<sup>11</sup> He contends that cultures and nationalities, ethnicities and economic or political progress have all to some degree been conditioned by geographic determinism. In the case of SADC, it may be argued that the relative isolation of the region from continental Europe, Asia and the Middle East historically resulted in a lower potential for interaction and confluence between cultures, polities and economies. This is in comparison to, for instance, North Africa around Ethiopia, the region surrounding Turkey, or the US. While SADC’s geography could have resulted in its relative isolation, the impact of imperialism and colonialism, enabled by global shipping within the context of mercantilism, counteracted this isolation.

North-south migration between regions in Africa also played an important role in the socio-cultural, ethnic, political and economic evolution of SADC. An extractive relation typically marked its interactions with other regions, including in infrastructure development bound to extractive economic practices. As a result, connectedness played only a limited role in the advancement of local populations and their socio-economic wellbeing, with often detrimental outcomes.

The point made above about geographic determinism is not only historical but must be born in mind when contemplating the possible alternative futures for infrastructure in SADC. For example, how will the apparent trend in de-globalisation and block formation in trade influence SADC, in light of its geographic proximity or isolation? So, too, present-day and prospective shipping routes – such as the emerging routes through the Arctic enabled by a warmer climate and melting ice – will have long-term impacts on SADC’s bulk infrastructure needs and development patterns. Likewise, an expansion of the ports and rail, road and ICT networks of Africa and their connection to the rest of the globe will, for better or worse, shape SADC’s infrastructure and have knock-on effects on its population’s wellbeing.

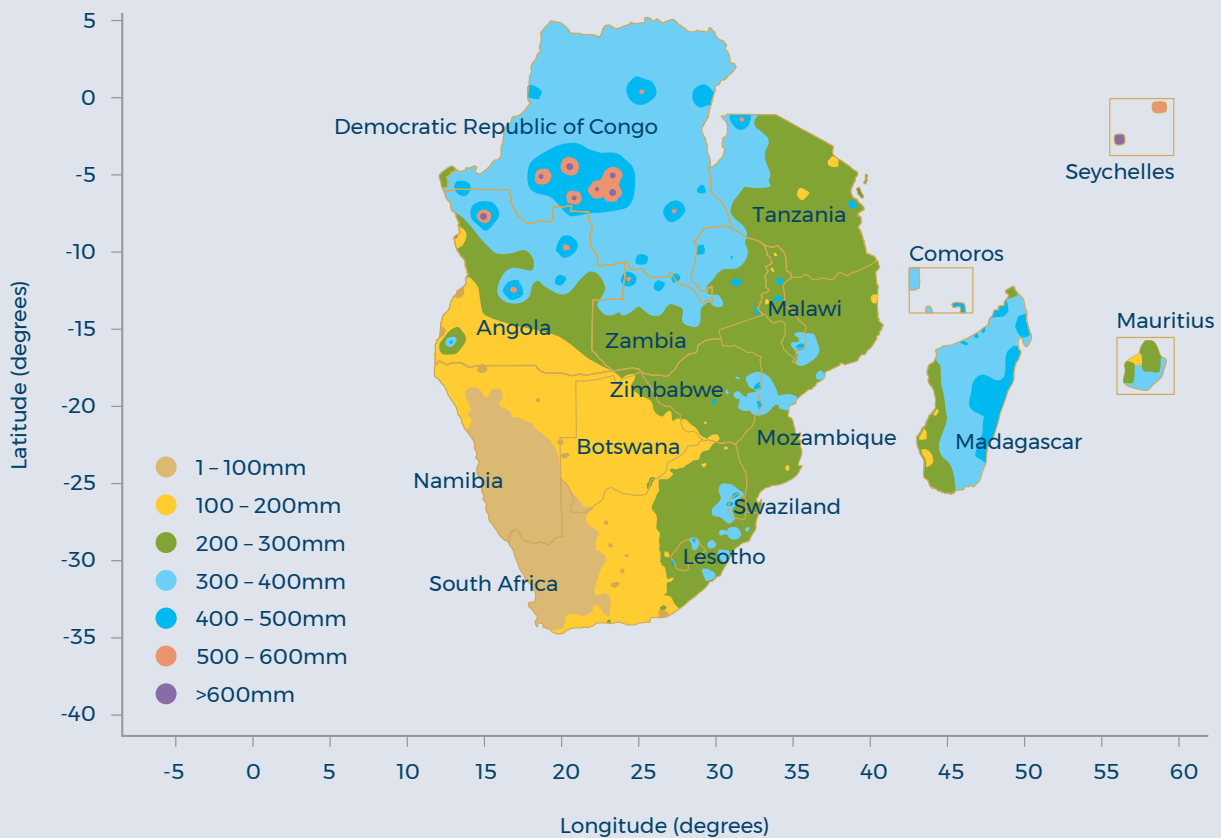
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<sup>11</sup> Tim Marshall, *Prisoners of Geography: Our World Explained in 12 Simple Maps*, Illustrated Young Readers Edition (New York: The Experiment, 2021), 80.

## Ecology as a determining factor of infrastructure

Tied to geographical factors is the broader issue of SADC's ecological endowments and their influence on infrastructure, past and future.

**Figure 2** Long-term mean rainfall over SADC countries October-November-December (1971-2000)



Source: SADC Climate Service Centre, "The Twenty fifth Annual Southern Africa Regional Climate Outlook Forum Statement for 2021-22 rainfall season", [http://csc.sadc.int/images/documents/EN\\_FINAL-SARCOF-25-STATEMENT-for-2021-22-rainfall-season.pdf](http://csc.sadc.int/images/documents/EN_FINAL-SARCOF-25-STATEMENT-for-2021-22-rainfall-season.pdf)

The long-term rainfall in the region is a fair predictor of its relative regional population growth and density, settlement patterns and long-term economic development. The futurist Elise Boulding argues<sup>12</sup> for the existence of a 'two-hundred year present',<sup>13</sup> consisting of at least 100 years of history that perpetuates patterns of societal development

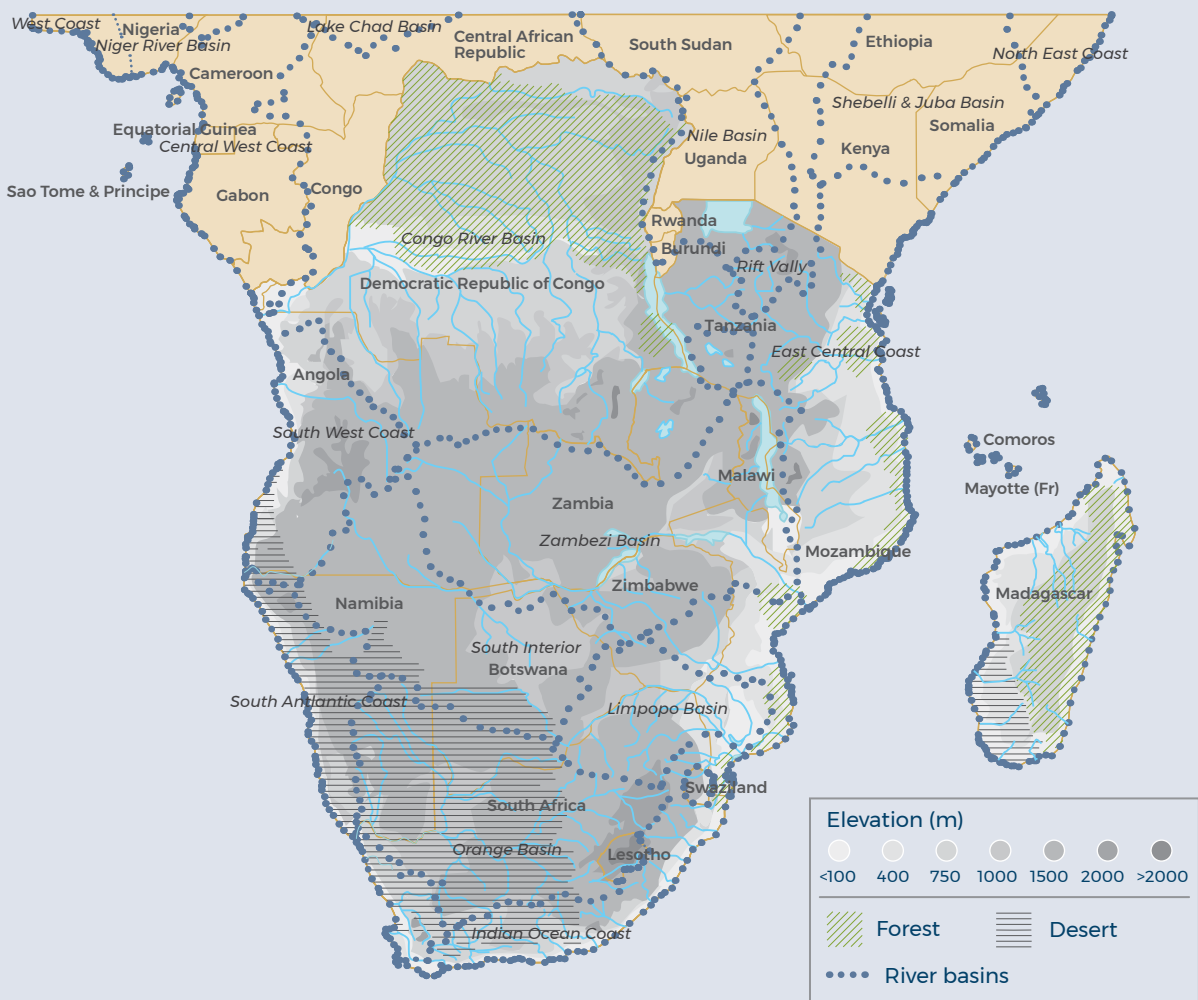
<sup>12</sup> Elise Boulding, "Evolutionary Visions, Sociology, and the Human Life Span", in *Evolutionary Vision*, ed. Erich Jantsch (London: Routledge, 1981), 26.

<sup>13</sup> Paul Saffo, "Elise Boulding on the '200-Year Present'", The Longnow Foundation, July 2010.

for another 100 years. In the case of infrastructure, and its relation to ecology, the baseline future is likely to be closely related to rainfall, among other factors, as an enabler of food production, economic activity and human settlement. This will continue to shape the trajectory of further development in SADC, ultimately determining what kind of infrastructure will be developed, at what scale and for what purpose.

Closely related to this nexus between rainfall, human settlement, development and infrastructure are the topological features of SADC and their effects. As depicted in Figure 3, SADC's deserts are sparsely populated and uneven in their relative infrastructure development compared to river basins and forested areas.

**Figure 3 Topographic assessment of SADC**



Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)



## Mineral resources as a defining feature of infrastructure development

Thirdly, mineral resource endowments in the region provided a historical proxy for nodal infrastructure development owing to the impact of primary resource extraction (see next section).

In light of the above, one might argue that geography, rainfall, topography and mineral resource endowments produced a cluster of factors that predetermined the infrastructure destiny of the region.

We might now ask whether these long-run factors will also determine the region's infrastructure future. We argue that the quality of human and environmental wellbeing experienced in SADC's vast land area of 9.85 million km<sup>2</sup>, inhabited by approximately 371.78 million people, will in the coming century continue to be determined by the ways in which its geographic reality and ecological conditions are mediated by the politics and economics that arose from them – unless a new approach is found.

## Political economy as a historical orchestrator of SADC infrastructure

On the back of the geographic and ecological drivers, perhaps the next most impactful – and certainly most recent – factors shaping infrastructure have been economic and political developments in the region.<sup>14</sup> This is about the systems of economic development. These include mining in the last century and the development of secondary industry in the past 50 years (such as industrial manufacturing) and services in the past two decades, all of which were especially influenced by the industrialisation of South Africa.

These factors have cemented SADC into a pattern of infrastructure development that has narrowly served the industrial complex of 'mining or making for export'.<sup>15</sup>

Inherently extractive, large-scale infrastructure has emerged to serve economic imperatives, enabled by governance and policy mostly in service of SADC elites. As a result, infrastructure has followed and entrenched patterns of inequality rather than counteracting them.

Unsurprisingly, as Figure 4 shows, the economic activity of SADC clusters in terms of spatial distribution follows the same pattern as the main regional road corridors seen in Figure 5. Likewise, rail infrastructure (Figure 6), the power network and infrastructure (Figure 7) and air traffic infrastructure and flows (Figure 8) all follow the same pattern of conglomeration.

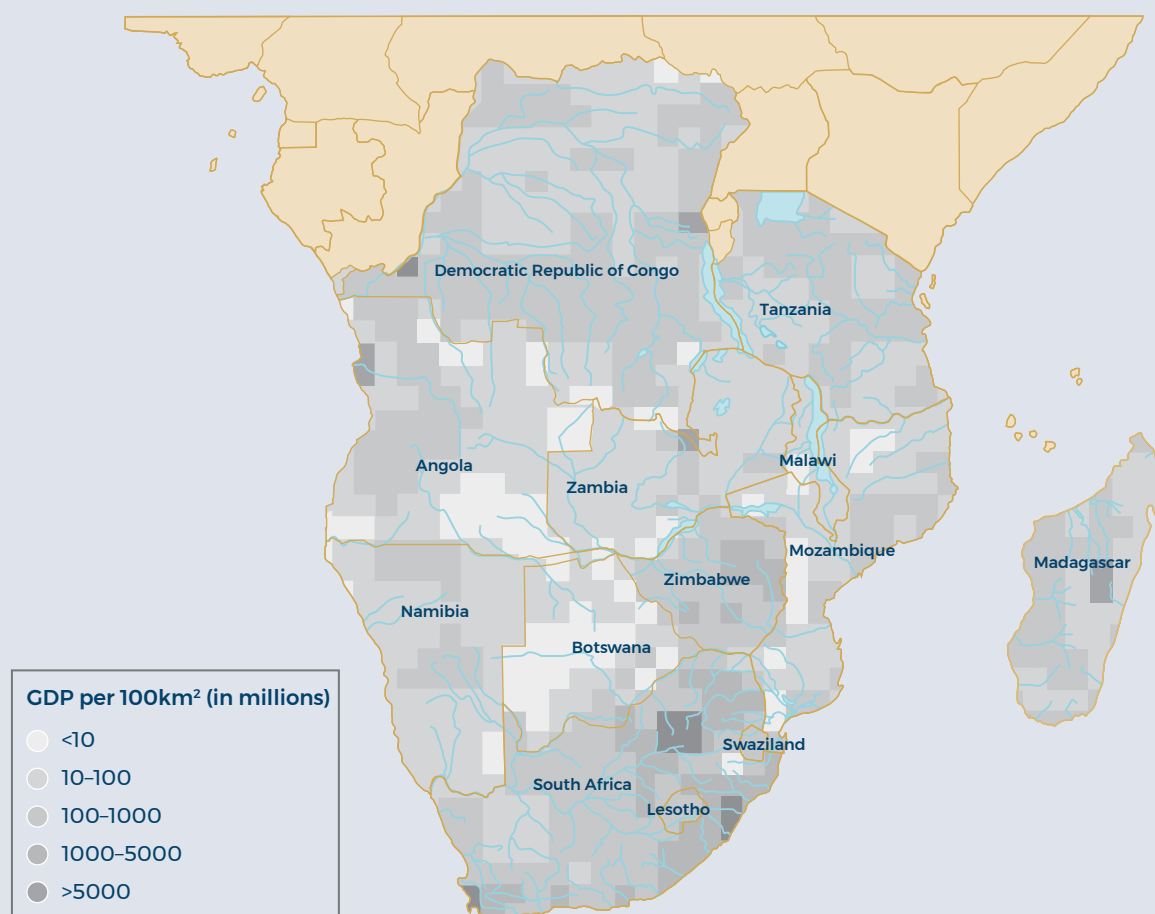
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14 Jan Bronauer and Ji Yoon, *Regional Economic Development in SADC: Taking Stock and Looking Ahead*, Report 25 (Johannesburg: SAIIA, 2018), 46.

15 Andrew Osehi Enaifoghe, "South Africa's Politics of Regional Integration in SADC and Its Socio-Economic Implications", *Journal of African Foreign Affairs* 6, no. 1 (2019): 85–106.

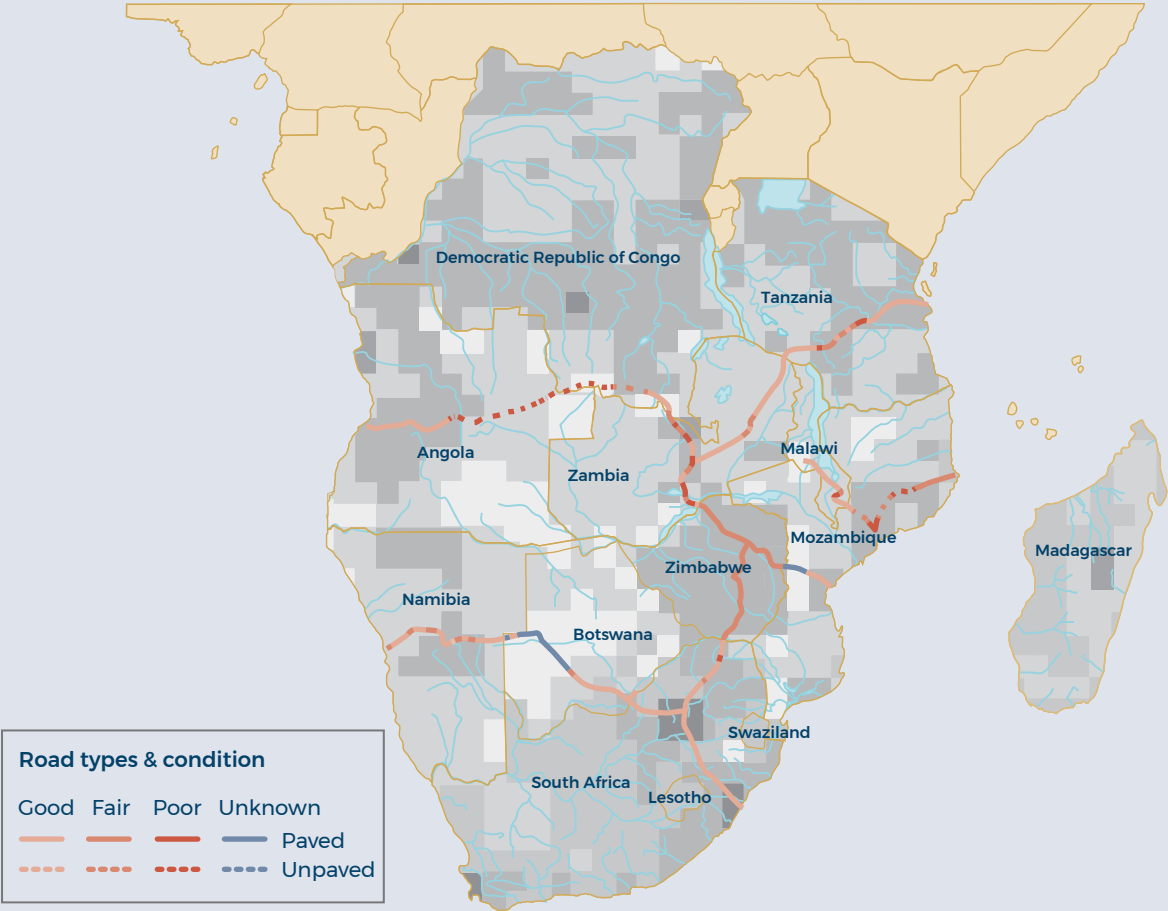
This signifies the ways in which geography, ecology, political economy and, later, commerce have locked SADC into an infrastructure destiny that is, for most of its inhabitants, either inaccessible or undesirable when looked at from a socio-economic and ecological point of view.

**Figure 4** Special distribution of economic activity within SADC



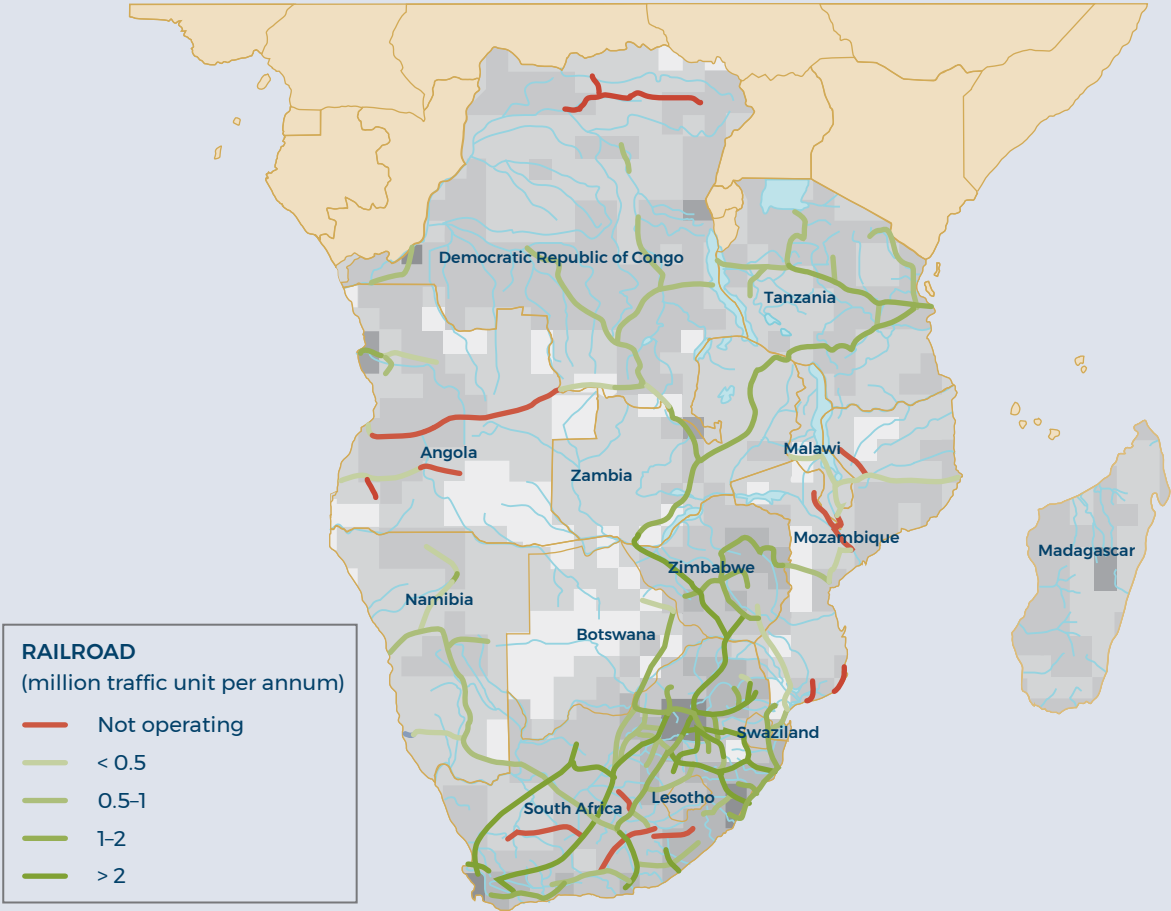
Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

Figure 5 SADC’s seven main regional road corridors



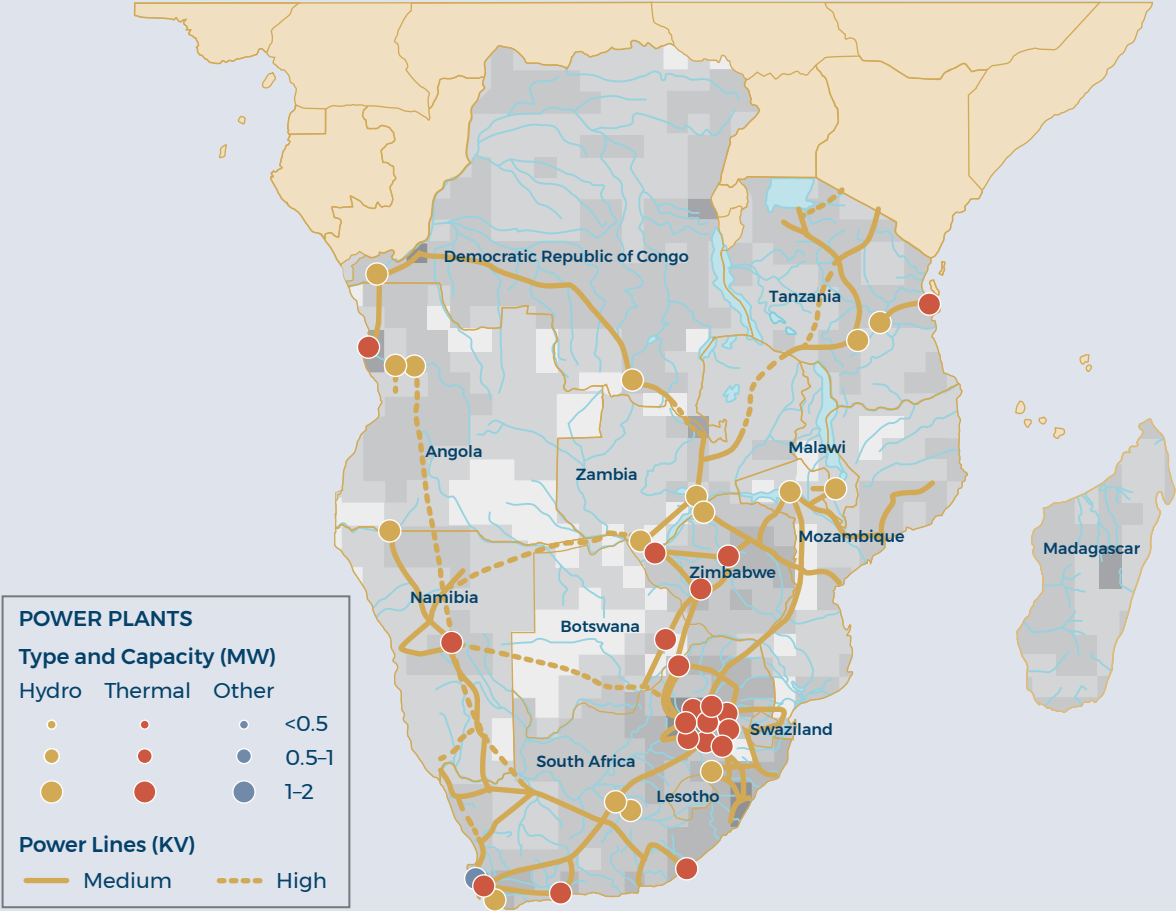
Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

Figure 6 SADC’s regional railways



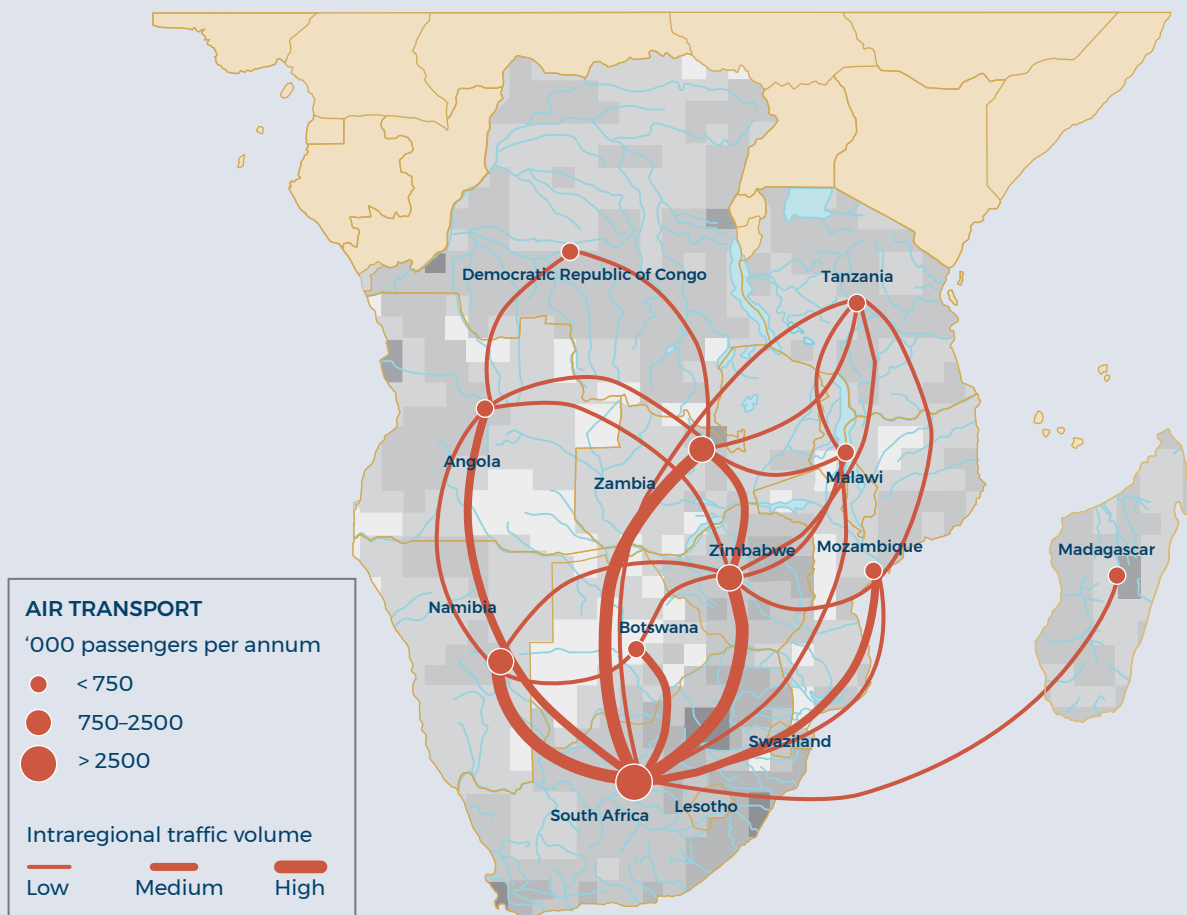
Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

Figure 7 SADC's regional power network and infrastructure



Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

Figure 8 SADC's regional airports and air traffic flows



Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

From a systemic and evolutionary perspective, SADC is locked into a pattern of long-run infrastructure development that is elitist, extractive, ecologically unsustainable and socially undesirable.

Notably, SADC's infrastructure evolution followed similar patterns to that of other regions. It passed through the revolutionary social transformations of the first industrial revolution (enabled largely by coal-fired electricity), the second (enabled by mechanisation) and the third (enabled more recently by ICT).

Politically and in terms of policy, SADC governments have for the most part accepted the received wisdom that infrastructure development is the responsibility of the state, and ought to be narrowly conceived of as an economic and industrial input. The region's

governance challenges, a discussion of which is beyond the scope of this paper, have largely contributed to either poor or non-existent infrastructure development and maintenance.<sup>16</sup> Namibia, Botswana and South Africa are partial exceptions, to some degree.<sup>17</sup> In most other instances, infrastructure as a long-term development lever has been neglected or seen under-investment.

As a result of this rather technocratic conception of infrastructure as an industrial input, the legacy of development in SADC – as in many parts of the world – has been unimaginative. Highways have been built between so-called ‘economic centres’ without care for the communities living on their sidelines and in their shadows. Rail networks and airports have been developed to improve the national connectedness of SADC members with each other and beyond borders. These have been for purposes of trade, tourism and national prestige, with little care for the disconnected intra-state relations between communities or attention to creating opportunities for local livelihoods. This approach has resulted in unmanaged urbanisation, worsening preconditions of food insecurity, poor sanitation and joblessness among highly congested informal communities migrating to live in proximity to bulk infrastructure.

Similarly, SADC governments’ conception about what infrastructure is and can be has been narrowly defined in relation to resources and the environment, seeing those as inputs to production rather than co-evolving systems required for human and social flourishing. The result has been a pattern of infrastructure evolution that stands in brutal opposition to the practical needs of millions of people living in the region.

## Political systems and their relation to infrastructure

While SADC has largely adopted multi-party systems and holds periodic elections, with economic development policies often touted by political campaigners, democratisation has not resulted in greater patterns of inclusion. Despite 10 SADC countries regularly holding parliamentary, presidential and local government elections, most of which are judged to be generally free and fair, government policy and planning has not translated into new and more desirable infrastructure developments. Instead, in many cases the challenges that remain have held back progress on reforming SADC’s infrastructure system in the last 50 years of post-colonialism and, in the case of South Africa, the last 25 years post-apartheid. These challenges include corruption,<sup>18</sup> mismanagement, state incapacity and insecurity.

It also seems likely that SADC will continue to receive the attention of investors interested in the region’s primary resource endowments, especially rare earth minerals required for

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16 Peter Kasuni, Sunweck Makoto and Thabani Nyoni, “The Impact of Corruption on Economic Growth: The Case of SADC Countries”, *International Journal of Advance Research and Innovative Ideas in Education* 6, no. 6 (2020).

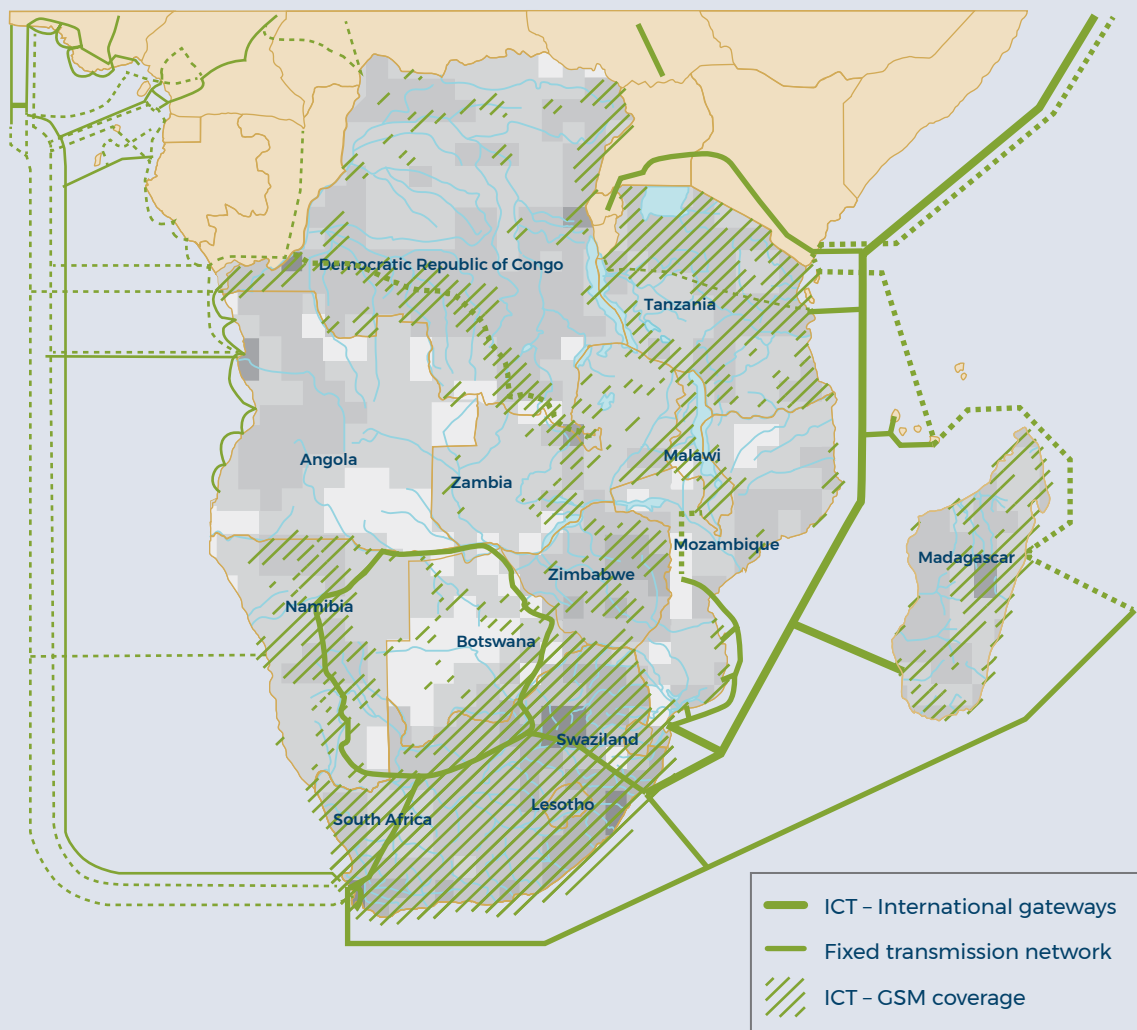
17 Palesa Shipalana and Asmita Parshotam, “Perspectives on PPP Infrastructure Development in SADC Countries” (Policy Insights 71, SAIIA, Johannesburg, 2019), 21.

18 Prega Ramsamy, “Good Governance in the Southern African Development Community” (Occasional Paper 14, Centre for Human Rights, University of Pretoria, Pretoria, 2002), 5.

the energy transition.<sup>19</sup> SADC has considerable reserves and, unless political and economic interests are aligned to social impartiality, the extraction of these resources will remain a key driver of its current infrastructure development. In this way, additional infrastructure will only benefit a small minority and exclude the general population from its benefits.

## ICT infrastructure represents alternative possibilities for infrastructure

Figure 9 SADC’s regional ICT network



Source: Rupa Ranganathan and Vivien Foster, "The SADC's Infrastructure: A Regional Perspective" (Policy Research Working Paper 5898, World Bank, Washington DC, 2011)

19 M Oosthuizen et al., "The Future of Energy in SA and SADC" (Paper, Gordon Institute of Business Science, Johannesburg, 2015), 36.



The final driver influencing infrastructure evolution relates to technology. Notably, the ICT infrastructure of SADC, the enabler of the so-called fourth industrial revolution,<sup>20</sup> has occurred in a somewhat more distributed pattern than other forms (See Figure 9).

The difference in the development pattern of ICT infrastructure has largely been owing to the decoupling, to some degree, of ICT infrastructure from the deterministic features of geography, ecology and related human settlement and economic or political development. This decoupling, or emergent flexibility in the development of the technology, holds great promise for the world and for SADC. Many argue that a 'leapfrog' effect may result from the phenomenon. This means human development in areas such as education, health and services can be fast-tracked without having to overcome the enormous hurdle of addressing SADC's backlog in conventional infrastructure.<sup>21</sup>

While the revolutionary power of ICT is likely to have positive effects, it is the view of this paper that a more profound re-imagining of infrastructure is required and indeed possible for SADC.

## Disjuncture between infrastructure development and human development in SADC

Because SADC has followed the evolutionary pathway describe above, a disjuncture has emerged between its infrastructure and its social needs, when looked at from a human development and security perspective. The only exception is ICT, as noted.

While the population of SADC has grown apace and urbanisation has swelled the ranks of peri-urban communities, access to health, education and provision of water and sanitation infrastructure has lagged. This has compounded the socio-economic effects of poverty and deprivation. It has undermined the capacity of SADC inhabitants to secure livelihoods and dignified and humane living conditions, especially for the region's large youth cohort.

While neglecting the social needs of communities, SADC's infrastructure has centred on ecologically harmful carbon-fuelled development. From a climate perspective, greenhouse gases are the major human-induced driver of climate change. Although the SADC region, excluding South Africa, contributes very little carbon emissions compared to the developed world,<sup>22</sup> it faces high social risks as a result of the impacts of climate change.<sup>23</sup>

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20 Chelsea Markowitz, "Harnessing the 4IR in SADC: Roles for Policymakers" (Occasional Paper 303, SAIIA, Johannesburg, 2019).

21 Wesley Doorsamy, Babu Sena Paul and Tshilidzi Marwala, "The Fourth Industrial Revolution in Africa", in *International Perspectives on Artificial Intelligence*, eds. J. Mark Munoz and Alka Maurya (London: Anthem Press, 2022), 91-106.

22 SADC, Climate Service Centre, "Statement from the Twenty-Fourth Annual Southern African Regional Climate Outlook Forum (SARCOF-24) Held Virtually 27-28 August 2020", September 11, 2020.

23 Joshua Busby, "Warming World: Why Climate Change Matters More Than Anything Else", *Foreign Affairs* 97, no. 4 (2018): 49-50.

Figure 10 Social dimension and vulnerabilities

**SOCIAL TRENDS SHAPING THE SADC REGION**



Source: Author's summary of exercise output of Mastering Strategic Foresight delegates, GIBS Executive MBA, 2022 (used with students' permission)

Climate change is likely to affect the region through the expansion of the Kalahari Desert, increased water insecurity issues, higher temperatures, more frequent wildfires, rising sea levels and greater storm surges.<sup>24</sup> Preferred futures for infrastructure in SADC would need to account for these undesirable risks.

According to the World Bank population data portal, the population of the SADC region is understood to have grown from 336.9 million in 2017 to 345.2 million in 2018, and then to 360.3 million in 2019, representing an annual population growth rate of 4.3%. The largest population share in the region in 2019 was in the Democratic Republic of Congo (DRC, 26.9%) followed by South Africa (16.1%) and Tanzania (15.2%).

Overall, the region has also experienced a downward trend in mortality, particularly infant and child deaths. The combination of high fertility and declining mortality has been largely responsible for its rapidly increasing population. Although there is some uncertainty about the level of growth, it is certain that many more young people will enter the labour force in the next 10 to 20 years.

In addition, there will be a natural increase in urban population via population growth, in-migration (relocation from rural to urban) and the reclassification of rural areas as urban areas. As a result, climate impacts are likely to worsen drastically the social conditions of many SADC residents. Urbanisation rates in Southern Africa are higher than those in the rest of Africa. More than three times as many people are expected to live in urban areas in Africa by 2050 than had in 2015.<sup>25</sup> By the middle of the century, urban regions will be home to around 60% of the continent's inhabitants.<sup>26</sup>

This is consistent with the fact that a substantial percentage of Africa's urban population currently live in secondary and tertiary cities that tend to have close relationships with the economic activity of neighbouring rural communities. Consequently, agricultural and agri-food systems are expected to play a significant role in urban employment creation. The UN estimates that the proportion of urban dwellers in the region is larger than in all other African regions, and this trend is expected to continue until 2050.<sup>27</sup>

Since people living in rural regions may move to urban areas because they offer better connectivity, healthcare facilities and other social infrastructure, as well as globalisation, marketisation and administrative or institutional power, the trend is likely to persist. However, the rapid agglomeration of SADC's human settlements raises systemic social risks, potentially worsened by poorly conceived infrastructure plans.

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24 Didas Kimaro e al., "Climate Change Mitigation and Adaptation in ECA/SADC/COMESA Region: Opportunities and Challenges" (Draft Background Paper, African Centre for Technology Studies, Entebbe, 2020).

25 Thomas Jayne, Felix K Yeboah and Carla Henry, "The future of Work in African Agriculture: Trends and Drivers of Change" (Working Paper 25, International Labor Organization, Research Department, Geneva, 2018), 32.

26 John Cleland and Kazuyo Machiyama, "The Challenges Posed by Demographic Change in sub-Saharan Africa: A Concise Overview", *Population and Development Review* 43 (2017): 264-286.

27 UN, "COP26: Together for Our Planet", <https://www.un.org/en/climatechange/cop26>; UN Environment Programme, *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication* (Nairobi: UNEP, 2011).

## Food and health insecurity a key risk

In terms of food security, it is estimated that 41.2 million individuals living in 13 SADC member states were unable to guarantee their own food supply in 2019, according to the Southern African Regional Vulnerability Assessment and Analysis.<sup>28</sup>

On average, food insecurity rose by 28% between 2017 and 2018, according to the 11 SADC nations that provided data for both years. Increases were seen in Zambia (144%), Zimbabwe (128%), Eswatini (90%), Mozambique (85%) and the DRC (80%) in terms of the number of individuals who were food insecure.

In terms of health and nutrition, the frequency of global acute malnutrition among children under five exceeds 5% in seven SADC member states, according to the available data from 2019. The problem is exacerbated by recurrent drought conditions, floods, pests, war, economic difficulties, poverty and persistent structural challenges.

In 10 of the 16 SADC member states, the prevalence of stunting surpasses 30% and is considered extremely high. The current pace of stunting reduction will not meet the 2025 World Health Assembly targets or the 2030 Sustainable Development Goals (SDGs).

In terms of poverty and inequality, it is further anticipated by the vulnerability assessment that the level of inequality (as measured by the Gini coefficient) in Southern Africa (the region with the highest level of inequality in the world) will continue to increase. Even though 11 SADC countries have experienced economic growth and poverty reduction, at least half have seen a widening gap between the rich and the poor. The Gini coefficient for all SADC countries surpasses 0.27, the level at which the International Monetary Fund deems inequality detrimental to economic growth.<sup>29</sup>

According to the SDG Dashboard, all countries except two show severe or major challenges in meeting SDG 10 on inequality reduction.

The underlying drivers of food insecurity are understood to be poverty, extreme climate change, low investment in the agricultural sector and price volatility.

## The fraught politics of infrastructure in SADC

As contemplated in the systems map diagram (see Figure 11), population growth, migration and urbanisation are incentives for populist politics and policies. This, in turn, incentivises increased reliance on coal-heavy energy and infrastructure sources, against the backdrop of ageing and strained infrastructures. While SADC governments support greater regional

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28 SADC, *Synthesis Report on the State of Food and Nutrition Security and Vulnerability in Southern Africa* (Gaborone: SADC Secretariat, 2019).

29 SADC, *Synthesis Report on the State*.

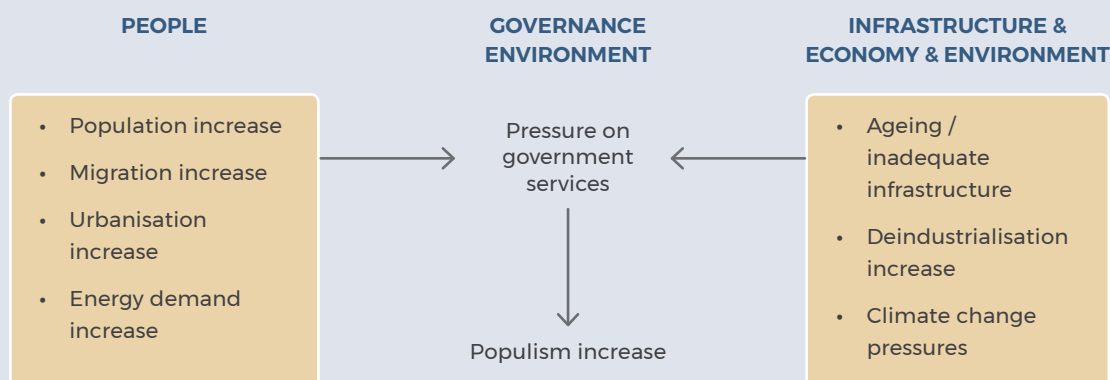
connectedness in principle and appear responsive to climate-related risks at the policy level, the politics of short-term pressures disincentivise movement in this regard.

It seems likely that SADC’s social disparities, inequalities and population pressures, along with regional migration and urbanisation, will breed new forms of populism and heightened social demands. Consequently, its ageing and strained infrastructure cannot accommodate the demand and, as climate risks worsen, political leaders will feel pressured to provide short-term and reactionary solutions.

So too, the underlying drivers of food insecurity represent a challenge to policymakers and infrastructure planners. This necessitates creative approaches to increase security of supply, nutrition, labour force participation and disposable income. Infrastructure thus plays a significant role in enabling the social conditions that will underpin social security and cohesion in the SADC region in coming decades.

**Figure 11 Systems map depiction of the dynamics of the politics of infrastructure**

Political interests responding to pressure arising from mismatch between population needs and resource availability



Source: Author’s summary of exercise output of Mastering Strategic Foresight delegates, GIBS Executive MBA, 2022

## Regenerative infrastructure: Localised patterns of circular infrastructure

Whereas historical patterns of development prioritised industrial forms of development over human security and environmental sustainability, new forms of human- and environment-

centric approaches are emerging. In her seminal book *Doughnut Economics*,<sup>30</sup> Kate Raworth argues that economic systems can and must be reimagined within the ‘ecological ceiling’ of what the ecology can bear.

**Figure 12 Doughnut economics: Maintaining the social foundation within the ecological ceiling**



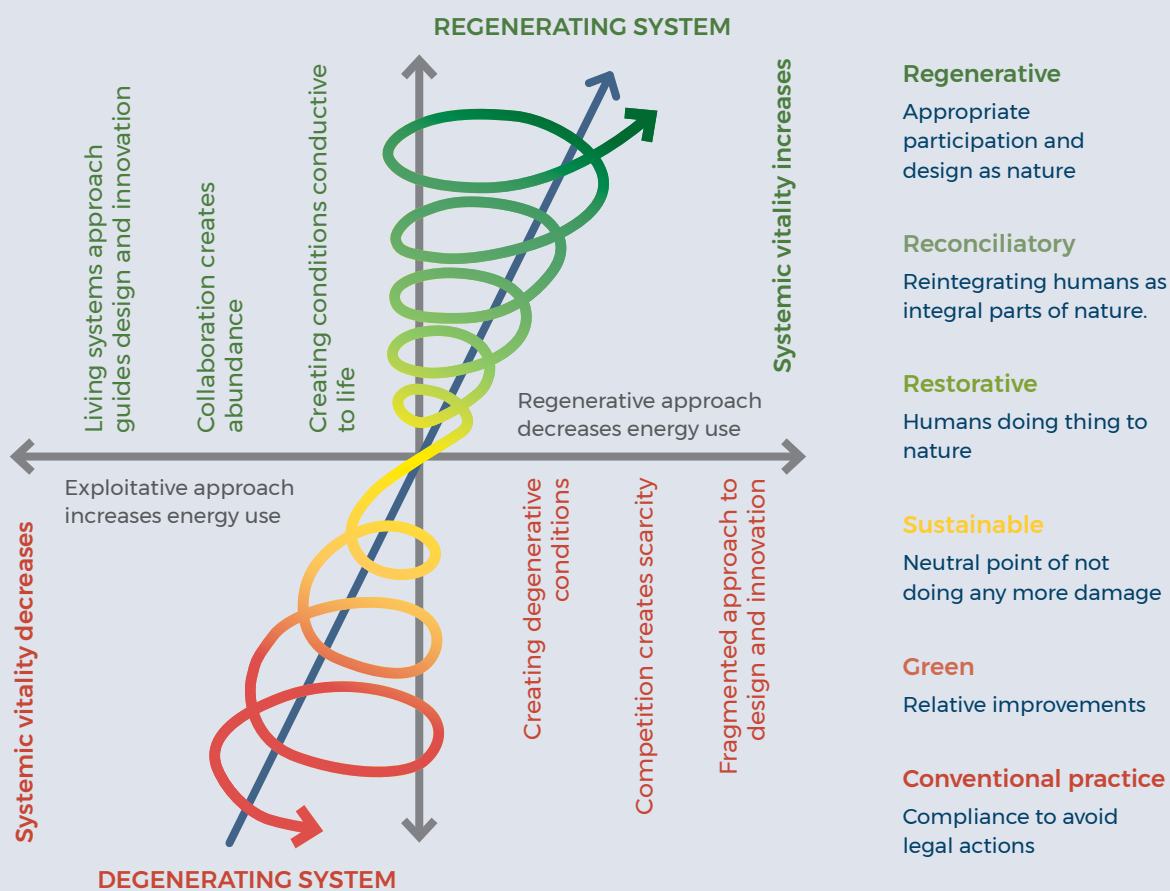
Source: Doughnut Economics, "About Doughnut Economics", <https://doughnuteconomics.org>

In addition, Raworth makes the case that a minimum ‘social foundation’ must be maintained upon which society can endure by providing food security, water security and other social goods. Her main hypothesis is that the ecological ceiling and social foundation must be kept in dynamic equilibrium by avoiding ‘overshoot’ on the one hand and a social ‘shortfall’ on the other.

30 Kate Raworth, *Seven Ways to Think Like a 21st-Century Economist* (White River Junction: Chelsea Green Publishing, 2017).

Raworth’s vision has enormous implications for how markets, trade and other policies (and, for that matter, the entire global financial system) are structured. So too, it has implications for infrastructure, which at some level is the enabler of every other system. In order to depart from the undesirable lock-in effect of SADC infrastructure described above, the ‘doughnut economics’ framework provides a useful conceptual reference point for the following question: How might infrastructure be re-imagined to enable the elements of a social foundation in SADC and prevent overshoot beyond the region’s ecological ceiling?

**Figure 13** Designing regenerative cultures



Source: Daniel C Wahl, “Sustainability Is Not Enough: We Need Regenerative Cultures”, Medium (blog), March 15, 2017

To begin with, infrastructure must be reimagined with a view towards long-term sustainability, which prioritises human and ecological health, resilience and adaptability.<sup>31</sup> Some might argue that the economic viability of any reimagination and the use of future scenarios are both questionable. After all, turning alternative possibilities into reality would

<sup>31</sup> Daniel C Wahl, “Sustainability Is Not Enough: We Need Regenerative Cultures”, Medium (blog), March 15, 2017.

require new business models, market structures and mechanisms (for instance) and the support of a transformed, enabling regulatory environment. However, in light of the vulnerable socio-political conditions in many parts of SADC, one may need to compare the true cost of inaction (often motivated by social, economic or climate risks) with the cost of reimagining and an investment in infrastructure reform.

Wahl,<sup>32</sup> a proponent of regenerative approaches to development, talks of 'wise action' by policymakers and business leaders. This would see human and ecological wellbeing prioritised over short-termism and extractive gain. Wahl suggests that a reimagining would aim to design infrastructure and other techno-economic endeavours 'for systemic health'. He argues that designers, technologists, policymakers and planning professionals ought to be challenged to evaluate their proposed actions in term of their positive, life-sustaining, restorative and regenerative potential.

Although somewhat radical compared to conventional perspectives, this approach suggests that populations might transcend the patterns of consumption and extraction as dominant cultural patterns. Instead, they can pursue regenerative human cultures that place health and care, or resilience, at their centre. Here, sustainability is about sustaining a pattern – a preferred pattern, in this case infrastructure, in support of human safety and wellbeing.

Such a vision in the context of SADC would require a transformation of the material resource base and resource productivity that historically has been the formative bedrock of its infrastructure. Beyond mere 'greening' or the introduction of aesthetic and shallow patch solutions such as gardens and a reduction in the use of carbon-based materials, a regenerative approach would necessitate creating cycles of reuse, and even circular economic activity.

Another proponent of such a reimagining, Bill Reed, argues the case as follows:<sup>33</sup>

Instead of doing less damage to the environment, it is necessary to learn how we can participate with the environment – using the health of ecological systems as a basis for design... The shift from a fragmented worldview to a whole systems mental model is the significant leap our culture must make – framing and understanding living system interrelationships in an integrated way. A place-based approach is one way to achieve this understanding... Our role, as designers and stakeholders is to shift our relationship to one that creates a whole system of mutually beneficial relationships.

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32 Wahl, "Sustainability Is Not Enough".

33 Bill Reed, "Shifting from 'Sustainability' to Regeneration", *Building Research & Information* 35, no. 6 (2007): 674-680.



# Imagining transformative infrastructure futures in SADC

It seems that green infrastructure<sup>34</sup> as an alternative to the baseline of a projected future in SADC would require not only a new approach to infrastructure design but also a change in the way in which stakeholders interact. Such interactions include those between policymakers, government officials, the private sector and other actors in the built environment.

## Getting the politics of infrastructure right

To enable a green infrastructure<sup>35</sup> transformation, one of the key challenges is improving the political environment.

The historical political landscape in SADC is complex and multi-faceted. Like Europe, where multiple nationalities share a continental region with different systems of governance and government and diverse political cultures, SADC is deeply diverse. However, Europe has through the embattled but persistent project of EU integration standardised and harmonised much of its political and policy regimes. SADC, on the other hand, remains a kaleidoscope of actors with little coordination between nations.<sup>36</sup> This is evidenced by the diverse bilateral relations between SADC nations and global powers, amid relatively low levels of regional integration and trade within SADC to date.

Locally, governing parties and elites, as well as business actors, still hold sway over decisions and policies that shape large-scale infrastructure. As such, the political drivers of trade barriers, misaligned policies, domestic political instability and politically destabilising demographics are likely to hinder visionary approaches to green infrastructure at a regional level. It seems unlikely that top-down approaches to reform can succeed in the absence of a major external shock.

While there is symbolic agreement at a policy level in SADC, this manifests in nominal agreements rather than action plans. Such agreements include shared commitments to the SDGs, the Paris Agreement on decarbonisation commitments, and the [SADC Green Economy Strategy and Action Plan \(2020–2030\)](#). The [Regional Indicative Strategic Development Plan 2020–2030](#), for instance, points to a strategic intent of regional coordination and cooperation on elements of green infrastructure but offers little by way of medium-term or immediate commitments.

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34 Ali Cheshmehzangi et al., "Green Infrastructures for Urban Sustainability: Issues, Implications, and Solutions for Underdeveloped Areas", *Urban Forestry and Urban Greening* 59 (April 2021).

35 US Environmental Protection Agency, "What is Green Infrastructure?", <https://www.epa.gov/green-infrastructure/what-green-infrastructure>.

36 Kyu Deug Hwang, "The Historical Evolution of SADC and Regionalism in Southern Africa", *International Area Studies Review* 10, no. 1 (2007): 55–72.

## Economic stagnation constrains political will

The politics of infrastructure is further complicated by economic factors playing out at national levels in SADC. With the International Monetary Fund (IMF) reporting GDP growth rates as being in decline – from 6.8% on average in 2007 to 1.4% in 2019 – and given the shock of COVID-19 on regional economies, SADC governments are constrained in terms of fiscal room to take action on infrastructure. The IMF shows that government debt as a percentage of GDP increased over 10 years from 28.5% to 56.1% in SADC, while FDI declined from \$14 457 million over the previous 10 years to \$5 721 million in 2019. These signals of economic stagnation represent considerable constraints on the political needed for a green infrastructure reform.

## Alternative scenarios

From the preceding analysis it is clear that SADC requires a new approach to infrastructure if it is going to see a reversal of historical and present-day social and environmental degradation.

Below are three inductive scenarios, or creative narratives, about alternative futures for green infrastructure in SADC. They seek to provide an imaginary step-change in the current trajectory of infrastructure patterns and are thus intentionally provocative and visionary while rooted in historical and contextual reality.

### DEFINITION OF SCENARIOS

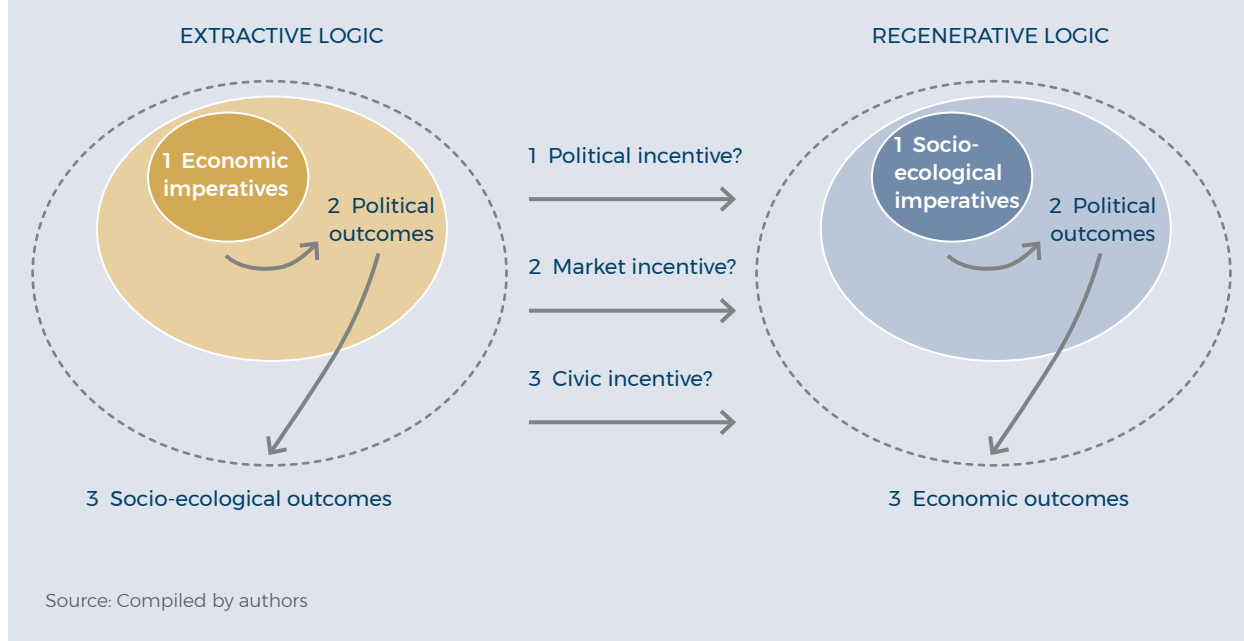
Developing multiple stories or imaginary pictures of how the future could look in order to explore and learn from them.

Source: Organisation for Economic Co-operation and Development, Strategic Foresight, "What Is Foresight", <https://www.oecd.org/strategic-foresight/whatisforesight/>

Each scenario uses a component from the systemic drivers discussed above as a linchpin for dramatic and transformational societal change, of which infrastructure is a key part. They then proceed from an inherent logic or theory of change, providing an evolutionary storyline with internal coherence.

As depicted in Figure 14, historical patterns of infrastructure development proceeded from the basis of economic imperatives, shaped primarily by political interests and neglected socio-ecological outcomes. However, a regenerative approach to infrastructure must proceed from a commitment to socio-ecological imperatives, resulting in the reform of political interests in service of economic outcomes that are sustainable, equitable and ecologically additive as opposed to extractive.

**Figure 14** Depiction of change from extractive to regenerative logic, on the basis of either political, market or civic incentives as the basis for alternative future scenarios



The three following scenarios or stories are rooted in each of the three incentives required to make the shift from extractive to regenerative infrastructure. The first scenario imagines a political incentive, brought about by dramatic climate change-induced migration, to take a new approach to infrastructure. The second emanates from the civic incentive; of communities taking it upon themselves to create new pathways for regenerative infrastructure development in the form of innovative, technology-enabled and bottom-up community action. The third scenario is rooted in a market incentive, enabled by emerging global standards and regulations associated with companies' environmental, governance and social commitments.

#### SCENARIO 1 RADICAL LAND-USE CONVERSION

*Description: SADC leverages climate-induced migration to revitalise people and planet, induced by a top-down drive resulting from an external shock, resulting in new nodes of integrated development. The scenario envisions a 'Marshall Plan-style' approach to policy and investment in SADC, relying on funding in the form of both aid and trade, especially in metals and minerals that are in high demand owing to the global energy transition.*

Source: Ben Heubl, "Booming Demand for Critical Minerals Could Harm the Environment, Not Save It", Institution of Engineering and Technology, July 2021.

In 2030 climate change is causing havoc across the SADC region on multiple fronts. Mudslides in Angola, hurricanes as far south as Gqeberha, multiple floods in the east and extreme droughts in the west beset the region. Besides tremendous infrastructure destruction and related economic disruption, a string of humanitarian crises ensue, compounded by food insecurity, especially severe in landlocked Zambia, Malawi and Zimbabwe. A major social trend that emerges is regional climate migration<sup>37</sup> within and across SADC countries, affecting an estimated 32 million inhabitants. At the same time, policymakers and financiers are focused on energy transition and long-term climate mitigation projects at the expense of an immediate humanitarian response.

Sadly, efforts at increasing domestic resilience in donor countries, themselves experiencing climate shocks, lead to a rapid decline in international aid. The so-called West pours support into energy transitions in Africa through the newly formed Loss and Damage Fund,<sup>38</sup> but not at a scale that can combat the effects. Additionally, China, touted as a funder of last resort for African nations in need of capital investment, becomes increasingly isolationist<sup>39</sup> and protectionist in reaction to rising geopolitical tensions with the US. The knock-on effects are that historical gains for SADC from globalisation have all but come to an end, except those relating to mineral exports. With minimal international support and in need of game-changing ideas, SADC members accelerate towards a more united regional approach, emphasising regional integration in a new path towards progress. And so, the 2035 SADC Habitability Strategy (SHS2035) is born.

The main concept of the plan is to respect the emerging patterns of migration, induced by extreme weather, by identifying and then safeguarding and developing those regions that emerge as resilient green-belt regions.<sup>40</sup> This is a concept first coined by the Chinese in the Belt and Road Initiative,<sup>41</sup> but it is underpinned in SADC's approach by circular economies and technology-enabled resilient infrastructure. The SHS2035 is positioned to attract investment from green bonds<sup>42</sup> and as a vehicle for contributions from the newly formed UN Climate Fund, as well as providing carbon credits<sup>43</sup> to investors. The revenues to be gained in South Africa's Western and Northern Cape rare earth metals and green hydrogen boom<sup>44</sup> are coupled with those of Namibia, Mozambique and Zambia, rich in uranium, aluminium and copper, respectively. As a result, SADC's Habitability Strategy becomes one

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37 Lisa Thalheimer, Otto Friederike and Abele Simone, "Deciphering Impacts and Human Responses to a Changing Climate in East Africa", *Frontiers in Climate* 3 (2021).

38 UNEP, "What You Need to Know About the COP27 Loss and Damage Fund", <https://www.unep.org/news-and-stories/story/what-you-need-know-about-cop27-loss-and-damage-fund>.

39 Cui Lei, "Will China Return to Isolationism?", *The Diplomat*, November 2018.

40 Tabeth Matiza Chiuta, Angela Sanyanga and Fortune Nyatsanza, *The SADC Biodiversity Action Plan: Building Wealth and Livelihoods Through Biodiversity Conservation and Management* (Harare: Watenn Consulting, 2010).

41 Ali Cheshmehzangim, Linjun Xie and May Tan-Mullins, "Pioneering a Green Belt and Road Initiative (BRI) Alignment Between China and Other Members: Mapping BRI's Sustainability Plan", *Blue-Green Systems* 3, no. 1 (2021): 49-61.

42 Judith E Tyson, "Developing Green Bond Markets for Africa: A joint FSD Africa-ODI Research Program for Financial Sector Development in Africa" (Policy Brief 3, Overseas Development Institute, London, 2021).

43 Lian Pin Koh et al., "Carbon Prospecting in Tropical Forests for Climate Change Mitigation", *Nature Communications* 12, no. 1 (2021): 1-9.

44 Elkhan Richard Sadik-Zada, "Political Economy of Green Hydrogen Rollout: A Global Perspective", *Sustainability* 13, no. 23 (2021).

of the few scalable, green and bankable mega-projects<sup>45</sup> into which developed countries can pour resources in pursuit of their shared interest.

Linking energy, water and food security<sup>46</sup> in a new model of infrastructure development, countries such as Tanzania, Malawi and Zimbabwe are positioned as future breadbaskets. In addition, their infrastructure reconstruction programmes are fast-tracked as conditions change in favour of export.

## SCENARIO 2 FOOD-WATER-ENERGY-HOUSING NEXUS

*Description: SADC's entrepreneurs invent solutions for sustainable communities in a bottom-up, innovation-driven reform of local nodes around regenerative systems of production, recycling and responsible consumption. Driven by social change and a response to growing insecurity and infrastructure failures, Citizen Action Networks (CANs) provide the institutional backbone for local action and curtail localised consumption as a priority. In the scenario, universities play a key role in popularising the models of development.*

By 2035 many SADC governments are hampered by inefficiencies and power struggles on various fronts, which prevent them from taking early climate action. Countless communities that have suffered years of underdevelopment are left vulnerable to the threats of extreme weather.<sup>47</sup> However, there are first-hand accounts on social media of how local communities across the globe adapt to climate change.<sup>48</sup> This, along with the public sharing of knowledge gained from their resilience efforts, fuels a popular shift in the mindsets of local SADC communities – especially among the youth, who feel they stand the most to lose. A new breed of techno-entrepreneurs emerges, harnessing digital tools to create micro-enterprise ecosystems.<sup>49</sup>

These global stories inspire young African entrepreneurs and, with a growing sense of pride, the floodgates of innovation open, giving rise to the emergence of countless creative infrastructure and public e-service solutions.

These grassroots innovations, mostly situated in local nodes such as villages and cities, are strongly centred around ICT and digital infrastructure to support education access, and later local, independent energy generation, food production and clean water. As grassroots

45 "New Mega Projects Planned for South Africa's 'Next Gold Rush'", *BusinessTech*, November 29, 2022.

46 Tiago Liberalesso et al., "Green Infrastructure and Public Policies: An International Review of Green Roofs and Green Walls Incentives", *Land Use Policy* 96 (June 2019).

47 Richard Damania et al., *Uncharted Waters: The New Economics of Water Scarcity and Variability* (Washington DC: World Bank, 2017).

48 Mingyue Fan et al., "Effects of Entrepreneurial Orientation on Social Media Adoption and SME Performance: The Moderating Role of Innovation Capabilities", *PloS One* 16, no. 4 (2021).

49 Thomas Elliot et al., "An Expanded Framing of Ecosystem Services Is Needed for a Sustainable Urban Future", *Renewable and Sustainable Energy Reviews* 162 (March 2022).

innovations have to account for local resource limitations, their business models centre on and popularise the principle of conservation, preventing them from overreaching or using more than what is needed. SADC governments, desperate to demonstrate state capacity and relevance and to bolster their legitimacy, pile in support for these entrepreneurs and adopt their projects and state-enabled prototypes. Models that work are quickly scaled through the removal of red tape and deregulation, at little cost to government bureaucrats.

Overall, the pace of innovation is too fast for centralised control, and policymaking for local service provision is devolved to local communities and cities, to regulate innovation to the needs of local contexts. During the early days, mostly CANs are seen – a new form of emergent citizen-led governance developed in response to the COVID-19 pandemic<sup>50</sup> that provide the institutional backbone for local action. However, soon partnerships with local universities and other research institutions strengthen the movement. As patterns of innovation emerge, they play a key role in providing supporting research and popularising the emerging models of development.

Integrated principles of socio-ecological development, based on ‘whole-systems thinking’, soon follow. These serve as a manifesto of sorts, with popular opinion forcing governments to use the principles as criteria for future large-scale, national infrastructure developments. In response, the *Journal of Public Management* of the University of Stellenbosch publishes a special edition on ‘Democratic and Ecological Resilience through Social and Digital Innovation’ in 2030, with papers from scholarly practitioners across the region attracting praise globally after being showcased at COP47 hosted in Windhoek, Namibia.

## Featured infrastructure types

Local food production and electricity generation; local sanitation and water access; ICT and connectivity.

### SCENARIO 3 PLACE-BASED LIVELIHOODS

*Description: Environmental, social and governance (ESG) investors outpace conventional finance as development finance goes mainstream. An institutional and market-led approach is enabled by the Global South sustainable growth story, a mission economy in which the World Bank and regional development banks, the Development Bank of Southern Africa and BRICS all play a role. New regulations, especially in trade border tariffs, incentivise greening of supply chains in SADC.*

50 Agnese Roda, “The Community Action Network and Finding”, in *The COVID-19 Pandemic: Ethical Challenges and Considerations*, eds. Eleftheria Egel and Cheryl Patton (Suffolk: Ethics International Press, 2022), 201-213.

By the late 2020s, limited progress has been made by multilateral bodies to improve global cooperation on climate change. There is a persistent threat of global instability and decades-old global power dynamics remain. In the face of persistent social instability (and possible nuclear threats) and the increasing effects of supply chain disruptions, businesses in Europe,<sup>51</sup> the Middle East and North America are anxious to safeguard the ecosystems on which they depend. The SADC region, due to its relative stability, having demonstrated unexpected resilience through the ‘turbulent twenties’, and given its high levels of natural resource endowments, is a target for supply-side investment. SADC’s own business community, pressured by lingering social inequity and the legacies of apartheid and colonialism, comes to terms early on with the realities of corporate responsibility, also referred to as ESG. This means that the new corporate demands of the Global North find resonance with local business and a new partnership for development is born in SADC.

Through special-purpose vehicles referred to as community-based public-private partnerships (C-PPPs), the private sector leads a transformational investment drive in SADC. New operating models consider socio-ecological sustainability and shared value to create business models that benefit all stakeholder categories, including the ecology, through regenerative infrastructure investments.

Since SADC’s industrial infrastructure has become outdated and poorly maintained, it is the perfect target for reform under for this new approach to business.

What started in South Africa as an energy system renewal programme quickly expands across SADC as green basins and reforestation are linked to investments for social and carbon credits. Being referenced in the quarterly report of the UN’s newly formed watchdog for just transition, which investigates and reports on corporate accountability for ESG, becomes highly tradable reputational currency for corporates operating in the region.

By taking and adapting place-based approaches and whole-system thinking into ‘living system thinking’, governments provide project finance<sup>52</sup> for the initial impact studies and prospectus to crowd-in funding into a rejuvenation drive of the region’s natural endowments, especially in water and biodiversity. Business finds that it can couple new business models for suitable food, or additive manufacturing using suitable materials, to SADC’s living systems policy approach. In addition, efficiencies are unlocked by reducing the externalities that otherwise need to be accounted for as penalisable losses or ‘scope 3 externalities’.

In 2030 the executive director of the UN Environment Programme opens its annual conference with a feature on the Zambezi Basin’s mega-food production system, saying, ‘This project, one of many C-PPPs across SADC, has become the first to provide food to over 150 000 000 per annum, while maintaining a zero-carbon footprint.’

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51 Olivia Lazard and Richard Youngs, eds., *The EU and Climate Security: Toward Ecological Diplomacy* (Washington DC: Carnegie Endowment for International Peace, Carnegie Europe, 2021).

52 Sonia Phalatse, “The Role of Private Finance in Infrastructure Development in South Africa: A Critical Assessment”, *Journal of Infrastructure, Policy and Development* 6, no. 1 (2022): 1-33.

# Recommendations

These scenarios show that SADC policymakers require a fundamental paradigm shift in how they approach infrastructure. Instead of centring approaches on economic imperatives, with ecological and social outcomes mere trade-offs to manage, the latter must be brought to the centre of their policy thinking. The scenarios demonstrate that much higher levels of coordination will be needed. This coordination is necessary not merely between SADC governments at the multilateral level but also across society and business, communities and markets, to unlock regenerative approaches to infrastructure. The scenarios demonstrate that a failure to respond adequately to the systemic risks of climate change poses existential threats to SADC communities and economies. However, these same risks can serve as a catalyst to enhance political will and investment for accelerated change.

In light of these observations, the following recommendations are made.

- Regulations should be developed to encourage investment and support the creation of C-PPPs among and within SADC nations. These regulations should encourage foreign investment in place-based or regionally focused projects and must prioritise the creation of ecologically sensitive social development zones, underpinned by sustainable economic practices.
- Policies should be developed to protect regional resources and economies within a more visionary imagining of development, on the basis of regenerative and circular economies. Such economies can be enabled by regenerative infrastructure that contributes to improving human and ecological security at the food-water-energy nexus.
- Further regulations are required to encourage skills, knowledge and technology sharing among SADC nations and the innovation systems within them. This will boost technology adoption and development through collaboration and shared investments. Tertiary institutions and research networks have a key role to play in enabling these.
- Regulations should be developed to enhance the positive effects of global trade with SADC, underpinned by agreements that enable SADC's regional capacitation in terms of know-how and knowledge transfer. Such agreements should guide and encourage institutional development through resource sharing, free movement of goods, and the movement of skilled workers into and among SADC nations.

It is also recommended that amendments to the Green Economy Strategy and Action Plan for Sustainable Development address the discussed drivers by:

- decreasing the level of reliance on non-renewable natural resources;
- decreasing the negative effects of climate change through decarbonisation and the development of resilient infrastructures;



- improving access to quality and sustainable infrastructure through a location-based design approach, with an orientation towards regenerative processes as opposed to industrial use only; and
- moving beyond bureaucratic political processes by involving citizens and the business community in improving the economic environment.

Furthermore, the plan should frame the terms of engagement for the establishment of a non-political Green Infrastructure Task Team, which should address the following issues:

- improving the quality of collaborative leadership in SADC on the issue of green infrastructure; and
- improving citizens' level of education on and awareness of the challenges and prospects associated with the issue, to catalyse greater citizen and private sector participation.

A Green Infrastructure Task Team should convene an annual Ubuntu Green Infrastructure Lekgotla as the overarching platform for SADC's approach. It should also invest in the development of a charter towards a SADC Green Infrastructure Social Compact. Such a compact could act as a framework for any SADC green infrastructure policy presented, debated, and executed at inter- and intra-state levels.

Finally, the SADC Secretariat and member states should implement existing policies that improve interaction, collaboration and communication between member states with a focus on the four policy components, or elements, reflected in Table 1.

TABLE 1 ELEMENTS OF POLICY TO BE ENHANCED	
<b>1 Standards</b>	Establishment of an overall strategy and policymaking plan that is cooperatively implemented by all SADC members, in light of global developments in climate funding, ESG and regulatory oversight. These green standards should include both the public and commercial sectors, with measurable and evaluable objectives.
<b>2 Regional investment</b>	Proposed allocation of funds towards the development of critical innovative green sectors with a focus on quick wins in cases where capital injection will lower financial barriers to entry, crowding in private sector investment, enhancing economic efficiency and producing greater productivity.
<b>3 Incentives</b>	Early-stage policy incentives that target FDI, enabling access to green funds and attracting private sector investment. These could include tax rebates, economic incentives, financial assistance, the exchange of skills and frameworks that enable the removal of red tape for access to capital.
<b>4 Collaboration</b>	SADC-led skills-development and skills-exchange initiatives across member states and with global partners. The objective is to develop the skills necessary for green innovation and planned regional infrastructure maintenance. This bottom-up approach should result in the creation of local employment and enhance the availability of skills for private and public sector initiatives.

Source: Compiled by authors

The collective implementation of these policies will enable the region to create new and innovative strategies to strengthen regional economic development linked to green infrastructure.

## Conclusion

The analysis demonstrates that inter-state cooperation remains critical to enhancing the state and future of infrastructure in SADC and enabling the development of green infrastructure in particular. The drivers of change affecting infrastructure are such that political process, economic dynamics, regulatory enablement and investment are unavoidable focus areas in need of concerted intervention, if green infrastructure is to be developed.

The scenarios demonstrate that SADC is able to change from an extractive to a regenerative logic in how it develops infrastructure in future. However, this would require harnessing the political will as well as market or civic incentives for such green infrastructure, especially those arising from the risks associated with climate change, the needs and demands of SADC populations, and the imperative for greater social equity.

Scenario one, or the 'radical land-use conversion' story, demonstrates the need for a coordinated and smart policy, such as the envisioned 2035 SADC Habitability Strategy, to position SADC to attract investment from green bonds globally. Also, the water resource management, construction and agriculture sectors need to be collaboratively engaged in the shared goal of regenerative development. The story shows that the SADC Secretariat can play a pivotal facilitation role in creating a new approach towards the built environment, as an enabler of greater socio-economic transformation and resilience in the region.

Scenario two, or the 'food-water-energy-housing nexus', demonstrates the importance of citizens' agency and action, and the role of social media and bottom-up community efforts at improving resilience. To the extent that populations in SADC are self-reliant, novel institutional approaches such as CANs can result from proactive mindsets of local SADC communities. This can lead to the development of new integrated principles of socio-ecological development, based on whole-systems thinking.

Scenario three, or 'place-based livelihoods', shows how the business community has a crucial role to play, possibly through C-PPPs, and in light of the prospective global standards and new watchdogs emerging to govern efforts at realising a just transition. The scenario shows that as this trend develops, corporate accountability for ESG may be a lynchpin for greater investment in green infrastructure.

As argued above, on the current path SADC's existing problems with poor and unsustainable water provision and sanitation, inefficient transport, mobility and logistics,

and carbon-heavy energy systems will prevail, unless it can overcome the long-term legacy patterns produced by colonialism, apartheid and hydrocarbon-based industrialisation. The likes of the African Continental Free Trade Agreement are not sufficient to overcome trends towards inequality, poverty and social deprivation, or environmental degradation.

Furthermore, the risks associated with climate change – as well as the incentives created by the clean and just transition – mean that SADC must adapt and seize the moment. While the scenarios portray visionary alternative futures for approaches to green and regenerative infrastructure in SADC, new regenerative approaches to circular economies, rooted in local production, requires a responsive adjustment to policy approaches. This should place sustainability, human development and innovation at the centre of how infrastructure is imagined.

As stated, new forms of human- and environment-centric approaches are emerging globally and can be used in SADC. To do so, the SADC Secretariat must facilitate the creation of the new policy regime enabling visionary and transformative green infrastructure.

# Authors

## Marius Oosthuizen

is Director, Scenarios at the World Energy Council, where he leads impact projects and scenario development on accelerating the clean and just transition globally, and Director for Learning at the School of International Futures (SOIF) in London. He is also a member of faculty at the University of Pretoria's Gordon Institute of Business Science and holds a PhD in integrative public leadership from Stellenbosch University, an MA in strategic foresight from Regent University, USA and an MPhil in social and political ethics, as well as undergraduate degrees in systematic theology.

## Johann Schutte

is a Foresight Specialist at the SOIF, where he does foresight research, analysis, material development and capability building. Most recently he was the co-author of the Wales Council for Voluntary Action's (WCVA) Toolkit for Community Futures in Wales to support futures thinking at the local level. He has also conducted Train the Trainer sessions for both the WCVA Community Futures project and the Health Futures Strategic Dialogue Workshop in Mongolia, sponsored by the World Health Organization's Western-Pacific Regional Office. He holds an MSc in Strategic Foresight from the University of Houston and an MDiv from the University of Stellenbosch.

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# About SAIIA

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Jan Smuts House, East Campus, University of the Witwatersrand  
PO Box 31596, Braamfontein 2017, Johannesburg, South Africa  
Tel +27 (0)11 339-2021 · Fax +27 (0)11 339-2154  
[www.saiia.org.za](http://www.saiia.org.za) · [info@saiia.org.za](mailto:info@saiia.org.za)