

SIEMENS

SOUTH AFRICA IN 2040

# Pictures of Transformation



# Index

Foreword

About this project

Executive Summary

Drivers of transformation

Deep Dive I: Agriculture & Food

Deep Dive II: Digital

Deep Dive III: Mining

Deep Dive IV: Energy

Deep Dive V: Infrastructure

Deep Dive VI: Water

Deep Dive VII: Society

Deep Drive VIII: Mobility

Conclusion: How Siemens contributes to  
advancing South Africa

## ABOUT THIS PROJECT

# Foreward

How will we live in the future? What is the life we want to fashion for ourselves, our children and our communities? And how can we – as companies and individuals – transform the everyday to create a healthier, fairer, more sustainable world? At Siemens, we ask ourselves these questions every day, in South Africa and around the world. Our global “Pictures of Transformation” project became an extensive study also in South Africa, to determine the drivers and blockers of transformation in our society and the transformative hypotheses that could become a reality in our lifetimes. We look at the technological progress we can make, the decarbonisation paths we can forge, and the circular, regenerative systems we can put in place to achieve beneficial transformation. One simple fact remains: Society and the economy can change for the better by 2040. We can make it happen. Now is the time to act, and Siemens is taking action. By multiplying our sustainable practices across industries, economies, and whole societies, we enable our partners to use this planet’s precious resources more efficiently to tackle the climate crisis. The future remains uncertain, but we can make progress through collaboration. This is real, not fantasy, and we invite everybody to join us in shaping the best possible future for our region and the world.

Sabine Dall'Omo,  
Siemens Sub-Saharan Africa CEO



## ABOUT THIS PROJECT

# How will South Africa look in 2040?

For the last couple of months, we have gathered and reviewed expert knowledge of global and local developments and future trends – not only in South Africa but also in other markets.

We wanted to find out where South Africa is heading and what its sustainability picture might look like in 2040 – the halfway mark between 2030's Sustainable Development Goals (SDGs) and 2050's global net zero climate goals. To do this, we interviewed internal and external experts. We conducted in-depth research on trends across industries and potential transformation areas – and identified global trends as well as specific local trends for South Africa.

To gain additional insights and to validate existing trends, we talked to members of various industries, including specialists from research institutions and government agencies – all to get a wide view of the sustainability landscape and their expectations for South Africa by 2040. The results were evaluated by Siemens and external specialists in their respective fields before being packaged for your benefit in this report.



Our Picture of Transformation is based on all these insights.

**“Together with our customers, digitalization will aid in making changes that will shape a better future for African societies.”**

Sabine Dall'Omo, Siemens Sub-Saharan Africa CEO

## ABOUT THIS PROJECT

# Executive summary

In this report, we unpack the key transformations South Africa are likely to see by 2040. In a nutshell, here is what you will learn:

**South Africa's agricultural sector** will embrace next generation **technology** for greater financial security, environmental resilience, consumer health and safety, and nationwide food and water security. Remote sensors, drones, robotics and smart siloes will prevail. **Farmers will go off the grid** with their own electric vehicle fleets and charging stations, their own 5G or 6G internet and



their own renewable energy generation, while mobile food safety labs will test their produce. Regenerative practices will lessen their dependence on commercial fertilisers and pesticides and could **reverse**

**biodiversity loss and increase crop yield** by 13%.

By 2040 the **digital economy** will boom in countless ways. Greater internet access, and 5G and 6G adoption, will change how people work, learn and enjoy their lives. **Virtualized cities** will change how citizens live. By 2040 South Africa's smart cities will rely on edge computing for real-time decision-making. Digital innovations will change how rural and urban populations are served. Industries will be transformed by the rise of the **industrial metaverse** and more **non-human labour will take up 50% of dangerous or tedious jobs**.

The mining industry will invest in innovations for carbon sequestration, worker safety, environmental rehabilitation and energy self-generation. AI and Machine Learning will drive

decision-making and miners will embed smart, cost-saving Internet of Things (IoT) technologies into every layer of operations. Sensors, drones, 3D printing and digital twin technology will drive efficiency.

By 2035, AI could be automating 35% of all mining work and 50% of mining jobs because of its pivotal role in supporting a safer mining industry. AI can, for instance, predict scenarios and ensure that South African mining complies with global ESG regulations to provide auditable proof of safe operational practices, more responsible water usage and more. Humans will do more meaningful, skilled and creative work.

South Africa will still have an **energy backlog** in 2040. Enough renewable energy generation will be in vain if the infrastructure does not exist to transmit and store this energy. Thankfully, digital innovations have the potential to address complex energy supply demand problems and **advances in renewable energy storage** will be an economic game changer. With sufficient energy infrastructure, South Africa could **meet the energy demands of 95% of the population through on-grid and off-grid connections** by 2040. The market could total 7.5 GW of installed capacity by 2035. In addition, the mobility sector will be boosted by substantial electrical energy generation and other alternative forms of fuel such as hydrogen.

In terms of **infrastructure development**, South Africa could see an exciting decade ahead, granted it attracts adequate investment. We could see a boom in multimodal mobility solutions, digital infrastructure, connected mega cities, better municipal infrastructure and greater infrastructure innovation opportunities for entrepreneurs by 2040. Digital transparency will overhaul municipal trading services and infrastructure management

by 2040. For instance, digital solutions will make services such as proper rail signalling more effective and efficient, and will reduce non-revenue services to improve the health of the public purse. South Africa's rail and air freight volumes could more than double by 2040.

AI and IoT could help manage traffic, public safety, energy and water in most SA cities by 2040. SA's taxi industry could be formalised and digitised and the e-hailing industry will go electric by 2040.

**South Africa's water situation is very concerning.** The country is facing a **water deficit of 17% by 2030**. Today, 60% of the country's rivers are over-exploited, 40% of its waste water is



untreated, and untold volumes are lost to leaks in ageing infrastructure and exploitation from agriculture and manufacturing.

**Technological interventions, new innovation and multi-sectoral collaborations are critical.** By 2040,

South Africa's new smart **National Digitized Water and Sanitation Monitoring System** will govern new water quality and quantity measurements, as well as data collection, management and communication protocols. **Satellites, drones, robotic crawlers, sensors and other IoT technologies** will monitor water and sewerage pipelines and reservoirs for problems such as leakages. Smart metres will improve municipal water readings, revenue collection and future demand calculations. With the rise in automation, most human jobs will be highly skilled and technical.

**South African society** could become a **top 30 economy** by 2040 - if it improves its good governance, education backlogs and youth unemployment. With near full nationwide internet access by 2040, **digitalization will transform the education, jobs and skills landscapes**, ensuring that the future of work is more highly skilled, and less manual and dangerous. Service delivery and political participation are also likely to be improved by greater internet access. Society could however be exposed to close to **half a billion cybercrime attacks** annually by 2040. In terms of labour distribution, BBBEE is unlikely to be dismantled, but up to 50 000 skilled South African professionals could be emigrating yearly by 2025.

In terms of **mobility**, South Africa will remain reliant on public transport, but the industry will ease its dependence on fossil fuels and embrace electric and hybrid modes of transport by 2040. An estimated **50% of vehicles in SA** will be electric or hybrid by 2040, powered by about **300 000 EV charging stations**, while **35% of trains** are likely to be electric as part of a revived rail system, and the entire e-hailing industry is expected to be fully electric by 2040. **South Africa's evolving logistics industry will digitalise exponentially** - improving real-time tracking through **smart sensors**, goods management through **robotics**, and demand and supply volumes through tools powered by **big-data, algorithms, artificial intelligence and machine learning**.

Hope you enjoy learning about the future of South Africa as much as we did researching it. South Africa will certainly be transformed by 2040 - and as the research points out, mostly for the better.

# Drivers of transformation

We live in complex times – and more challenging roads lie ahead. An immediate reduction in emissions is required while society reaches further, asking for more flexible, integrated, and healthy ways of living. Yet so much other noise is distracting public attention away from what is most important.

A strong drive towards technological innovation is the starting point for improving the world of tomorrow. In the following pages, you will find the key drivers of transformation that we have identified through the Picture of Transformation project and that are valid across all sectors.

## 1. Decarbonisation

South Africa must transition away from fossil fuel dependency sustainably, securely and affordably if it is to have a successful long-term decarbonisation future. Global greenhouse gas emissions are already triggering catastrophic weather events around the world, and Africa is predicted to shoulder the greatest global burdens of climate change in the coming decades.

Combine this with growing unemployment and the need for greater economic growth to emerge from the current economic down cycle, and the need for a just transition to a prosperous net zero economy becomes a non-negotiable imperative.

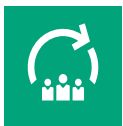


Sustainably electrifying the various sectors is a prerequisite to decarbonising our economy. This, however, leads to a shift in energy consumption, with the energy hungry, economically vital industries of agriculture, manufacturing and mining requiring a great deal of reliable power supply. Getting this balance right, for the benefit of all people and the environment, requires immediate collaborative action on the part of public institutions, private businesses and civil society. Together we can drive a massive push for solutions and technologies that can help manage the unprecedented transformation we are experiencing now, on the road to 2040 and beyond.



## 2. Circularity

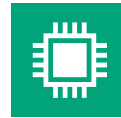
Many natural resources and raw materials seem abundant, especially in South Africa, where the sun always shines, the wind always blows, and the earth always produces a rich bounty. The reality, however, is that even seemingly abundant resources are precious and limited. It is our duty to guard, preserve and circulate the resources we have long into the future. South African society, and especially its civil society, entrepreneurs, and conscious consumers, have always had a strong sense of responsibility. They carry the multidimensional transformation agenda into all regions and communities and make it a lived reality. These same ethical standards have been brought into focus by globalisation and its effects on labour rights, occupational safety and health, environmental pollution, economic and political participation, and more. All of these parts form an ecosystem with circular systems that maintain a delicate balance. In these tumultuous times, balance may seem out of reach, but it can be restored and maintained through ethical and conscious collective action from companies and individuals.



## 3. Social impact of transformation

Human labour has always been the most important source of value creation in our economies. Digitalization and new working models can only partially overcome this inextricable link. The smart and autonomous networks of the future still have to be developed, built, and maintained by highly qualified people. A shortage of technology experts and engineers could be a bottleneck for progress – making education and upskilling key factors for establishing a resilient yet highly flexible labour market. Skilled workers are needed on all levels of education, all economic sectors and age groups. We need to take everyone along on the Just

Transition journey to prevent creating a new kind of inequality in the future – of transformation haves and have nots. Greater inclusion and equality is especially critical in South Africa, which today is the most economically unequal country on earth.



## 4. Purpose-driven technologies

South Africa is known for punching above its weight when it comes to digital innovation and transformation. There is a high level of adoption in the economy of digital technologies and new business models that can usher in a more sustainable world. With more information being collected by sensors, new platform approaches and connectivity solutions, we can reorganise more parts of our daily lives. At Siemens we believe in bringing together ground-breaking efficiency and convenience in the design, production, and distribution of goods and services. Artificial intelligence (AI), virtual reality, and automation are strong forces in the creation of more efficient industries, provided that they are underpinned by strong regulatory frameworks that guarantee cyber security, human rights, and consumer trust.



SOUTH AFRICA IN 2040

## Discover the future today

This is not a vision of a distant utopia or fairy tale. We present scenarios that are very probable and achievable – based on in-depth research and expert knowledge. With all the unique challenges that South Africa faces, the need for a successful transformation to sustainability has never been greater. If we act now, with the spirit of ubuntu, we can mitigate the risks presented and capitalise on the opportunities before us to create a better future for the country and planet. Let's share these findings with our communities so that we can drive the collective transformation we want to see by 2040.

Onwards and upwards!

*"The digital transformation of industries ensures that processes become more adaptable, flexible and efficient. This allows businesses to meet customer's needs in the most reliable way while also reaching their critical sustainability goals."*

Sabine Dall'Omo,  
Siemens Sub-Saharan Africa CEO



### A holistic vision for 2040

This is a graphic representation of South Africa in 2040. The country has undergone several significant changes in terms of agriculture and food, digital, mining, energy, infrastructure, water, society and mobility. While some gains were lost, others were made, bringing South Africa closer to the transformation it needs for its environment and people.



DEEP DIVE I: AGRICULTURE

# Agriculture: risks, rewards, and responsibilities

Agriculture is one of the most vital sectors in the South African economy, both in terms of meeting the needs of a highly food-insecure nation and as a major contributor to the economy.

Close to 20% of the South African population is food insecure. Yet, we grow more than enough food and millions of tons end up as food waste. The agriculture, forestry and fishing sector is also economically critical, contributing an estimated R134 billion to the country's Gross Domestic Product (GDP) in 2022.

Transformation in the agriculture and food sectors therefore requires a delicate balancing act between economic goals and human and environmental health goals.

These endeavours call for greater cooperation and shared education between the public and private sectors as well as academia and civil society.

### **1. Agriculture is a key driver of prosperity in South Africa.**

With 2040 in mind, there is a strong emphasis in the sector on achieving sufficient and sustainable food production, improving the livelihoods of small farmers, and achieving economies of scale and improved export revenues for larger farms. Technological innovation is improving efficiencies in the sector, and improved decarbonisation and sustainable practices are building a better future.



### **2. Food, and the way it is produced, drives human and environmental health.**

Food, and the way it is produced, drives human and environmental health. As the world becomes more conscious about the dangers of harmful chemicals in our soil, water and air, as well as detrimental food processing and

packaging, transformation should also focus on agricultural and food production standards. The industry must maintain a healthy and sustainable environment, for instance by protecting people from rising food-related non-communicable diseases such as diabetes, cancer, and obesity.

### **3. Agriculture's massive impact on South Africa's environmental footprint.**

62% of South Africa's water is used for irrigation. An estimated 10.3 million tonnes of food and beverages, which is about 34.3% of local food production - amounting to R61.5 billion worth of food is wasted every year. At the same time, the agri-food value chain accounts for more greenhouse gas emissions than any other sector. To lighten its carbon footprint in the future, the agricultural sector will have to embrace transformative technologies, regenerative farming practices and circular economic thinking.

Deep dive with us to find out what the key drivers and blockers of agricultural transformation are.

# Eye on technology in agriculture and food production

Deep dive with us to find out what the key drivers and blockers of agricultural transformation are.

### **1. Internet of Things:**

Our interviews with industry experts have revealed the major role that technology will play in transforming how we farm and provide food in the future. The agricultural sector is embracing the Internet of Things (IoT) in a big way - remote sensors, drones and robotics can monitor large swathes of land, crops and livestock, and can assist with harvesting, weed management and disease control on large commercial farms. Drones will assist with the spraying of crops and precision pesticide applications will ensure compliance with strict export standards. Smart siloes, greenhouses and machinery will also be managed remotely, while real-time sensors and data will optimise water management.

### **2. Digital systems and processes:**

Embracing digitalization to update its processes, the sector will use blockchain technology for smart contracts, traceability and the digital certification of organic produce. Mobile applications will assist farmers in monitoring the moisture levels in their soil, while Bluetooth Low Energy (BLE) will assist farmers in tracing and tracking inputs such as seed, fertiliser and pesticides, controlling contamination, and ensuring food safety standards all the way from farm to factory to fork. On the macro level, big data and algorithm-driven artificial intelligence and machine learning will help track and predict supply and demand, reducing costs by 15%, increasing crop yields by 13%, and reducing cash flow problems and food waste.

### 3. Going off the grid:

Between now and 2040, many more commercial farms will go off-grid, for instance by switching to renewable energy for better energy security and to 5G private networks for better internet

connectivity. Electric vehicles and equipment - powered by charging stations on the farm - will become more mainstream, reducing the industry's dependence on fossil fuels and outside refilling stations. Farms will become self-contained production centres that collectively help the country to dramatically improve its chances of reaching its 2050 net zero targets.



## Towards agricultural decarbonisation

The decarbonisation of the South African agricultural sector holds great promise. On the demand side, high electricity and diesel prices, decreasing costs of solar PV, and the need to grow food efficiently and extend the shelf-life of more agricultural produce, are driving the adoption of solar-powered irrigation, drying and cooling systems. In fact, it is hypothesised that 50% of renewable energy sources will be used in most large commercial farms to power refrigeration, heating, irrigation, and the operation of equipment and machinery. In the South African agricultural and food sectors, will come from renewable energy sources by 2040.

Unfortunately, factors such as lack of funding and teething problems with solar-powered systems still block much-needed progress, but progress is happening. Farmers and industry players are already investing in the best technologies, and a switch-over to electric tractors, trucks and other vehicles, powered by electric charging stations on farms, is imminent.

## Farm to factory to fork: Towards sustainable food production

### 1. Our food systems are broken.

We are not producing too little food. We are producing an abundance, but much of it is either not safe enough or it is not getting to everyone who needs it and ends up in landfill. We need to fix this before the food demand doubles by 2050 due to steep predicted population growth. Tragically, 26% of South Africans are starving. And yet, an estimated 10.3 million tonnes of food and beverages, which is about 34.3% of local food production - amounting to R61.5 billion worth of food - is lost or wasted every year. Much of this is fruits and vegetables, the very foods that can drive down the high burden of non-communicable diseases such as obesity, diabetes, hypertension and cancer we see in South Africa (provided that it is not covered in pesticides). It is expected that conscious consumers will gravitate towards more plant-based foods and less meat and dairy by the year 2040, improving their own health and that of the environment in the coming decades. Consumers will also demand more organic produce as the long-term effects of pesticides are monitored and disclosed.

### 2. The good news is that the country is making changes.

Increased regulation in the food industry and technological advances such as point-of-care mobile food safety laboratories, used by farmers and food processors, promise to deliver a much safer South African food landscape by 2040. The Sugary Beverages Tax Bill is likely to start showing results in reducing the prevalence of diseases like obesity. We are also likely to see food waste significantly reduced by 2040.

Food rescue organisations are rising up, and food rescue apps will become commonplace. Retailers and consumers will reduce food loss through more intelligent refrigeration and storage.

### **3. Greater transparency in the food system is coming.**

Traceability of food products - to ensure the validity of the ingredients and the safety of the processes used - is an important trend, ensuring not only food safety, but also promoting better supply chain management, lower operational costs, better export and import opportunities, and more pervasive sustainability practices in the food industry. Digitalization and technologies such as blockchain will play an increasingly important role in the evolution of end-to-end traceability in agriculture and food production. Traceability is key if farmers want to avoid the next international produce ban – following China and Saudi Arabia's recently lifted ban on South African red meat. This is because it allows the sector to prove animal health to its export markets. Greater transparency and traceability of food is also good news for South Africa consumers.

### **4. Creating a circular economy is key.**

The Extended Producer Responsibility Act will drive the transition to a circular agricultural system providing numerous social, economic and environmental advantages, including job opportunities, and material and cost savings.

### **5. Regenerative agriculture promises to go mainstream by 2040.**

These practices reverse biodiversity loss and increase crop yield by 13%. It heals the soil which in turn fixes the water cycles, produces healthier and more nutrient-dense foods, and allows the earth to sequester more carbon. Education about the benefits of regenerative farming will however have to be prioritised, as there is still a disappointing lack of knowledge about the subject in agricultural circles.

### **6. The face of farming will turn vertical.**

With major food retailers leading the market with 'vertical farms' in their stores, and more consumers demanding organic and pesticide-free foods, experts predict that vertical farms will start popping up in our cities and that smaller farmers will contribute more food to formal retail outlets by 2040. This will be a notable departure from the reality of the past decade, when only 20% of farms in the country provided 80% of the food. Progress can be made in this regard if South Africa can ensure an abundance of renewable energy and if the cost of real estate and technology can come down to make more innovative, smaller scale farming initiatives more viable for more people.

***"Farmers will go off the grid with their own 5G internet, their own renewable energy generation, their own EV fleets and charging stations, and regenerative practices that make them less dependent on commercial fertilisers and pesticides. Food will be safer, more abundant, and farmers will be able to manage their profitability and environmental impact much better."***

Sabine Dall'Omo,  
Siemens Sub-Saharan Africa CEO



## DEEP DIVE II: DIGITAL

# Digital ubiquity: connecting all places and people to the digital realm.

South Africa's digital future is bright. The Fourth Industrial Revolution (4IR) is in full swing in many public and private spheres. Although the country is known as an emerging market economy, its digital transformation is largely on par with most highly developed economies in the world.

### **1. The experts believe online trading platforms will proliferate by 2040.**

This will empower a cashless and tech savvy society. More data centres will spring up to accommodate the demands of a rapidly digitizing economy, while more 5G will support the boom in The Internet of Things (IoT) in urban and rural areas. Even 6G may eventually become a possibility. Small and large businesses will be digital-first and as digital trade grows, so will the need for more robust cyber security. Even the public sector and its various government departments will vastly increase productivity through digital advancements and beef up their cybersecurity layers.



## **2. Experts foresee the industrial metaverse expanding in South Africa.**

Digital twins - virtual replicas of physical objects, people or processes - for smart cities, smart grids, and economically vital industries such as mining, oil and gas, automotive, healthcare and construction, are an

important element of this digital revolution. IoT will grow in adoption as more industrial settings such as factory floors seek to use remote sensors to collect and process data in real-time. While this form of digitalization puts some jobs at risk, it also improves efficiencies, optimises production and creates opportunities for upskilling the workforce and creating new job sectors. It is predicted that 35% of jobs will be automated and that artificial intelligence (AI) will be ubiquitous in the workplace by 2035. The metaverse will reflect and support industrial operations virtually.

## **3. Digital adoption will give rise to high digital skills.**

While open-source platforms will make open innovation much simpler, digital ecosystems will mesh with all other business ecosystems, making digital collaboration driven by highly skilled digital workforces, the norm in all spheres of business. All of these endeavours necessitate more affordable and more reliable internet connectivity all over the country. The experts believe greater access to high-speed internet through next-generation wireless networks will have a compounding effect – driving up digital adoption, smartphone usage and vastly increased data traffic while driving down data costs. This will change lives in ways one can't even begin to imagine.

# The Internet of Things revolution in South Africa

## **1. The 4IR has given rise to an IoT revolution in South Africa.**

Automation, communications and networking are evolving exponentially in the new digital era. Smart cities are emerging, while industrial environments, such as those that treat water, generate power or manufacture goods, are increasingly relying on wireless sensors, actuator networks and real-time data processing to optimise production. Underpinning all of this are industrial-level cloud platforms and services, edge computing, more data centres, and more sophisticated cybersecurity services. The good news is that all of these elements are likely to become more accessible, user-friendly and affordable by 2040.

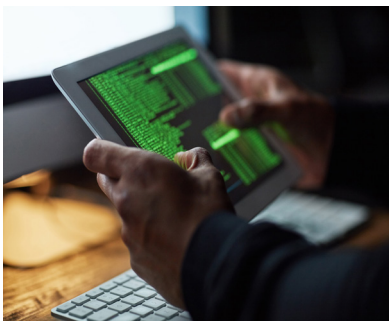
## **2. Say hello to South Africa's smart cities.**

Several South African cities are already investing in or investigating how to become smart cities. As rising digitalization and urbanisation intertwine, we are likely to see a boom in investments into smart connected cities with highly inventive uses of IoT and digital twin technology. These real-time virtual 3D models or digital mirrors show the streets, buildings and infrastructure of a city, and with the help of cameras and sensors, enable real-time monitoring, mapping, tracking and resource management. This improves services and keeps cities safer, healthier, cleaner and more efficient.



### **3. 5G and 6G will open the door for even more IoT innovation in cities.**

And by 2040 South Africa's smart cities will rely on edge computing for low latency, real-time decision-making. As a result, we are likely to see new digital innovations for an array of urban services, such as transport, traffic control, water supply, and law and order.



### **4. Network Function Virtualisation (NFV) is a big trend in telecoms.**

Another important component to the urban transformation picture is the contribution wireless telecom service providers will make by replacing network hardware with virtual machines. Allowing applications and processes to move to the cloud,

NFV will transform the way cities connect to the internet, other connected networks and digital devices. Networks will become more agile, efficient and scalable, and will for instance help operators to meet dynamic subscriber demands more efficiently and economically. Urban services will become much more integrated with IoT innovations and cloud computing to improve social and economic development in their regions.

### **5. South Africa has a very young population.**

With nearly a third under the age of 15. Young people from all over South Africa are starting to gain access to high-speed internet, high volumes of data and increasingly sophisticated and affordable smartphones. This enables them to use open-source platforms to innovate and collaborate, giving birth to even more new digital

innovation. Personalised content drives greater individualism and non-conformism. These young people are also bringing climate change and energy conversations to the forefront of public consciousness. As the cashless generation, they are comfortable spending their digital money on web-based communications, entertainment and gaming, software-based banking and retail services, digital trading, and online shopping. By 2024, most young people will use virtual platforms for both work and play, with hybrid work becoming the norm. AI too will be used with less human interactions.

***“As South Africa embraces the Fourth Industrial Revolution (4IR), 5G and 6G and the IoT revolution, we will by 2040 see accelerated digital adoption resulting in the rise of virtualized cities, industrial metaverses, and non-human labour especially in dangerous or tedious jobs.”***

Sabine Dall’Omo,  
Siemens Sub-Saharan Africa CEO



### DEEP DIVE III: MINING

## Mining transformation: innovation meets carbon sequestration.

The mining industry is implementing extensive measures to meet its Net Zero targets by 2050. It's an industry that has come a long way since the dark days of its past.

In the world of mining, transformation is synonymous with innovation. From discovery and extraction to transport, beneficiation and delivery, extensive digitalization is delivering greater efficiencies, safer working environments, decarbonisation and a changing workforce.

Unavoidable CO<sub>2</sub> emissions will be sequestered with carbon capture technologies, decommissioned mines and their surroundings will undergo rehabilitation, the industry's reliance on fossil fuels will be reduced and excess self-generated renewable energy will be pumped into the national grid. Much of mining's yield will be used to build greener technologies and economies.

### **1. Emerging technologies are changing mining.**

Trends driving the digital transformation in mining include the automation and digitalization of hardware tools to do away with risky, high cost, laborious, manual labour. Here sensors, robots and 3D printing solutions will pick up the load, driving down costs while accelerating progress. By 2035, an estimated 35% of jobs will be automated by a dizzying array of technologies, 50% of jobs will require less human interaction, and the workforce will be reskilled. Digitalization is narrowing not only the number of humans needed on mines, but also the skill sets required of them. Humans, in turn, will do more meaningful, skilled and creative work. The face of mining will also be transformed by the rapid rise of green technologies.

### **2. Will robots become the new miners?**

In the future, AI and Machine Learning will drive decision-making and miners will be embedding smart, cost-saving Internet of Things (IoT) technologies into every layer of operations. Productivity will be underpinned by insights mined from Big Data. Remote controlled sensors, robots and drones will collect data, inspect, monitor and control everything that is happening on the mine. Up to 40% of mines will be using digital twins to simulate processes, detect danger and determine the next best actions, especially in rough terrain.

### **3. About 30-40% of machinery in mining will be autonomous by 2040.**

The experts believe visualisation tools based on AI, Augmented Reality (AR) and Virtual Reality (VR) will help miners find minerals and work out better operational strategies, while wearable technologies will guide miners with real-time information to better manage their operations. Most mining operations connect their teams through mobile technology and digital platforms. Autonomous or self-driving trucks, drillers, drones and robots will take over in harsher environments to make working conditions safer for human miners. As physical human labour gets phased out by robotic labour, the reskilling of today's

workforces is a clear investment focus in the mission to achieve a safe Just Transition.

### **4. Most mines today are racing to meet all their Net Zero targets by 2050.**

This is a monumental task, requiring an overhaul of almost all of their methods and processes. Mines are going off-grid, generating their own power. In most cases today mines are opting for hybrid power through a combination of self-sustained solar plants supplemented by grid power. Several industry leaders are also exploring green hydrogen to replace diesel, and most are invested in battery storage for their energy stability. Thermal coal reliance is being phased out, virtually across the board. Further to their circular systems, many miners are recycling their materials, treating their water, carbon capturing their harmful emissions, and rehabilitating their decommissioned sites through re-vegetation, water management and ecosystem restoration. The ultimate goal is to use 19 renewable energy to eliminate -73% of Scope 1 and 2 emissions and -15% of Scope 1 and 2 emissions to achieve decarbonisation.

***“Mining will be totally transformed by 2040. Fully digitalized, the mining sector will have a reskilled workforce supported by machines that do the dangerous and tedious work, while a great deal of focus will be on climate change mitigation and environmental rehabilitation strategies to bring the sector closer to its 2050 net zero targets.”***

Sabine Dall’Omo,  
Siemens Sub-Saharan Africa CEO



#### DEEP DIVE IV: ENERGY

## Energy: High demand, low supply and the steps towards transition

Energy security remains one of the single greatest challenges of the South African economy. The country's legacy is an over-reliance on state-supplied thermal coal power. Its future hinges on securing a diverse energy mix that can provide critical energy stability and security to all of South Africa's people, businesses, institutions, sectors and industries.

### **1. Supply challenges are exacerbating socio-economic issues in South Africa.**

South Africa is a land of contrasts and unequal opportunities. At about 60.6 million in population, South Africa is the most economically unequal country in the world, with nearly 19 million disadvantaged citizens on social grants. The South African unemployment rate came to 32.9% in 2023 due to the energy crisis. The country also grapples with one of the worst youth unemployment crises in the world. The experts doubt these issues will be solved until the economy has enough energy and infrastructure growth to start growing again.

## **2. South Africa is facing a number of complex energy demand problems.**

South Africa, large parts of the country are rural and under-developed, and need energy stability to boost development. The urban economy on the other hand is highly developed, and many sectors such as manufacturing and construction have a very high demand for reliable energy. Both ends of the economy need energy to grow, boost the economy and create jobs. Meanwhile, a number of factors add more serious pressure to South Africa's already significant energy demand. Population growth is expected to outstrip generation capacity, the economy is trying to recover from the COVID-19 pandemic, and illegal connections are sapping the national grid. A large amount of domestic and industrial energy is also lost to wastage.

## **3. South Africa's just transition won't happen overnight.**

The experts hypothesise that given the magnitude of its challenges, South Africa will still grapple with addressing its energy backlog in 2040 instead of having the luxury of focusing all its attention on transitioning to purely green energy. The energy that will be generated and available for distribution simply won't be enough to meet the country's doubled energy demand.

Challenges abound in the South African energy sector, so what can be done to overcome them and solve the Energy Trilemma of security, sustainability and affordability?

# **Solutions for the future**

## **1. Building energy capacity**

The South African state energy utility is facing a myriad of challenges and does not have the infrastructure nor the financial means to build enough energy capacity for the economy. This is why the success of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is more important than ever.

More private sector players have to generate and transmit clean, affordable renewable energy to meet the demands of the massive South African economy and population. One of the key drivers of

progress with REIPPPP has been the easing of licensing regulations for self-generation of electricity from one megawatt (MW) to 100 MW. This is an especially important milestone for the mining industry. The introduction of energy efficiency measures, supported by government policy, will also be helpful for the creation of additional capacity, the experts say. A practical example of this is the large-scale rollout of LED bulbs which use 75-80% less power than incandescent bulbs. South Africa's energy storage market is another key ally in the fight for energy security and is estimated to grow to a market size of R14.5 billion by 2035, making it essential for the future energy services market.

The national embedded generation market for installations and operation and maintenance of rooftop solar PV has grown to the point where installed capacity has increased by as much as ~110 MW throughout South Africa. Some experts believe it could be as high as 250 MW. It is expected that growth will peak at a saturation point of ~500 MW installed per year on an ongoing basis. The market could therefore reach 7.5 GW of installed capacity by 2035.

## **2. Boosting energy infrastructure to roll out more privately generated power**

One of the keys to South Africa's energy future is sufficient energy infrastructure. Even if South Africa starts generating enough renewable energy to meet the demands of the nation, it will be in vain if the infrastructure does not exist to transmit and store this energy. To solve this problem, South Africa needs a great deal more investment in energy infrastructure. If sufficient energy infrastructure becomes available, experts believe South Africa will be able to meet the energy demands of 95% of the population through on-grid and off-grid connections by 2040. This will include the expansion of the country's transmission capabilities and grid expansion

capacity. Examples include Eskom's microgrid rollout and Siemens' Upper BlinkWater microgrid project. Future drivers of energy infrastructure include the government's Integrated Resources Plan (IRP), plans to fast-track infrastructure development, the National Energy Regulator of SA (NERSA) Eskom tariff hike by 14.5%. Blockers of progress, however, include theft of infrastructure, consumer non-payment and poor credit controls by the municipalities, and the high cost of building such infrastructure. By 2040 Eskom, which is a monopoly, will be reformed and unbundled into three units: generation, transmission and distribution. Strategically it will welcome the integration of privately generated power into the national grid. South Africa needs more market-entry competitors – large and small energy companies that can add greater diversity to the national energy mix.

### **3. Incentivising more private power generation in SA**

The South African government is encouraging South Africans to embrace renewable energy by way of tax rebates and grants for self-generation of electricity. Cities such as Cape Town are now also offering special incentives to its residents to invest in residential solar panels and Eskom has also publicly supported incentives for citizens to pump solar power into the national grid via legal connections. If the country gets this right, experts believe that South Africa's energy market will by 2040 no longer be made up just of customers who buy electricity but will in fact be led by 'prosumers' who produce energy via solar panels and feed excess electricity into the grid.

### **4. Investing in more energy storage**

Energy storage is likely to account for nearly 50% of the total energy investment market by 2040. The local energy storage market is in fact expected to reach a size of R14.5 billion by 2035. Battery storage will become the main solution for reserve power, insular systems and unconnected systems.

Experts predict that the massive growth in demand for energy storage will rise as other factors feeding into it rise simultaneously. As the

world ramps up to meet its 2050 Net Zero targets, the factors that will drive the boom in battery storage include a continually increasing demand for reliable and accessible renewable energy from intermittent sources like wind and sun, the gradual decommissioning of coal-fired power stations (with only Medupi and Kusile expected to still be in operation in 2050), and the ramping up of mining for the minerals needed to manufacture energy storage units.



Battery storage technology is also expected to evolve exponentially over the coming years - adding an expected extra 300GW to its existing 100GW potential - in parallel to great leaps forward for green hydrogen power. In addition, experts say we are likely to see an increase in hybrid power plants, which may incorporate wind and solar power and battery storage on the same site. Innovations such as moveable energy storage parks for electrical vehicle (EV) fleets will also become a more common sight.

Factors still standing in the way of these developments, however, come down mostly to logistical and supply chain issues. On the export side, the South African mining sector faces a myriad of challenges in trying to export their minerals efficiently and profitably, while on the import side, the local battery storage manufacturing industry faces great challenges in bringing processed minerals into the country reliably and affordably. Factors at play include South Africa's dysfunctional railways and ports and the interference of organised crime in commodity supply chains.

The reliable transportation of hydrogen is another national issue, as much of it is lost in transit, requiring oversized production to balance out supply. Theft of batteries and storage infrastructure is another quintessential South African challenge.

### **5. Increasing the supply of wind, solar and hydrogen power**

South Africa has vast expanses of unused or under-utilised land in arid, sun-baked, wind-swept and coastal areas. These areas are often home to geographically marginalised and impoverished communities, who don't have access to many economic opportunities. These conditions are ideal for the country's burgeoning solar, wind, hydro and hydrogen power industries. What's more, the decarbonisation of South Africa's energy sector demands the roll-out of 84 GW and 64 GW solar PV and wind by 2050 respectively. This is likely to be helped on by the drive to turn South Africans into solar power prosumers (producers and consumers) and the phasing out of the coal industry. By as soon as 2030, experts believe coal-fired power generation will drop from 70% of installed capacity to just 43%, while renewable energy sources including solar, wind and hydro power, will increase from just 7% to a significant 34%.

### **6. Solving ownership to tip the economies of scale**

Until the generation, transmission and storage of green power become more affordable and prevalent, South Africa will continue to grapple with the intermittency and unreliability of its renewable energy sources. These issues also place strain on the national power grid. At the same time, the local industry also still faces a lack of ownership of various elements of the energy supply chain and are still dependent on and beholden to other nations for their technology.

This makes it hard for the local industry to invest in green energy infrastructure and solutions. It also makes the sector vulnerable to supply chain disruptions caused by geopolitical events and other global issues – which has created a temptation in the local economy to ignore growing calls for decarbonisation and a transition away from all forms of fossil fuels.

Until the economies of scale tip in favour of renewable energy, the local industry will face a financial dilemma: invest in expensive renewable energy technologies now and shoulder the burden to create the economies of scale the industry needs, or wait however long for more affordable state-led services to be rolled out. The expected 2024 global recession also throws a spanner in the works. This tension is slowing down progress, but many courageous and principled investors are looking beyond the challenges and taking the leap to invest in the future they want to see.

***“The demand for battery storage will soar as we all become more dependent on intermittent energy sources such as wind and solar power. Advances in battery storage technology will be a big game changer for the local and global economies by 2040.”***

Sabine Dall'Omo  
Siemens Sub-Saharan Africa CEO



## DEEP DIVE V: INFRASTRUCTURE

# Infrastructure: new opportunities to drive the economy forward

While infrastructure is currently facing under-investment in South Africa, plans are afoot to change that. Experts believe if the country can drive greater infrastructure investment, we could see a boom in multimodal mobility solutions, digital infrastructure, connected mega cities, better municipal infrastructure and greater infrastructure innovation opportunities for entrepreneurs by 2040. As an antidote to the current high levels of municipal mismanagement, it is also foreseeable that there will be much greater digital transparency when it comes to municipal trading services and infrastructure management by 2040.

### **1. Connectivity will improve public and private services.**

Experts foresee huge increases in internet connectivity across urban and rural areas in South Africa over the next decade and a half, which will enable a lot more data-driven public services and private business opportunities. Cities will be equipped with AI and analytics capabilities, which will assist with the management of issues such as traffic, public safety, energy and water management. The taxi and public transport industries will also be using more real-time technologies that can improve commuter experiences, fleet management and financial efficiencies.



## **2. Improved transport infrastructure will get things moving better.**

Experts predict that multimodal solutions for mobility in South Africa's cities will shift the trend from an over-reliance on private vehicle use to more meaningful public transport solutions - in the process reshaping our cities and how people live in them. Experts are also hopeful that South Africa's all but collapsed rails systems will be overhauled if adequate investment is secured. The Passenger Rail Association of SA (PRASA) is expected to roll out new electric modular units (EMUs) for inter-city commuting, and freight transport could shift away from its over-reliance on road travel to a more balanced use of rail and air freight, at more than double its current volume. The Gautrain is likely to be extended to more parts of Gauteng, with the addition of Gautrain inner city buses that connect its stations to other urban hubs.



## **3. Transport experts also foresee the formalisation and digitalization of South Africa's powerful taxi industry**

Which far exceeds the current volume of bus and train services - by 2040. Greater investment into the country's ports, harbours and transport links - funded through the sale of SA's container ports - could bring relief to frustrated exporters and a long-overdue restoration of lost revenue for the country, especially from mineral and agricultural exports. Overall, significant investments in the transport industry have the potential to support economic development, bridge the country's geographic divides more affordably, and - as

electric and hydrogen-powered vehicles gain popularity - also promote a low-carbon economy and boosted regional and international trade.

## **4. Human settlements will get a boost.**

A combination of unabated urbanisation and population growth is expected to bring the country to 70 million inhabitants by 2035 and 77.6 million by 2040. Crime rates, noise and environmental pollution, as well as service delivery deficits are expected to remain high, but cities will have new ways of dealing with it. Analytical digital tools and AI-powered systems will be employed to help prevent violent crime, rioting, traffic congestion, accidents and other emergencies. Digital inclusion will drive democratic systems of government. Digital services will improve online and offline efficiencies in densely populated areas. For instance, the monitoring of roads by intelligent cameras could prompt the automatic dispatch of emergency services to people who need help in dangerous situations.

## **5. The construction industry will go green on a much grander scale.**

Experts foresee that building owners will experience increased pressure from the market to achieve Green Star status for their buildings. Similarly, builders will face pressure to use recyclable and renewable materials and an increased demand to use products produced in the circular economy in sustainable ways. The availability of green building materials will also increase. The demand for certified professionals in the green building space will also grow exponentially. A major challenge the green building industry will need to tackle creatively, however, is the high cost of sustainable construction, which still puts it out of reach for most average property investors.

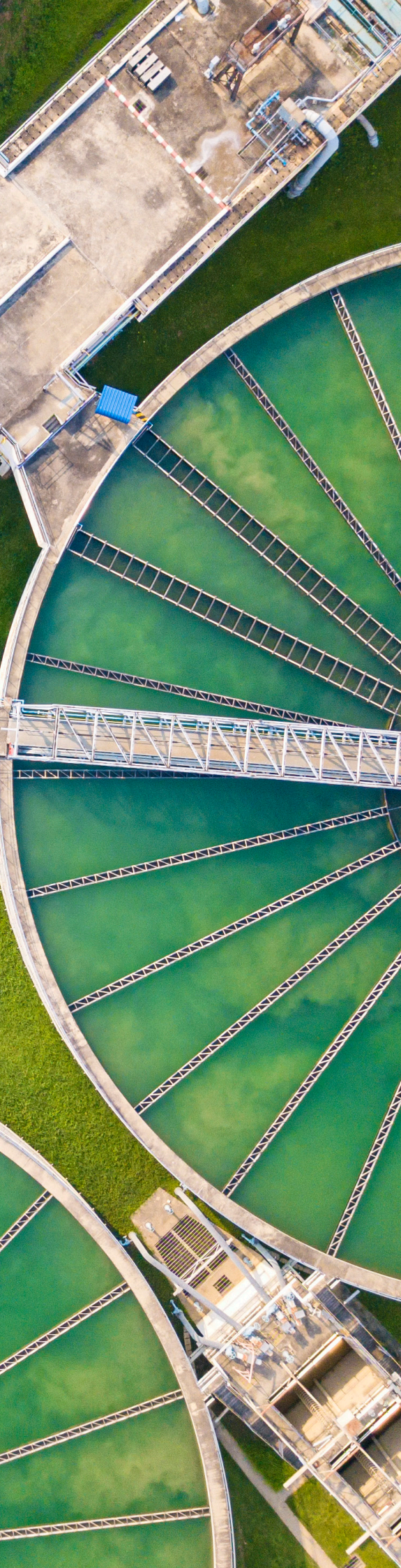
# Power to the people

## **1. Prosumers will get a slice of the energy infrastructure pie.**

By 2040, there will be a steep increase in prosumers - consumers who produce energy from renewable energy infrastructure that they own and manage themselves. By selling their excess power to their municipalities, they can earn extra income and lessen the burden on municipal infrastructure. Greater investments into transmission infrastructure will also enable more private companies and individuals to strengthen the national grid.

## **2. Entrepreneurs will serve the highly populated urban centres.**

More people will need more goods and services, and entrepreneurs will be there to fill the gap. But, they will have stiff competition from the mega retailers and many will have to continue bootstrapping their businesses, because startup funding will remain hard to come by. These circumstances will push entrepreneurial creativity - especially as they step in to find innovative solutions for the challenges in their communities. As megacities continue to cluster people around schools, health facilities and places of worship in their neighbourhoods, transport costs driven by a demand for long commutes may be reduced. Entrepreneurs will have the opportunity to carve out new ways to serve the needs of their densely populated communities.



## DEEP DIVE VI: WATER

# Water: South Africa will face a deficit of 17% by 2030 if we don't act now

Water security will become a major and heavily legislated issue in South Africa by 2040. To protect our national water resources, the national government will drive ambitious legislation and policies. Municipalities will protect local water resources by employing a range of smart monitoring systems to detect leaks, contamination and pollution. Heavy water users such as coal power stations will be forced to find alternative methods of cooling. Smart metering will reach mass rollout and adoption. A diversified mix of water sources will become necessary, including groundwater, return flows, and desalination. Society too will need to become very resourceful and creative with their water conservation strategies.

### **1. Society and the government must collaborate**

To reduce the escalating water deficit. To deal with the crisis, South Africa will have to launch continuous skills development programmes and stakeholder engagements all along the water value chain. Much stricter good governance on all aspects of water use and abuse, from taps to toilets to sewers, will become necessary. Even listed companies will face stricter reporting standards on their water usage.

## **2. Good governance must start with municipalities.**

Firstly, municipalities will need to allocate more responsibly managed funds to the maintenance of water infrastructure, secondly they will need to use smart technologies to manage their water resources, thirdly they need to join collaborative platforms with innovation partners who can help solve their water problems, fourth, they need to get stricter and more transparent about how they manage their water resources, and finally, all levels of government will have to work together to create attractive conditions for private investment to solve the water crisis.

## **3. Smart water technology to the rescue**

Combine worsening water insecurity and the government's policies to promote the 4IR, and what you get is the accelerated adoption of smart systems for water and wastewater management. By 2040, South Africa's new smart National Digitized Water and Sanitation Monitoring System will govern new water quality and quantity measurements, as well as data collection, management and communication protocols. Satellites, drones, robotic crawlers, sensors and other IoT technologies will monitor water and sewerage pipelines and reservoirs for problems such as leakages. Smart meters will help municipalities to improve water readings, revenue collection and future demand calculations. Most of these technological interventions will be automated, which means that most of the human jobs in water management by the year 2040 will be highly skilled and technical.

## **4. Opportunities for water conservation and optimisation**

The government is expected to have several attractive incentives for better water conservation in place by 2040, for instance the industrial and mining sectors will be incentivised to recycle and reuse their water. By then, more laws governing water rights, privileges and protections will also be in place. And heavy users will be forced to comply with regulations to curb their water usage.

Municipalities will also need to be policed. The imperative is clear: we can't carry on like this. Currently, of the 824 water treatment works in the country, only 50% are operational, with 30% in a critical state, 20% in a poor state, and 40% of SA's waste water remaining untreated. What's more, 60% of South Africa's rivers are over-exploited.

## **5. Early interventions will hopefully reap benefits**

The Water Partnership Office established in 2023 has the potential to successfully accelerate water and sanitation infrastructure delivery across the country by the year 2040. By then we should see mining houses and their partners having successfully completed the R24 billion Olifants Management Model (OMM) in Limpopo connecting De Hoop Dam to Olifantspoort and Flag Boshielo Dam to Mogalawena. We also hope to have seen the refurbishment and expansion of the R10 billion Vaal Gamagara Water Scheme by mining houses and their partners in the Northern Cape. Many other large scale initiatives will be required to turn the tide.

***"South Africa will face a deficit of 17% by 2030 if we don't act now. We must use all our opportunities for innovation and collaboration to turn the situation around. We need to deploy technology to utilities that can detect and proactively manage water leakages and help conserve scarce water resources. Water is life and vital to the quality of life for more than 70 million South Africans."***

Sabine Dall'Omo,  
Siemens Sub-Saharan Africa CEO



## DEEP DIVE VII: SOCIETY

# Society: drivers and blockers of real progress

Social transformation in South Africa is profoundly shaped by the external forces that impact the quality and trajectory of each life within its borders. People's access to technology, the internet and job opportunities determine their location and migration patterns. The surrounding resources, services and protections they can access, including universal medical care, impact their health equity and wellbeing. The state of South Africa's economy, infrastructure, governance, internal multi-party and coalition politics and global geopolitics impacts society. How all of these factors develop will determine the prosperity of South African society by 2040 - and whether skilled professionals choose to stay or emigrate.

### **1. Society will be shaped by the digital future of education and work.**

South Africa's internet penetration sits above 74% and is expected to keep improving over the next decade. As 5G and fibre internet access in rural and low income areas improves, and online schools, learning tools and upskilling platforms grow in popularity, South Africa is likely to see a greater 'last mile' democratisation of education and employment across the country. With formal brick and mortar universities' fees expected to increase by 6 -7% per annum from 2024, many students are likely to opt for more affordable online alternatives.

The same factors will extend the hybrid and remote work trend in the coming decades - and as more companies digitise, career opportunities in the ICT sector are expected to abound. Much of the future of work will also be impacted by advances or setbacks in cyber safety and security. Cyber theft is expected to become a major concern in society. Interpol estimates that South Africa experienced 230 million cyber threat detections in 2022 and this is set to double by 2040. Despite the threat, civil services are however expected to improve by and large, as the government improves its technology adoption and service delivery efficiencies.

## **2. Inclusivity and transformation will remain priorities in South African society.**

Experts foresee Broad-Based Black Economic Empowerment (BBBEE) continuing beyond 2040. While the skills pool is expected to benefit from greater economic empowerment of more previously disadvantaged South Africans by 2040, the pool is leaking. An estimated 50 000 skilled professionals will be emigrating from South Africa yearly by 2025 and the number is likely to keep growing as developed economies vie for top South African skills, especially from the medical, agricultural and technology industries. Meanwhile, South Africa is expected to make great strides in terms of the integration of LGBTQIIA+ in local workforces, and gender equality will remain protected and prioritised across the economy.

# The political economy of South Africa's transformation

## **1. South Africa's precarious investment future may improve in time.**

While South Africa's economic growth is expected to slump in the short term as the world descends into a shallow recession in 2024, experts believe South Africa will see enormous inflows of foreign direct investment, especially for capital projects, in line with emerging markets trends in the next decade. This in turn will drive renewed economic growth and activity in the medium to long term. Technological infrastructure investments will also be ushering in a cashless society that would be more reliant on digital currencies and that could facilitate greater formalisation and digitalization of the country's economy. South Africa's informal economy is estimated to make up about 28.8% of the total, which comes to about \$338 billion in gross domestic product. If even a fraction of the informal economy engages in digital trade, it could transform entrepreneurial opportunities and tax revenues in the country.

## **2. South Africa has enormous economic potential.**

If it can return to real growth, South Africa could have one of the top 30 economies in the world by 2040. Technology-driven productivity, local production and export, and South Africa's well-developed value chains across industries, are expected to be strong economic drivers in the future. Many economic challenges stand in the way of growth, however, with skills shortages, an over-reliance on foreign direct investments and loans, and low access to seed capital for entrepreneurs being at the top of the list.

## **3. Politics will continue to be a source of drama in South Africa.**

Analysts are predicting that the current ruling party may lose its absolute majority after the 2024 elections, which will usher in a few years of intensified coalition politics in South Africa. In this period - and exacerbated by economic hardship - civil unrest and protests are likely to focus on dissatisfaction about service delivery levels.

Widespread dissatisfaction from the citizenry will prompt changes in political thinking and faultlines. Despite this, red tape and inefficiencies in service delivery are unlikely to be solved very soon, and the private sector is expected to step in more than it already is, to address service delivery gaps.

## **4. And, how South Africa aligns itself within the global community will also have an impact on society.**

The country's strategic relationships with key international organisations such as BRICS, the African Union, the G20, the OECD, FATF, and PEPFAR, and key free trade agreements such as AGOA and afCFTA over the next 15 years will have ripple effects on South Africa's society, affecting everything from food security to HIV/AIDS care.

***"South Africa's society will benefit substantially from greater internet access by 2040. This will change the education, jobs and skills landscape, as well as service delivery and political participation. The dark side to that coin however is greater exposure to cybercrime - an issue we must tackle now."***

Sabine Dall'Omo,  
Siemens Sub-Saharan Africa CEO



#### DEEP DIVE VIII: MOBILITY

## **Mobility:** a future of increased options without increased emissions

The transport sector in South Africa is set for a major decarbonisation drive by 2040. It will start with the privatisation of the public transport sector in major cities, including the railways, the embrace of technologies such as robotics and real-time monitoring systems, and the gradual adoption of electric and hydrogen-powered vehicles, especially in the e-hailing and bus industries, boosted by government subsidies incentivising adoption. Public-private partnerships will drive the accelerated rollouts of infrastructure needed for these ambitious changes.

Experts also predict that automakers will follow global trends by embracing the industrial metaverse and digital twin technologies to optimise their operations.



**1. Emissions in the mobility sector are expected to be reduced by 3% by 2040.**

While global standards on carbon neutrality and emission reductions are already being adopted in the European Union, Africa is expected to follow suit by 2035-2040. South Africa is likely to see more private train networks roll out by 2040, and these networks are expected to be highly geared for carbon neutrality. About 35% of trains in South Africa are likely to be electric by 2040.

**2. An estimated 50% of vehicles registered in South Africa will be electric or hybrid by 2040.**

Government incentives will drive the demand for New Electric Vehicles (NEVs) and boost the rollout of e-charging stations. The National Association of Automobile Manufacturers of South Africa (NAAMSA) has NEV sales targets of 60% of total sales by 2035. Experts say South Africa could have close to 300 000 charging stations all across the country by 2040, as a result of government tender processes and tax incentives to encourage EV vehicle and fleet adoption. As battery storage technology improves and becomes more accessible, so will the range of these vehicles, alleviating consumer “range anxiety”. Home charging stations powered by solar PV connected to smart grids will also enable consumers to manage the costs associated with electric vehicles. Meanwhile, NEVs and NEV components will have to be manufactured locally to further drive local demand. It is predicted that public-private partnerships will assist with the development of the infrastructure needed to manufacture NEVs. Vehicles will be fitted with carbon emission tracking systems, for the purposes of sustainability reporting. As these developments unfold, legislation will evolve alongside it.

**3. Public transport will remain the country’s dominant means of travel.**

The taxi industry is expected to remain dominant, but as the rail networks improve thanks to an injection of rail infrastructure investments, more commuters are expected to use trains for inter-city connections. In fact, partnerships with the Gibela Rail Transport Consortium are expected to see 600 trains built for local use and exports by 2040.



Commuters will keep looking for the most cost-effective means of travel, as the cost of fossil fuels are likely to skyrocket in the coming years due to global shortages and consumer mindset changes that will roll back demand for petrol and diesel. It is however unlikely that the taxi industry will switch to EV by 2040 due to the high costs associated with switching. Large international e-hailing taxi operators that have millions of cars on the road in South Africa are however planning to fully adopt EV by 2040.

# The future of logistics in South Africa

Currently, the main modes of freight transport in South Africa are shipping, trucks and airfreight. By 2040, however, a rebuilt rail system is expected to be in place to move the bulk of goods around the country. Rail has the dual benefit of being more affordable and not being as vulnerable to weather impacts as the other three modes of freight travel - an important consideration as climate change is expected to escalate the prevalence of extreme weather events over the coming decades. As South Africa's logistics industry evolves, it continues to digitalise exponentially - improving real-time tracking through smart sensors and demand and supply volumes through predictive tools powered by big-data, algorithms, artificial intelligence and machine learning. By consolidating large amounts of data, digitalization will also enable the industry to reduce wastage and improve its carbon footprint. Digitalization also makes the industry safer, for instance, digitised cranes at ports can offload cargo safely during bad weather. Robotics-powered factories can also interface with logistical systems to streamline and speed up the shipment of goods to end users - bringing greater efficiencies to the manufacturing and e-commerce sectors. This will impact jobs for humans, but it will also raise digital skill levels in the businesses of the future.



***“As South Africa’s logistics industry evolves, it will digitalize exponentially - improving real-time tracking through smart sensors, goods management through robotics, and demand and supply volumes through tools powered by big-data, algorithms, artificial intelligence and machine learning.”***

Sabine Dall’Omo,  
Siemens Sub-Saharan Africa CEO



# Siemens' contribution to society

At Siemens, we work with an array of partners to create a better tomorrow. Our activities in South Africa and around the world revolve around building net zero economies through the industries and institutions that underpin it.

## 1. Digital industries

The industrial world is facing monumental challenges: rapidly changing market conditions, a soaring global population requiring dependable supplies, and simultaneously, an increasingly urgent need for greater sustainability. We help industries embrace and integrate cutting edge technologies. As an innovation leader, we think ahead to the next level of digital transformation – and integrate cutting-edge technologies such as artificial intelligence, edge computing, cloud computing, industrial 5G, blockchain, cybersecurity and additive manufacturing into our Digital Enterprise portfolio. This is how we drive the convergence of information technology and operation technology and enable the smart usage of data.

## 2. Digital Twins

The digital twin is making it easier to create simulation models for complex systems. We have partnered with various clients to enable greater efficiency in their businesses by virtualising their real-world environments and using simulation tools to create immersive ways to manage the complexities of their businesses.

### **3. Smart infrastructure**

There has never been a more urgent need to create resilient and sustainable infrastructure. With smart infrastructure, we are shaping an ecosystem that connects the real world with the digital world. Making decisions based on data and analytics empowers our customers to make their energy systems and processes in buildings and industries more efficient and sustainable. At Siemens we believe smart infrastructure is sustainable infrastructure. We enable EcoTransparency in smart grids and electrification, energy efficiency in smart buildings and sustainability targets at the grid edge.

### **4. Automation**

The industry is right on the threshold of the 4IR. Automation is being succeeded by the digitalization of production. The goal is an increase of productivity, efficiency, speed, and quality, resulting in higher competitiveness for companies on their way to the future of industry. We specialise in Totally Integrated Automation (TIA) - smart automation development, flexible machine concepts, transparent operation, and sustainable solutions that enable access to data to calculate and optimise the product carbon footprint.

### **5. Identification and transparency**

We offer end-to-end transparency of status, location, and time of objects within digital production and intralogistics. We have an integrated and scalable portfolio of solutions, for both local identification using RFID and comprehensive locating using RTLS. Our solutions involve integration into existing systems, application-specific processing and analysis of data, and obtaining a genuine foundation for decision-making. The key to everything is individually configurable solutions from sensor to cloud. And many years of project experience.

### **6. Water for the future**

Using digital twin technology, smart apps, digital workflows, smart automation, leak-detection sensors and more, we are digitising the water industry to make it more efficient and sustainable - for both new and existing facilities.