



CREATING A THRIVING WORLD CLASS
AFRICAN DATA CENTRE & CLOUD INFRASTRUCTURE ECOSYSTEM
AS A CATALYST FOR ECONOMIC TRANSFORMATION

Oxford Business Group Report

BP 2027, Abidjan, Côte d'Ivoire

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Words from the Chairman: Dr Ayotunde Coker

This Oxford Business Group report, in conjunction with Africa Data Centres Association, is one we are proud to be part of. It has always provided a comprehensive and unique perspective across many dimensions of the data centre and cloud market in Africa.

Though currently dominated by South Africa in terms of the scale of implementation of data centres and cloud platforms, other key or Tier-1 locations are emerging across the continent. These include Egypt, Kenya, Morocco and Nigeria. According to the report, 15 African countries have economies large enough to support data centre and cloud service ecosystems; some would be classified as Tier-2 markets. The scope and magnitude of the market potential are expanding on the continent, and the report illustrates this trend.

Several factors will influence the rate of growth. One element is the availability of hyperscale engineered data centres at key Tier-1 locations. This is exemplified by the emergence of new facilities such as IXAfrica in Nairobi, and multiple facilities under construction by OADC, Kasi and Rack Centre in Nigeria, with additional projects being announced. Other regional data centre companies such as PAIX, Raxio Wingu, Paratus and N+ONE are also developing across the continent and delivering data centre capacity at the point of consumption. While broadband penetration is increasing, broadband adoption – primarily driven by smartphone access – is crucial for sustained growth. Moreover, the regulatory perspective on data protection, including the significance of the Malabo Convention, may drive a pan-African data protection regulatory environment.

The breadth of the report is an illustration of the growth and potential of the market in Africa.



Dr Ayotunde Coker
ADCA Chairman



Words from the Managing Director: Paul-Francois Cattier



Paul-Francois Cattier
ADCA Managing Director



The Africa Data Centres Association is honoured and delighted to produce the “Data Centres in Africa Focus Report, 2024” report in collaboration with Oxford Business Group, following the success of the second edition in 2022.

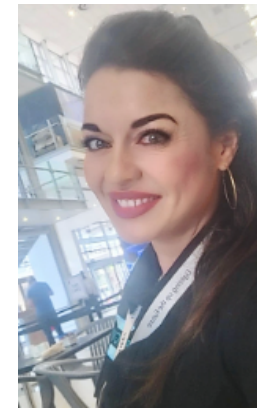
This report underscores the key role of private investment in data centre infrastructure development, which will drive economic growth in Africa over the coming years.

Within this report you will find a joint report published by Oxford Business Group that explores the African data centre market in greater detail. The “Data Centres in Africa Focus Report” covers existing infrastructure, market growth potential, key stakeholders, recent developments in terms of broadband and the mobile market, the impact of the African Continental Free Trade Agreement, regulations, cloud delivery, blockchain technology and artificial intelligence. In addition, it explores challenges such as finance and investment, access to land and power, market reform, the ICT talent pool, bridging the digital divide and regional integration.

You will also discover information on the Africa Data Centres Association members, as well as details on data centre operators, suppliers and media partners in the directory.

I wish you a great read. As you will see, many investment opportunities exist for those who want to take part in the development of Africa’s digital economy.

Words from the General Secretary: Nikki Blake Bergvik



Nikki Blake Bergvik
ADCA General Secretary

The Africa Data Centres Association (ADCA) is pleased to announce the release of our latest report highlighting significant developments within our industry. Since our last report in 2022, notable advancement has occurred – leading to the projection that the African data centre market will surpass \$5bn by 2026.

Operators have successfully completed new facility constructions, extended their reach in additional countries and unveiled plans for future expansion projects, demonstrating the sector's dynamic growth. The African data centre market is witnessing significant enhancements propelled by factors such as increased digitisation, the adoption of cloud computing and enhanced internet accessibility continent-wide.

This expansion is driven by a growing demand for colocation services, bolstered by government initiatives aimed at improving digital infrastructure and investment from global tech giants. Nonetheless, challenges such as unreliable power supply, limited connectivity in certain regions and regulatory complexities persist.

Despite these hurdles, the market remains attractive for investment and infrastructure improvements, highlighting its crucial role in driving the continent's digital transformation and economic development.

ADCA's mission is to unite operators and suppliers to address common challenges collaboratively rather than individually. Our goal is to contribute to the creation of a green and sustainable future, fostering a better, healthier and more prosperous Africa.

We extend our gratitude to our members for their steadfast support. With ADCA's membership expanding, our aim is for this report to serve as a guiding tool in charting the course for the ongoing development of the continent's digital economy. We believe this publication will greatly enhance your understanding of the evolving African data centre market.

ADCA Board Members



Dr Ayotunde Coker
Open Access Data Centre
ADCA Chairman

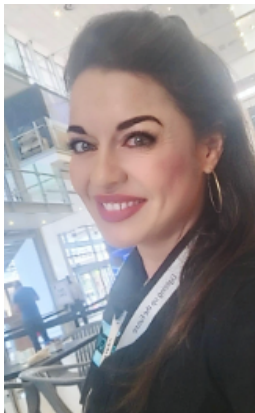


Gender Diversity
Geography Diversity

Paul-Francois Cattier
ADCA Managing Director



Nikki
Blake
Bergvik
ADCA
General
Secretary



Timi
Fadeyi
ADCA
Treasurer



Fatoumata
Sarr Dieng
Sonatel
Orange



Mr Wouter
Van Hulten
PAIX



Stephane
Duproz
Africa Data
Centres



Lawrence
Nkala
TelOne



Patrice
Tano
Raxio



Faith
Whithaker
Schneider
Electric



Gbenga
Adegbidji
Main One



Addition to the team:

Mary Kariuki – Marketing Manager

Mary is a highly motivated marketing communications professional with extensive experience in the data centre industry. Her journey in the African digital infrastructure sector is marked by her strategic acumen, relationship-building prowess, and a commitment to staying at the forefront of market trends and dynamics. Her multifaceted approach to her work has contributed significantly to shaping the narrative of digital infrastructure in the African context.



ADCA Data Centre Member Directory

	Africa Data Centres offers a range of colocation services to support your data, applications and back-end systems. The network's scalable and secure services are ready to meet all your business needs – both currently, and in the digital future.		Galaxy Backbone is the information technology and shared services provider of the federal government of Nigeria.
	AWS is a subsidiary of Amazon that provides on-demand cloud computing platforms on a metered, pay-as-you-go basis.		IXAfrica in Nairobi is proud to be the newest digital habitat for cloud, colocation and connectivity in East Africa. The facility was designed to assemble hypercloud and internet customers on East Africa's largest data hub campus.
	Cloud & Racks is a Tier-3+ data centre. Located in Lomé, Togo, Cloud & Racks offers colocation and cloud computing services.		MainOne is a leading provider of innovative telecoms services and network solutions for businesses in West Africa. The company's world-class regional network infrastructure enhances the productivity and profitability of its customers.
	Digital Parks Africa is an advanced, carrier-neutral, Uptime-Tier-3-Design-certified data centre located in Samrand, Gauteng, South Africa.		Based in Casablanca, N+ONE empowers its customers with mission-critical services ranging from raw colocation to fully managed hosting and cutting-edge cloud computing infrastructure.
	GPX is a global technology leader providing next-generation, Tier-4-design, carrier-neutral data centres to developing global markets.		Onix Data Centres, incorporated in London, owns and operates data centres in West Africa. Its flagship facility is the Tier-4-certified, carrier-neutral colocation facility in Accra, Ghana. The Accra facility is the only Tier-4-certified facility in the region.

ADCA Data Centre Member Directory

	OADC is supporting and accelerating Africa's digital transformation by constructing and operating a pan-African network of world-class, client-centric data centre facilities. These facilities are designed to meet the specific needs of various stakeholders, including telecoms, internet service providers, cloud operators, the wholesale community, major enterprises and governments.		Sonatel is the principal telecommunications provider in Senegal
	PAIX data centres is a pan-African provider of cloud and carrier-neutral, colocation data-centre services in Africa. Founded in 2016, PAIX delivers top-tier services to a diverse customer base, spanning both national and international customers throughout the African continent.		STELLARIX offers colocation, cloud, virtualisation and interconnection services, as well as a wide range of IT solutions to support the digital transformation of businesses.
 The data centre company	Raxio Group is Africa's leading carrier-neutral data centre operator. The company builds and operates the most extensive network of Tier-3 data centres in the region. The company's facilities are tailored to serve both retail and wholesale clients, accommodating a wide range of businesses from small to medium-sized enterprises, to hyperscalers.	 Bringing You Together	TelOne offers fast, affordable and reliable telecommunications services to individuals, homes, businesses, educational institutions and government departments throughout Zimbabwe.
	Founded in 2012, Rack Centre is the only carrier- and cloud-neutral Tier-3-certified data centre facility in Africa. The company focuses on providing best-in-class data centre colocation services, and unrestricted interconnection between carriers and customers.		21st Century Technologies is an ecosystem technology group of companies, building bold and ambitious digital infrastructure.

ADCA Supplier Member Directory

	Created in 1983, APL is a leading consulting and engineering firm specialising in the design and construction of data centres.		COREX is a consolidated company with extensive experience in engineering, and a proven track record of international projects.
	Bergvik Group specialises in, and provides solutions for, the electrical and data centre market. Over the last 14 years the group has established itself as a market leader in Africa.		CBRE is the global leader in commercial real estate services and investment. The company provides services, insights and data that span every dimension of the industry, and creates solutions for clients of every size, in every sector, across every geography.
	Since its inception in 1964 in vibrant Beirut, BUTEC has evolved into a regional institutionalised group specialising in four business lines: engineering & contracting, electro-mechanical solutions, facility services and utility services.		Danfoss is engineering technology that helps the world achieve more with less. With the promise of quality, reliability and innovation deeply rooted in its DNA, the company delivers an extensive range of products and solutions across its business segments.
	As a leading manufacturer of premium clean-air solutions, Camfil provides commercial and industrial systems for air filtration and air-pollution control that improve worker and equipment productivity, minimise energy use, and benefit human health and the environment.		DataProtect specialises in information security, drawing from a unified vision and a pool of cutting-edge skills. This enables the company to provide unique expertise in the local and regional market.
	CAP DC is a global data centre engineering brand with companies in Southern Europe and Africa. CAP DC is a subsidiary of CAP INGELEC GROUP.		DATACONNECT, a subsidiary of the NEW DIGITAL AFRICA Group, is the leading African provider of managed infrastructure services for businesses, offering innovative and tailor-made solutions in connectivity, cloud, data centre and cybersecurity.
	Caterpillar Inc. is the world's leading manufacturer of construction and mining equipment, off-highway diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives.		Future-tech specialises in data centre engineering consultancy, providing services in mergers and acquisitions, investment, design, project management and operations.

ADCA Supplier Member Directory

 HiRef ITALIAN COOLING SOLUTIONS	HiRef delivers high-performance, energy-efficient air conditioning systems, with a strong focus on environmental and economic sustainability.	 Sterling & Wilson Wilson Electric Works joined forces with Sterling Investments of the SP Group in 1973 to form the engineering behemoth Sterling & Wilson. Today it is the Indian subcontinent's largest combined mechanical, electrical and plumbing services, and engineering, procurement and construction, business.
 HUAWEI	Huawei is a leading global provider of information and communications technology infrastructure and smart devices.	 Sterling Generators Sterling Generators has one of Asia's largest diesel generator manufacturing plants at Silvassa. It is India's leading mechanical, electrical and plumbing services company, with a pan-India presence.
 WORLDWIDE MISSION CRITICAL	Worldwide Mission Critical was founded on the principle that the right team of experienced data centre professionals will deliver great projects. The company's ability to put together oversight for all aspects of projects sets Worldwide Mission Critical apart.	 SUDLOWS CONSULTING Sudlows is an international award-winning infrastructure specialist formed around three core divisions: critical infrastructure, enterprise services and facilities management.
 A Rolls-Royce solution	Rolls-Royce provides world-class power solutions and complete life-cycle support under the product and solution brand mtu.	 systemair For 50 years, Systemair has been delivering sustainable, and energy-saving HVAC products and solutions to the world.
 Life Is On Schneider Electric	Schneider Electric provides energy and automation digital solutions for efficiency and sustainability.	 VERTIV™ Vertiv offers critical infrastructure technologies and rapidly deployable, customised solutions to meet specific business requirements and needs.
 SIEMENS	Siemens' technology empowers customers to transform the industries that form the backbone of economies, including industry, transport, buildings and grids. The company's solutions accelerate the digital transformation of multiple industries, amplifying the scale of sustainability impact.	 UptimeInstitute® Uptime Institute is the standard bearer for digital infrastructure performance. Its tier standard has been used in the design, construction and operations of thousands of sites in more than 114 countries.
 Starline® A brand of Legrand	Starline draws on over 90 years of innovation to deliver safe and flexible overhead power distribution to a variety of industries, businesses and institutions.	

Data Centres in Africa Focus Report

In collaboration with



AFRICA
DATA CENTRES
ASSOCIATION

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Foreword



Ayotunde Coker,
Chairman, Africa Data
Centres Association

Africa's data centre industry is expanding rapidly due to the increasing demand for such facilities throughout the continent, particularly in fast-growing markets such as Kenya, Morocco and South Africa. The continent will need more than 700 data centres in the long run to fully benefit from the growing segment and ensure its digital sovereignty.

Africa benefits from several favourable features that can foster growth in the area of economy including a large and youthful population, increasing network penetration and growing access to broadband. Such factors are attracting many international operators to the market and will be crucial for the future development of the industry.

Indeed, connectivity and access to broadband play an important role in the development of the data centre industry. For example, more than 83m Nigerians are connected to broadband, highlighting the potential of the ICT ecosystem in the country.

Today the primary focus is on increasing broadband penetration to enable access from the coast, where subsea cables are anchored, to the heart of the African continent. Demand for data centres has increased exponentially in recent years and is now three times greater than supply. Storing and managing the billions of data points generated daily by

companies, governments and individuals is critical. Several data centre facilities such as edge and hyperscale have seen rapid growth in West Africa. Meanwhile, cloud-based data centres are evolving in Nigeria and South Africa, with many expansion projects under way in partnership with top US technology companies.

We believe that the industry is set for rapid development in line with the growth of the digital economy across the continent. Even though we experienced a brief slowdown due to the Covid-19 pandemic, economic expansion is gaining momentum. The development of data centres is picking up pace due to strong demand from economic operators, as well as increasing awareness that African countries must establish their digital sovereignty in an increasingly competitive and complex world.

The market for data centres has expanded and the cloud segment is seeing strong interest from foreign investors. In light of this, the challenge is to convince economic operators of the benefits of dematerialisation and the use of the cloud, artificial intelligence and the internet of things. The roadblocks to the sector's development must be overcome, particularly in data security, the reliability of broadband network infrastructures and regulations so that data sovereignty is seen as a pan-Africa opportunity, similar to the way it is perceived in Europe and North America.

Overview

Spurred by the rapid digitalisation witnessed during the Covid-19 pandemic, data centres (DCs) are now central nodes of the global – and African – economy. They store, process and distribute vast troves of data remotely in large groups of networked computer systems and servers.

Companies need DCs to monitor and improve performance, while governments require them to deliver essential public services. Increasingly, DCs also host the cloud-based applications that consumers rely on for everyday services such as banking, work collaboration, entertainment and navigation. Indeed, DCs helped to facilitate remote work during the pandemic, even amid strict lockdowns.

Allied Market Research projects that the global market for DC provision will reach \$517.2bn by 2030, up from an estimated of \$187.4bn in 2020. According to the most recent figures, as of mid-2023 Africa

accounted for less than 2% of global co-location DC supply, with over half that total located in South Africa.

Revenue from the African DC market is expected to expand at a compound annual growth rate of 12% in 2019-25 to \$3bn. Demand for cloud-based services and modular DC solutions from organisations – particularly small and medium-sized enterprises (SMEs) – and government agencies, will underpin the market, with more than 70% of African organisations expected to shift to the cloud by 2025.

In more mature markets, the world's largest technology companies maintain hyperscale DCs that house upwards of 5000 servers, in which one tenant leases several MWs of space. Microsoft hosts the largest, in Chicago, with almost 200 MW available. In Africa, demand has only recently justified the rollout of multi-tenant facilities in major markets. Late adoption has left a massive

supply gap – Africa needs up to 1000 MW and 700 facilities to meet demand and bring capacity density on a par with that of South Africa, the region's leader.

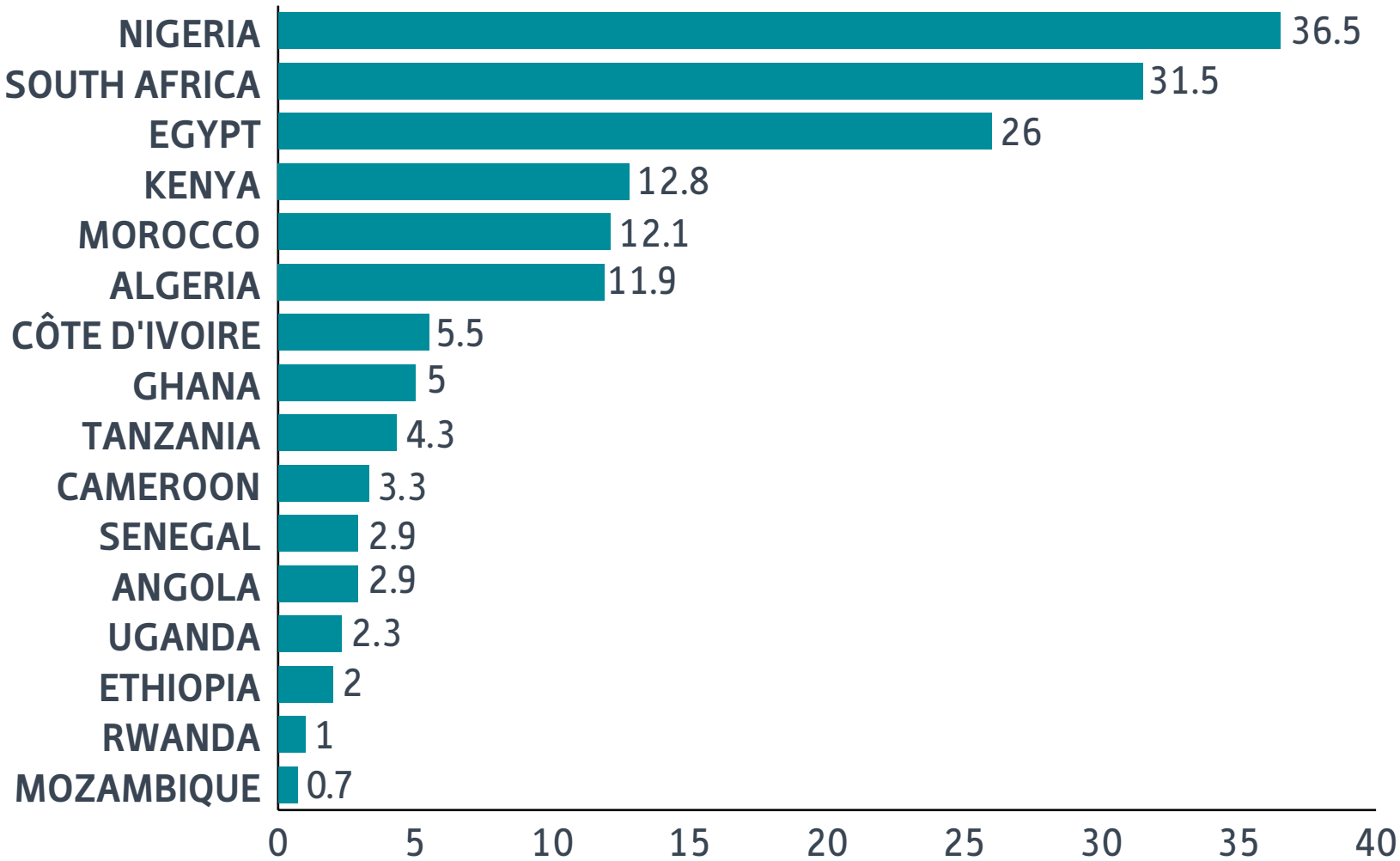
Launching a DC in Africa poses challenges related to limited access to essential resources such as electricity, land, water and connectivity. Despite this, a blend of multinational and African tech firms, often backed by significant venture capital, are rapidly establishing new facilities. These endeavours reduce latency and enhance the digital economy.

Governments and pan-African organisations are actively contributing through supportive policy-making, safeguarding the environment and critical infrastructure. The Africa Data Centres Association, the industry trade organisation for the continent, connects equipment suppliers with DC operators and ensures the industry's voice resonates among key decision-makers.



The global market for DC provision is set to reach **\$517.2bn** by 2030

Largest digital economies in Africa by iGDP*, 2025E (\$ bn)



*iGDP measures the contribution of the internet to GDP

Part 1: Introduction

Case Study



MainOne, an Equinix company, launched its operations in West Africa in 2010 following the construction of a 7000-km submarine cable from Portugal to Nigeria. In 2015 the company commissioned its first data centre (DC) in Nigeria, which served as a catalyst in the company's journey toward developing a robust, interconnected ecosystem across the region.

MainOne's long-term vision is to improve digital access in West Africa, an endeavour in which it has invested significantly over the past 15 years, including in submarine cables, DCs, connectivity and cloud-based solutions. In April 2022 the acquisition of MainOne by US-based digital infrastructure firm Equinix for \$320m bolstered the capabilities of the African company.

MainOne's DCs have played a pivotal role in expanding capacity and connectivity in West Africa. With services delivered to 10 countries, including Nigeria, Ghana and Côte d'Ivoire, the company has increased the combined capacity of its DCs to 5 MW in key markets.

The newest LG02 DC in Lagos, Nigeria, is a carrier-neutral facility that hosts an interconnected ecosystem of network operators, content and service providers, internet exchanges and enterprises across West Africa through national networks, with access to submarine cables. The facility shares a campus with LG01 and hosts internet exchange points – such as the recently launched AMS-IX Lagos interconnection platform and the IXPN – for content and network service providers to exchange traffic through high-bandwidth connections. Additionally, the company has expanded its footprint with the Tier-3, AC1 Appolonia City DC, launched in Accra, Ghana in June 2021, and the expansion of its facility, ABJ1 in Abidjan, Côte d'Ivoire in November 2023.

MainOne addresses energy supply and sustainability concerns by strategically locating its DCs close to grid-based power sources, which reduces the dependency on diesel generators, and by connecting directly to the grid through partnerships with local distribution companies.



Viewpoint

Funke Opeke, West Africa Managing Director, MainOne,
an Equinix Company

The African continent is fast undergoing a digital transformation, a reality that is largely driven by increased demand for content and cloud-based services. This trend has resulted in a need for reliable and secure data storage, as well as processing facilities in the region designed to deliver low latency.

The potential for carrier-neutral data centres (DCs) on the continent is substantial, as shown by recent acquisitions and new builds witnessed in recent years. As the necessary infrastructure and expertise progress and evolve, and local consumption of digital services grows, the development of DCs is set to continue to expand across the region.

This growth is also being fuelled by increasing concern on the continent about issues such as data security and protection. African governments and leading regulatory agencies are establishing more robust frameworks

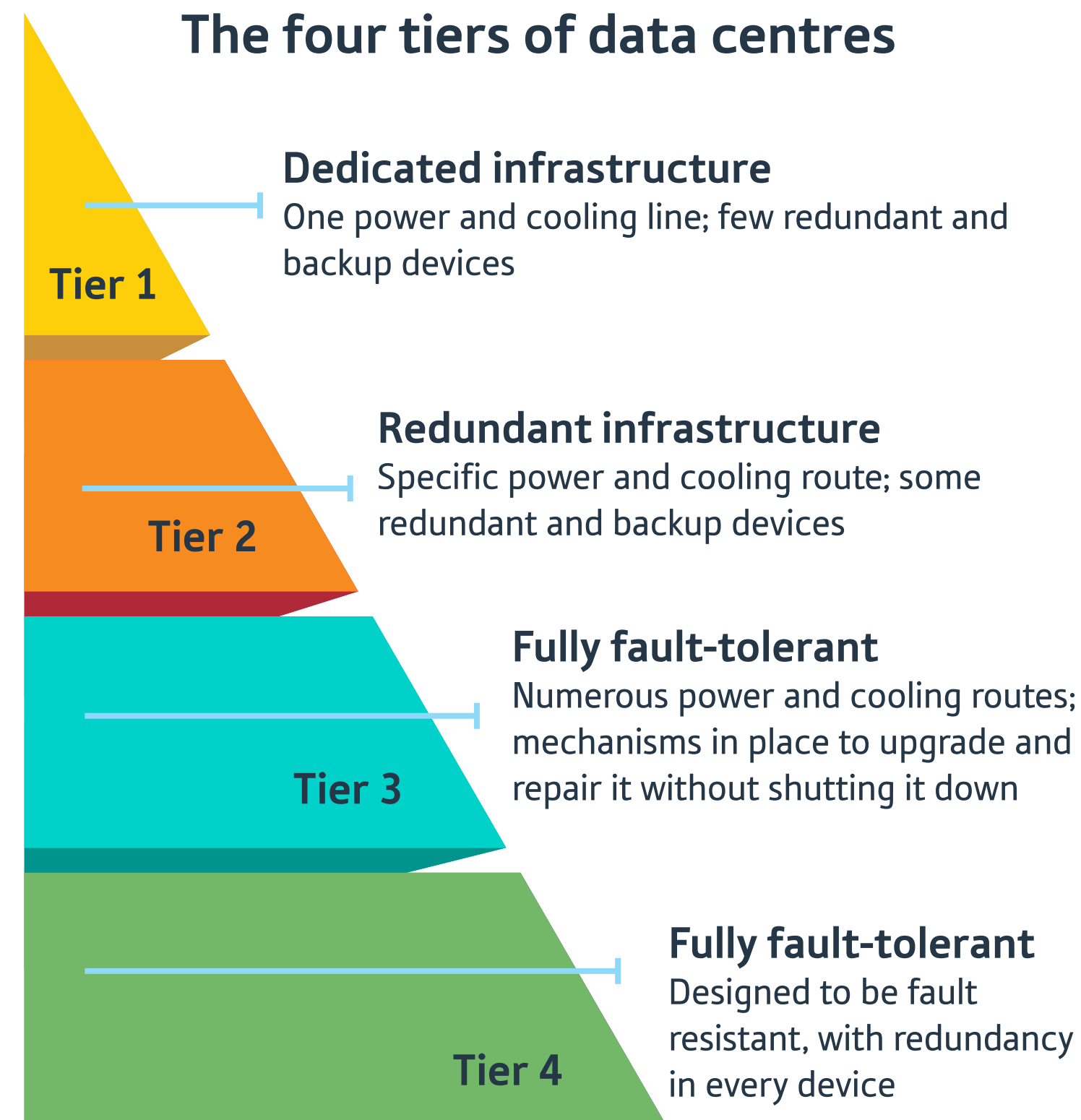
to protect citizens' personal data and enforce compliance through policies such as the Nigerian Data Protection Regulation. Increased compliance and enforcement of these regulations – coupled with the increased reliance on digital services – is expected to accelerate already strong demand for data centres on the continent.

Given the fact that the operation of DCs requires large amounts of energy, it will be important for African governments to address the issue of improved access to affordable, reliable, and environmentally sustainable sources of electricity. Indeed, this is a pressing issue for the growing number of DC operators active on the continent.

The expansion of clean and renewable sources of power will help the desired growth of DCs on the continent, and curtailing their carbon footprint will be critical for sustainability.

Definitions

The four tiers of data centres



DCs encompass various elements of internet infrastructure, such as internet exchanges, cloud exchanges, cloud providers, web-hosting providers, internet backbone carriers, content delivery networks, internet access providers and fibre operators. DCs are functional and utilitarian facilities that house vast banks of server racks, connectivity and storage systems, as well as redundant or backup power, redundant data communications connections, cooling installations, fire safety systems and security devices.

Maintaining such facilities independently is very costly, but co-location DCs operate lean business models by renting to multiple clients at the same time. Tenants are charged for space and provide their own hardware, allowing them to scale seamlessly, rather than having to estimate the cost of their business' future IT requirements. Conversely, single-tenant, or enterprise, DCs only facilitate the needs of their own companies, such as a telecoms firm, bank or government that has its own in-house IT infrastructure. Carrier-neutral facilities, meanwhile, allow for interconnection between many carriers and are therefore wholly independent of any network provider, ensuring diversity and flexibility, and a level playing field for domestic and international clients alike. Edge DCs are smaller facilities located close to the populations they serve, while

hyperscale DCs are large facilities that can scale up efficiently. Hosting IT systems in co-location DCs offers several advantages. Foremost is reliability: DCs are categorised into four tiers that increase based on redundancy and expected annual uptime. For instance, Tier-1 DCs have a solitary path for power and cooling, with minimal redundant and backup components, offering an expected uptime of 99.67%, equivalent to 29 hours of annual downtime. Tier-2 DCs maintain a single power and cooling path with some redundancy, providing an expected uptime of 99.74%, or 22 hours of annual downtime. Tier-3 facilities incorporate multiple power and cooling paths to restrict downtime to 1.6 hours annually. Tier-4 DCs, of which there are now a few in Africa, are constructed to be entirely fault-tolerant, with redundancy for every component and an expected downtime of 26 minutes a year.

DC tenants can therefore be confident that they will not lose business due to connectivity outages, which could have significant consequences for key services such as health care. Additionally, energy costs are lower, as DCs typically use more efficient equipment – including chilled water systems – compared to on-premise operations. Lastly, as facilities are purpose-built to safeguard clients' data and infrastructure, DCs offer a higher level of security than in-house operations.

Infrastructure

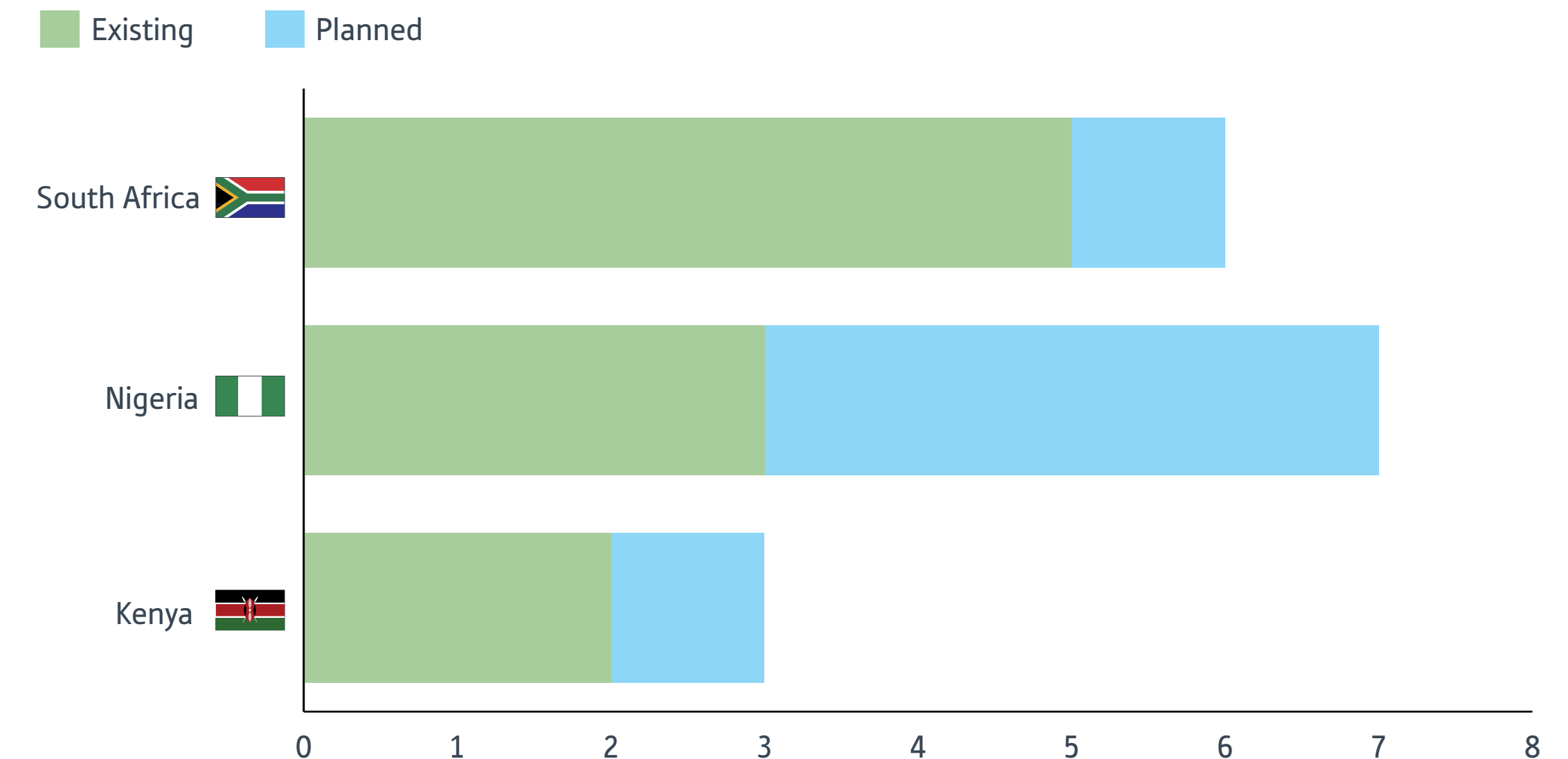
In terms of capacity, Africa's 140,000 sq metres of space shared among a little more than 100 DCs is roughly equivalent to that of Switzerland. However, rapid digitisation and the rollout of 4G and 5G infrastructure mean that supply is poised to increase by 50% in 2021-26. More than 30 Tier-3 and multi-tenant facilities have come on-line since 2016, doubling the continent's data hosting capacity to roughly 200 MW as of late 2019.

However, capacity is unevenly distributed with more than half based in South Africa due to the size of its economy (\$405.1bn in 2022), its links to subsea fibre-optic cables and its liberalised telecoms market. It is also the locus of Africa's largest internet exchange, NAPAfrica, which retains the most peering connections on the continent, and serves as a gateway for telecoms carriers, content delivery networks, cloud providers and other stakeholders in over 20 countries. Johannesburg hosts 55 MW of capacity, compared to 796 MW and 728 MW in Dublin and London, respectively, but ahead of other up-and-coming markets such as Madrid, Marseille and Warsaw.

Although South Africa's current power and grid instability is unlikely to challenge its position as the continent's DC leader, it will most likely limit future expansion, creating opportunities for other players in the region. Nairobi, for example, hosts 19 MW of capacity. Although the city's capacity is about one-third that of Johannesburg, Kenya sits on four major subsea cables, and boasts strong cross-border fibre connections and a vibrant stock exchange, making it well placed to become a regional centre for DCs. Forecasts suggest that the country's total capacity could reach 23 MW by 2028. Notably, between 70% and 80% of Kenya's electricity supply comes from green sources. Elsewhere on the continent, Côte d'Ivoire and Nigeria benefit from many similar advantages, as do Ghana and Senegal.

Around 10% of the existing DC capacity serves nearly half of sub-Saharan Africa's economic output and broadband connections, according to figures from Xalam Analytics. Moreover, one-third of Africa's 80 or so cities with a population of more than 1m people have a DC rated Tier-3 or above, demonstrating the scale of the distribution gap.

Africa's leaders in DC capacity, 2020 (no. of carrier-neutral DCs)



100+ DCs in Africa as of 2023

CAGR in DCs in Africa in 2023-28

12%

Growth Potential

Forecasts for the growth of the DC market in Africa draw upon a blend of influencing factors, notably the continent's rapidly expanding population. The UN projects that more than half of the global population increase from 2020 to 2050 will take place in Africa, including the doubling of the sub-Saharan population over the next 30 years to 2.5bn. Nigeria is set to lead this demographic surge, surpassing the US to become the world's third-most-populous country. The UN envisions that by 2040, over half of Africa's population will reside in urban centres, with eight transforming into mega-cities of 10m or more inhabitants.

Presently, 15 African countries have economies and populations large enough to develop DC and cloud service ecosystems. Some 43% of the African population had access to the internet by early 2022. This figure is set to increase by 11% over the next decade, when Africa is estimated to account for around 16% of the global internet user base. The rise in internet uptake is expected to foster an increasingly digitalised African economy. The internet economy is projected to be worth \$180bn

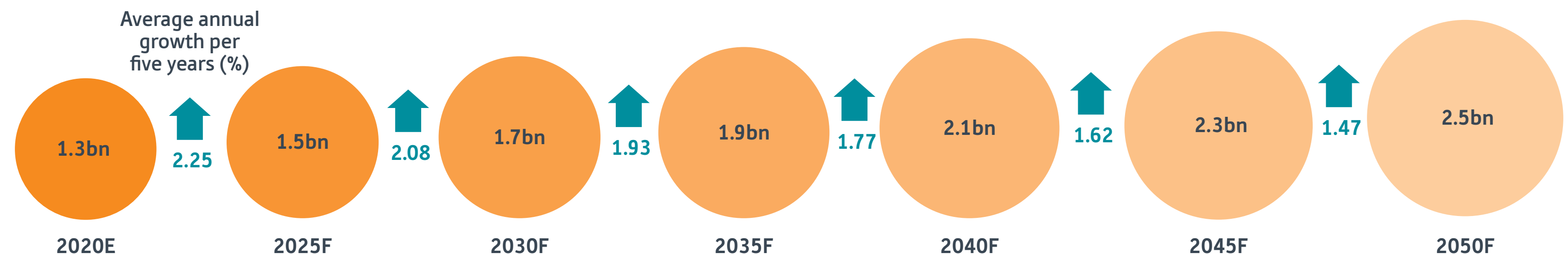
by 2025, growing to \$712bn by 2050. Meanwhile, data-sovereignty regulations demanding that data is stored in-country, or at least within the five subregions that partition the continent, will help drive demand for localised data storage services. Research company International Data Corporation projects that annual cloud computing subscriptions in South Africa alone will grow from \$370m in 2019 to \$1.7bn in 2024.

Governments are increasingly driving demand for DC capacity. Senegal, for example, will transfer

all government data and digital platforms from foreign servers to a new national DC, maintained by Huawei, in an effort to strengthen its digital sovereignty. China is supporting Senegal's shift to e-governance by establishing a national broadband network in the West African country and funding a Smart Senegal e-infrastructure project, which has evolved into the Senegal Digital Strategy 2025. This policy and its broader aims have attracted major international cloud service providers such as Amazon Web Services (AWS), Google, Huawei and Microsoft. As cloud providers proliferate,

they will create a virtuous circle of DC demand by enabling an increasing proportion of businesses to move their operations to the cloud. Both AWS and Microsoft were early entrants into the African market, and are now seeking additional DC capacity, indicating that their ventures have been rewarded with successful business cases. Multiple international hyperscale providers, including Alibaba's Whale Cloud Services and Huawei Cloud, already maintain a presence in South Africa, while Kenya and Nigeria host several US providers, including Microsoft, which is also present in Angola.

Africa's population is forecast to increase significantly over the coming decades



Digital Transformation

Mirroring the rest of the world, particularly in the post-pandemic recovery phase, digital transformation has changed how African businesses operate and deliver value to customers – a process catalysed by increased access to the internet and mobile services, as well as growing recognition of the benefits for economic development and social progress.

Although all sectors of the regional economy have been affected by the emergence of these new digital environments, the financial services industry, as an early adopter, has been in the spotlight given its deployment of technologies to reduce transaction costs, improve access to credit and drive financial inclusion.

As mobile connectivity continues to outpace broadband, with 65% of the African population expected to be connected via smartphones by 2025, investment in digital financial services continues to expand – whether in the form of Kenya's M-Pesa mobile banking service, catering to more than 50m previously unserved users,

or Visa's \$1bn commitment in 2022 to expand mobile payment services for SMEs across Africa over five years. Digital technologies have also expanded well beyond financial services into education, health care, agriculture and governance, enabling distance learning and democratising access to education, as well as empowering telemedicine in rural areas.

A 2020 report by the International Finance Corporation and Google estimated that Africa's internet economy could reach \$180bn, or 5.2% of the continent's GDP, by 2025. Harnessing this growth potential will require significant telecoms infrastructure investment to support growth in data traffic, particularly as the transition to 4G and 5G networks continues.

Mobile connectivity has also enabled enterprise digital transformation while generating many social benefits, allowing social assistance to be delivered in a faster and more effective manner. A 2020 World Bank and GSMA study revealed that extreme poverty in Nigeria, the largest

mobile market on the continent, declined by about 4% after one year of mobile broadband coverage, and about 8% after two or more years of coverage. Growing digital transformation has also increased demand for digital literacy in the labour market, with an estimated 230m jobs in

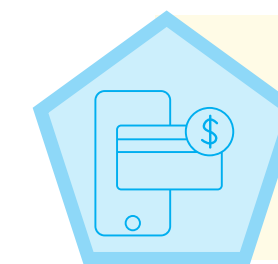
sub-Saharan Africa expected to require digital skills by 2030. The continent's digital transition is enabling a new generation of start-ups to create new products for the African market as well as compete globally, adding to demand for a local entrepreneurial and digitally savvy workforce.



Africa's internet economy is projected to be worth **\$180bn**, or **5.2%** of GDP, by 2025



An estimated **230m** jobs on the continent will require digital skills by 2030



Smartphone penetration in Africa is expected to reach **65%** by 2025

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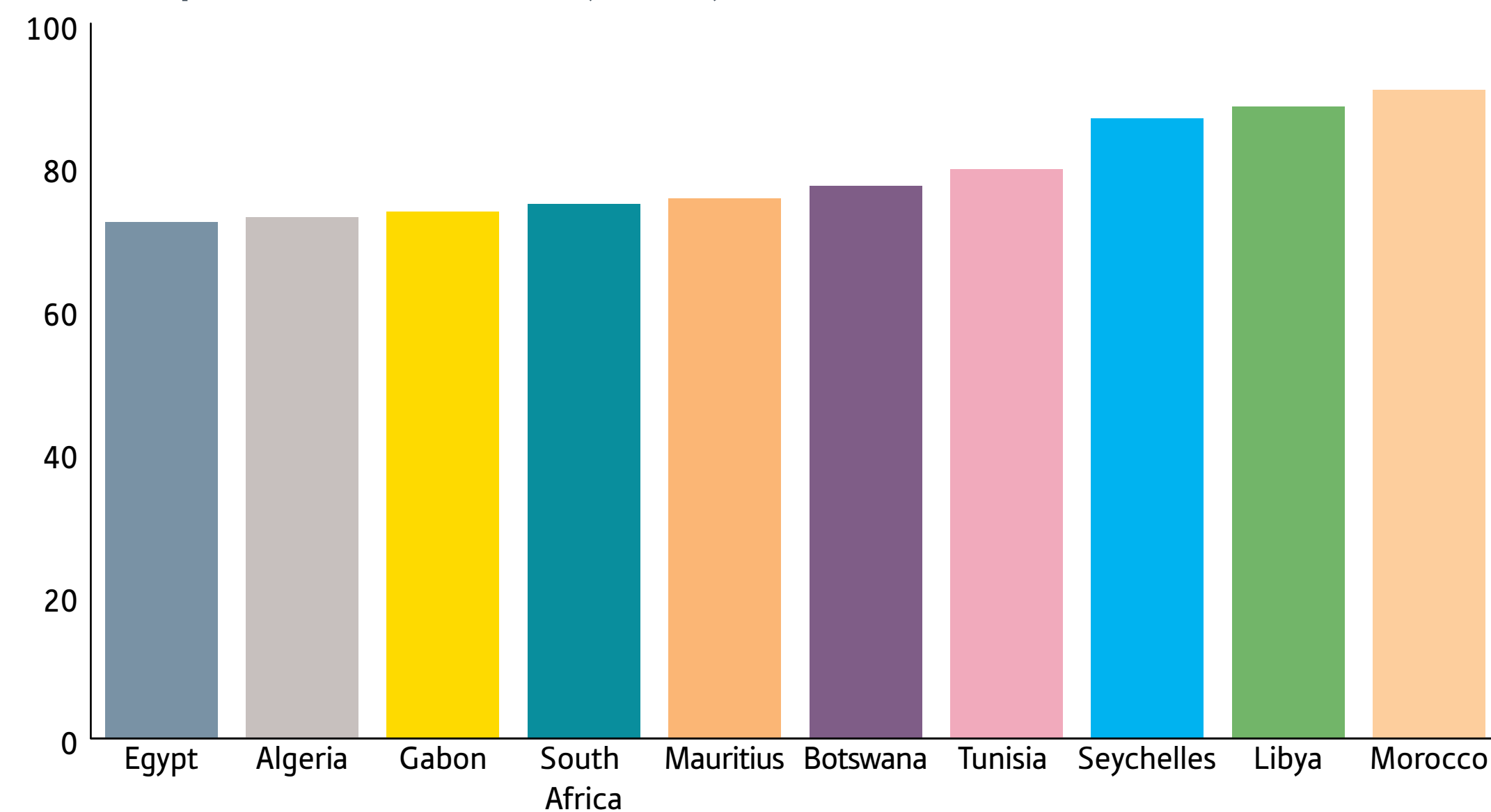
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Broadband Deployment

Broadband internet plays a crucial role in driving the digital economy, and the relative lack of it across Africa signals a growing demand for data centre (DC) services in the medium term. Africa's broadband user base is expected to double between 2020 and 2030 to over 500m amid infrastructure and connectivity improvements. Markets beyond South Africa account for 85% of the continent's broadband subscriber base, but only around 30% of the co-location supply.

Active mobile broadband subscriptions per 100 inhabitants in Africa reached 42 in 2022, but trailed the world average of 86.9 by a considerable margin. Just six African countries recorded rates above the global average: Côte d'Ivoire, Eswatini, Gabon, Senegal, Seychelles and South Africa. As for fixed broadband, the subscription rate for sub-Saharan Africa was 0.7 per 100 inhabitants in 2022, well below the worldwide average of 18.4 – a consequence of the absence of legacy infrastructure and the comparatively lower cost of wireless networks. Several internet providers offer satellite

Internet penetration in Africa, January 2024 (%)



Africa's operational fibre-optic network reached **1,184,028 km** in June 2022, up from **820,397 km** in 2017 and with **119,062 km** of fibre-optic network under construction

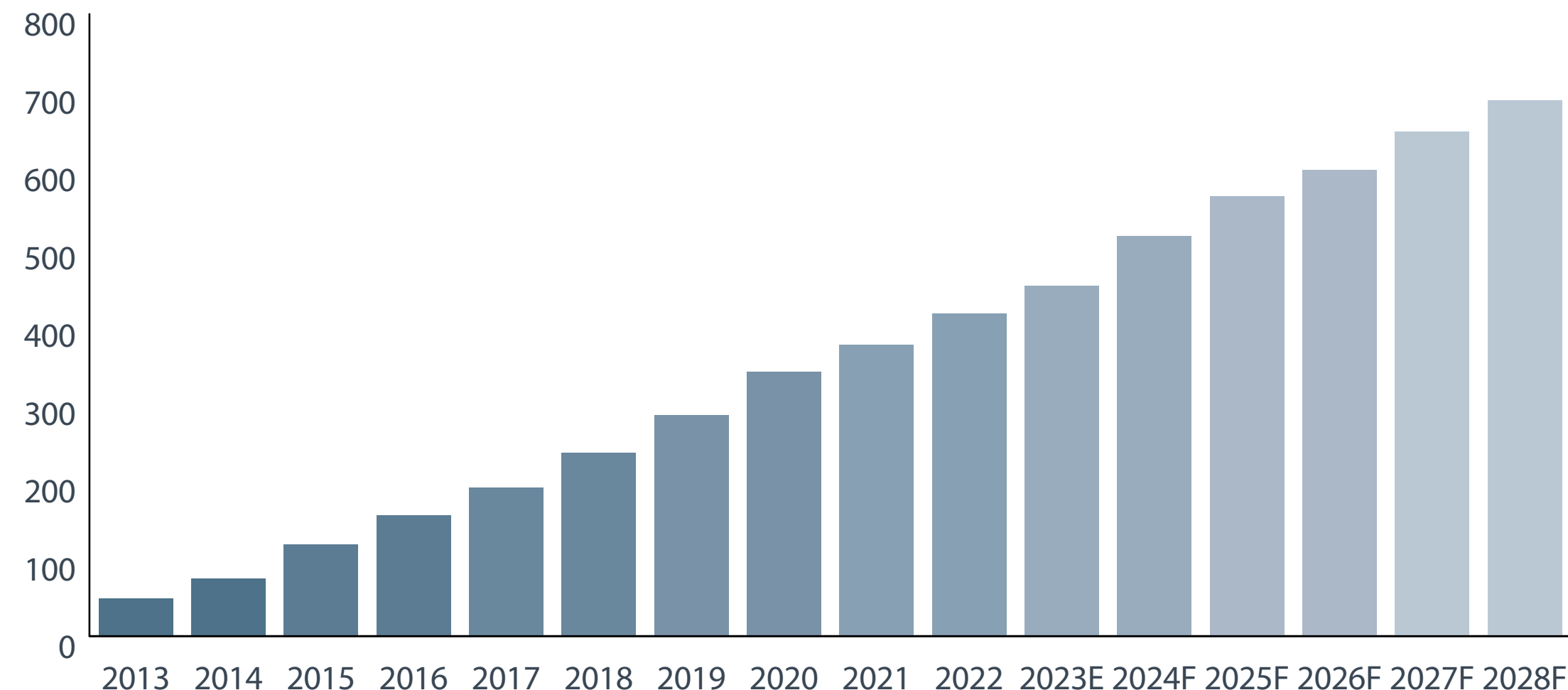
broadband, which is essential for various industries working in remote areas. The presence of satellite broadband is most notable in Kenya, Nigeria, South Africa, Tanzania and Zimbabwe.

While international bandwidth usage across Africa has expanded rapidly in recent years, from 5 Tbps in 2017 to 21 Tbps in 2020 and 39 Tbps in 2022, the average bandwidth per internet user rate across the continent was recorded as 85 kbps per internet user in 2022. This figure lagged behind the world average of 233 kbps for that year.

A 2019 World Bank report estimated that it would cost some \$100bn to achieve universal broadband connectivity in Africa by 2030 across infrastructure, skills training and maintenance needs. Tackling the infrastructure requirement is already well under way: as of June 2022 Africa's operational fibre-optic network reached 1,184,028 km, up from 820,397 km in 2017 and with 119,062 km of fibre-optic network under construction. Furthermore, there were an additional 125,541 km planned, and 69,352 km proposed.

Mobile Market

Number of smartphone subscriptions in sub-Saharan Africa, 2013-28F (m)



Mobile tools are Africans' devices of choice to connect to the internet, with fewer than 10% of households owning a home computer, and the use of handsets is expected to drive data consumption in the years ahead. In November 2023 Swedish multinational telecoms company

Ericsson forecast that mobile data traffic in sub-Saharan Africa will post a compound annual growth rate (CAGR) of 33% between 2023 and 2029, with an estimated average smartphone data reading of 23 GB per device by the end of the period up from 6.7 GB at the end of 2023.

As it stands, mobile network industry association, GSMA estimates that some 26% of sub-Saharan Africa's population, or 270m people, use mobile internet, while half of the population has coverage but does not connect and one-quarter remain outside the reach of services. That usage gap of some 520m people is due to poor mobile literacy, costly handsets and data packages, and issues such as a lack of relevant content. The year 2019 saw more mobile broadband (3G and 4G) connections than 2G in the region for the first time, as operators continued to upgrade infrastructure and consumers benefitted from more affordable devices.

Smartphones, which are critical enablers of mobile internet use, now account for half of all mobile connections, and their uptake has expanded at a CAGR of 28% since 2015. This has driven adoption of smart feature phones, which carry popular apps and connect to 4G networks but are available at a lower price point. Operators are expected to invest \$52bn in sub-Saharan Africa's network infrastructure between 2019

and 2025, helping lift smartphone penetration to 65% across 678m connections.

Looking ahead, with 3G network coverage in Africa at 77.4% and 4G network coverage at 44.3% in 2020, the stage is set for the rollout of 5G connectivity across the continent. Telecoms providers Vodacom and MTN launched the first commercial 5G networks in sub-Saharan Africa in 2020, offering 5G mobile and fixed wireless access in South Africa. While the low uptake of 4G services previously cast doubt on whether Africa was ready for 5G technology, the Covid-19 pandemic changed this mindset and sped up the companies' plans. The health crisis triggered a surge in demand for data-heavy services as people turned online for entertainment, education and work. While 5G rollout is occurring steadily in key markets such as Kenya and Nigeria, penetration remains low and is already restricted by the high cost of 5G-enabled devices. It is predicted that while there are likely to be 41m 5G mobile connections in Africa in 2025, this will represent 4% of total connections.

Driving Data Consumption

The increase in data consumption in Africa is primarily driven by economic growth. While this was positive across much of the continent during the pandemic, macroeconomic headwinds have created a more challenging environment starting from mid-2022 into 2023. Digital financial technology will play a significant part in boosting financial inclusion across the continent. For example, countries including Benin, Côte d'Ivoire, the Gambia, Lesotho, Madagascar, Namibia, Togo, Uganda, Zambia and Zimbabwe improved their social protection efforts over the course of the pandemic through mobile money platforms, electronic cash transfers and other virtual engagement. Improved digital financial inclusion will drive demand for DC capacity as institutions seek to store and protect rising levels of sensitive customer data.

Mobile money is a vital driver of economic growth in sub-Saharan Africa. Mobile banking is key to boosting the digitalisation of the informal sector, which the World Bank estimates to account for more than 35% of output and 60% of employment across the region. For example, over 1m citizens

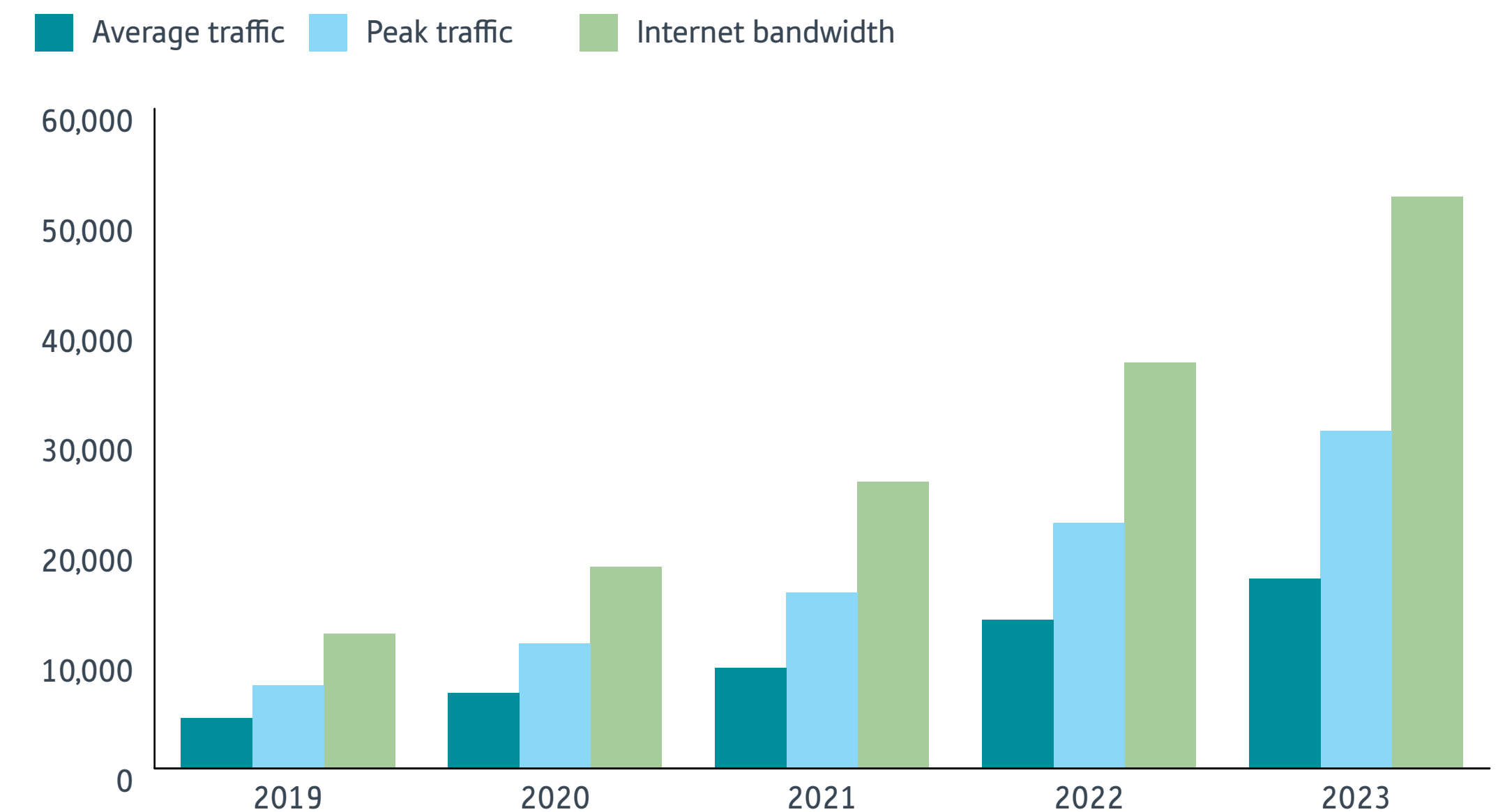
signed up to Togo's social welfare programme Novissi in April 2020, which used digital cash transfers to help informal workers during pandemic lockdowns. Mobile money transfers also delivered emergency income support in Namibia and unemployment benefits in Zambia.

Meanwhile, traditional financial institutions are migrating their operations to DCs and will continue to do so as they look to expand their digital offerings. First Bank of Nigeria and KCB Bank, Nigeria and Kenya's largest banks, respectively, both have mobile apps with more than 1m users, while Kenya's Equity Bank allows free bank-to-mobile wallet transfers. Financial technology (fintech) will be a key driver of data consumption. DC providers such as Main One are responding to boost capacity in light of expected growth across the region.

Increasing competition among cities to become regional DC leaders is spurring demand, with governments playing a key role. Many governments are actively pursuing digital transformation to diversify economies and streamline processes for

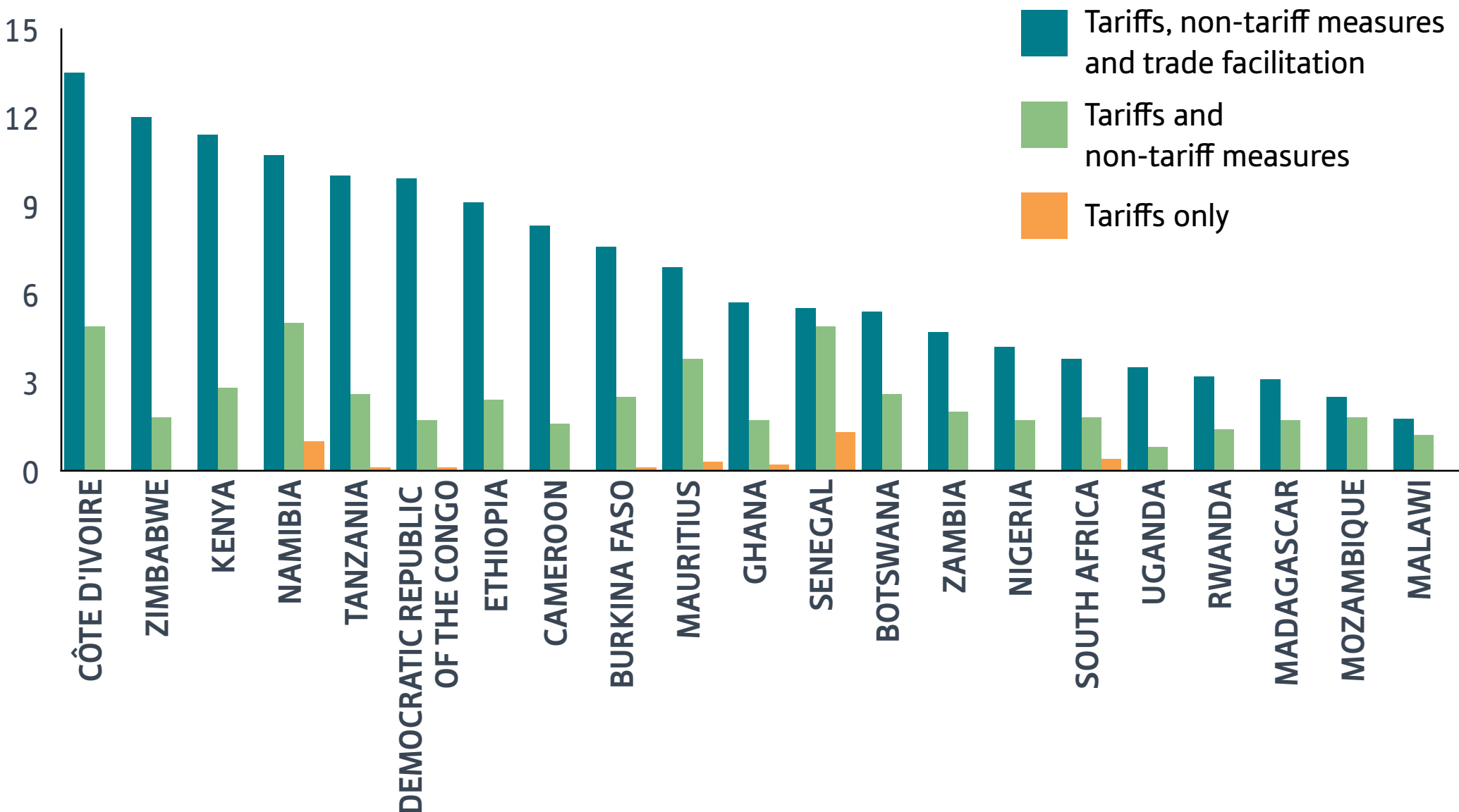
residents and investors. South Africa leads in cellular internet-of-things (IoT) connections, but use cases are expanding across sub-Saharan Africa, presenting opportunities to tackle challenges in energy, water management, agriculture, transport, logistics, manufacturing and health care.

Internet traffic in Africa (Gbps)



The AfCFTA Impact

Income gains due to the AfCFTA in 2035 (% change from baseline)



The African Continental Free Trade Area (AfCFTA) holds significant promise to stimulate DC investment throughout Africa. Currently, obstacles to cross-

border investment include capital transfer taxes and taxes on specific equipment, with currency value fluctuations making it risky to transfer money

between countries. These structural challenges have hindered industry growth, limiting the capacity to generate profit and reinvest them in new ventures across diverse geographical locations. For this reason, development has been concentrated in existing hubs such as South Africa.

The AfCFTA aims to institute a trade system mirroring the EU's benefits, encompassing free labour movement and tax exemptions on capital and equipment transfers within the continent. The treaty outlines the establishment of a continent-wide Customs union and envisions an online mechanism for monitoring, reporting and eliminating non-tariff barriers. Additionally, it seeks to implement a pan-African payment and settlement system, allowing African companies to clear and settle intra-African trade transactions in their respective local currencies. As of December 2023, 54 of 55 African countries had signed on to the AfCFTA, with 47 of those ratifying the agreement. Under ratification, least-developed countries (LDCs) consent to liberalise 90% of tariff lines within a decade of signing and their more

developed counterparts must do so within five years. Sensitive products, which account for up to 7% of tariff lines, will be fully liberalised over 13 years for LDCs and 10 years for non-LDCs, with the final 3% of tariff lines excluded from liberalisation. If successfully implemented, the agreement will create a single African market of over 1bn consumers and a combined GDP of more than \$3trn.

The single market should sharply lift intra-African trade and provide a platform for DC players to accelerate the rollout of new capacity. The share of intra-African exports as a percentage of total African exports was just 18% in 2023, extremely low compared to Europe (68%), Asia (58%) and the Americas (53%). Removing tariffs on goods under the AfCFTA is projected to increase the value of intra-African trade by between 15% (\$50bn) and 25% (\$70bn), depending on the degree of liberalisation, between 2018 and 2040. Lowering the cost of importing and accessing communication and network security equipment will encourage businesses to set up or ramp up operations in Africa, with corresponding benefits for DC demand.

Supporting Regulations

Countries and their status regarding the Malabo convention

Signed and ratified	Signed but not ratified
 Angola	 Benin
 Cape Verde	 Cameroon
 Côte d'Ivoire	 Chad
 Congo	 Comoros
 Ghana	 Djibouti
 Guinea	 Gambia
 Mozambique	 Guinea-Bissau
 Mauritania	 South Africa
 Mauritius	 Sierra Leone
 Namibia	 Sao Tome and Principe
 Niger	 Sudan
 Rwanda	 Tunisia
 Senegal	
 Togo	
 Zambia	

Marseille, France’s second-largest city, currently serves as the main gateway for the transfer of African data, as up to 80% is domiciled offshore. This limits the ability of operators in Africa to offer premium data transfer speeds to their customers. However, the continent is experiencing a change in attitude towards data sovereignty, or the idea that data is subject to the laws and governance structures of the country in which it is collected. With the EU’s General Data Protection Regulation (GDPR) serving as a benchmark and following campaigns by India and China to ensure data is stored onshore, African countries are legislating to remedy the situation, which has profound implications for DC growth.

The 2014 African Union Convention on Cyber Security and Personal Data Protection, also known as the Malabo Convention, was signed by 16 countries as of December 2023, with 13 countries having ratified the convention. While this trend is largely positive for DC capacity requirements, industry stakeholders have also raised a note of caution: there is a possibility that regulations may

be too stringent and therefore extremely difficult to adhere to.

In 2019 Uhuru Kenyatta, then-president of Kenya, approved data protection legislation that complies with the GDPR and facilitates the lawful use of personal data, thus strengthening individuals’ rights. The law also stipulated that personal data cannot be transferred outside of Kenya unless there is proof of adequate data protection safeguards or consent from the data subject. South Africa has implemented the Protection of Personal Information Act, which puts in place personal data protection controls of as rigorous a standard as those in the GDPR. In Nigeria all subscriber, government and consumer data has been mandated to be stored locally since the Guidelines for Nigerian Content Development in ICT were passed in 2014. As of June 2020 Nigeria’s central bank requires all point-of-sale and ATM transactions to be processed by a Nigerian firm. Tanzanian banks, meanwhile, are obligated to build DCs to store customer data within national borders. Consent is required in Zambia before data can be transferred outside of the country.

Part 2: Innovation

Cloud Delivery

Cloud computing has transformed the way both large and small organisations use technology, become more competitive and better address consumers' evolving needs. In particular, cloud products and services have simplified business platforms and enabled remote work in the aftermath of the Covid-19 pandemic. As cloud-enabled businesses continue to expand in Africa, it becomes increasingly important to develop local DC infrastructure in order to strengthen data sovereignty, reduce latency for users, and improve the speed and reliability of cloud-based applications.

As of 2021 Africa accounted for 17% of the world's population, 13% of its mobile connections and 5% of its broadband connections. However, it hosted only 1% of the world's DC space, according to research firm Xalam Analytics, signalling key opportunities for investment. In February 2024 Google launched its first cloud DC on the continent, following the

opening of Amazon's first African cloud DC in 2020, cementing a trend of global and regional players stepping up investment to improve regional connectivity and deliver to public and private organisations with access to storage, speed and scale.

By hosting data within their borders, African countries are able to deliver to both an underserved market and can shorten data's travel speed, resulting in faster access time and reduced latency, which can greatly contribute to real time processing and high traffic volumes. While existing and upcoming African hyperscale-ready tier 3 DCs do not enable the continent to store and process its large volumes of data, they enhance the cost-competitiveness of cloud computing for African businesses, thereby minimising costs associated with data transfer and egress fees that can add up for businesses that rely heavily on cloud services. Egress fees, which are charged for data

transferred out of a provider's network, on average represented 6% of the monthly bill from cloud providers. Indeed, 99% of respondents revealed that they incurred planned or unplanned egress fees at least on an annual basis, according to a 2021 survey by advisory service provider International Data Corporation.

Data is in constant motion, from edge to cloud to private networks, therefore increasing unexpected cloud fees and adding to the difficulty of governing data. As egress fees vary depending on the amount of transferred data and location from which it is transferred, building DCs closer to users would reduce data transfer over long distances. Additionally, the construction and operation of DCs in Africa could spur job creation and stimulate economic activity, in addition to helping drive the competitiveness of local cloud computing and the development of new technologies to empower businesses.



Viewpoint

Wouter van Hulten, CEO and
Founder, PAIX Data Centres

Africa is at the forefront of a digital revolution, and data centres (DCs) have emerged as the linchpin driving this transformative wave. The Equiano, 2Africa, Medusa and BlueMed subsea cables fostering high-speed fibre-optic links are connecting continents and powering regional growth through proliferating DCs. Key markets, including Nigeria, Kenya, Egypt and Morocco, are leveraging their competitive advantages to attract investment and accelerate growth.

Sustainability is key, with Morocco leading the way in adopting clean energy to power DCs. Advances in cloud computing, artificial intelligence and machine learning are redefining DC functions, requiring swift adaptation. Edge computing, predictive analytics and cybersecurity solutions present opportunities for the continent.

However, Africa faces challenges, with less than 1% of the global DC space despite hosting 17% of the world's population. Inadequate power supply, limited fibre connectivity and high internet access costs hamper DC performance. A multi-stakeholder approach is crucial, emphasising the need for special economic zones, data sovereignty laws and incentives for renewable energy to unlock the potential of DCs. Providing secure and scalable digital infrastructure is key to accelerating Africa's digitalisation and contributing to its development.

Blockchain

Much of Africa's blockchain expansion and development has been linked to cryptocurrency start-ups, particularly as the continent became the third-fastest marketplace worldwide for the industry in 2022. Indeed, Africa experienced a 1200% increase in cryptocurrency payments from 2020 to 2021, according to blockchain data platform Chainalysis. Although African countries such as Kenya, Nigeria and South Africa rank among the top-10 cryptocurrency-using countries in the world, the industry remains small, with African crypto transactions peaking at \$20bn per month in mid-2021. Likewise, the highly volatile nature of crypto asset prices has resulted in increased scrutiny by policymakers.

Cryptocurrencies are not the only solutions offered by blockchain technology. The rise of mobile tools, combined with 370m unbanked Africans, have shown that the continent presents a unique opportunity for peer-to-peer cryptocurrency markets, with sub-Saharan Africa conducting the world's highest proportion of crypto retail payments less than \$1000 as of September 2022.

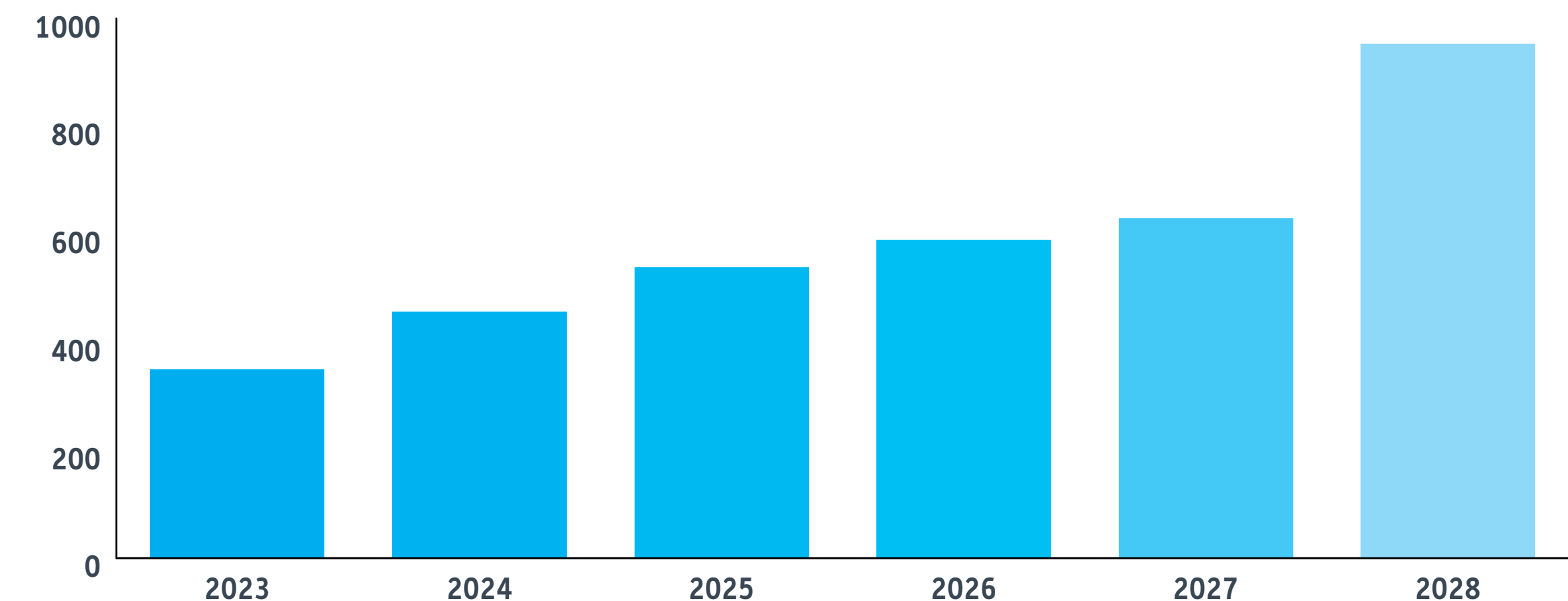
This has led to investment growth in African blockchain start-ups, which raised \$127m in 2021, with fintech businesses accounting for \$67m, or 53% of all blockchain funding.

Blockchain is not limited to fintech but has the potential to improve efficiency, accuracy and transparency of financial and contractual transactions. For instance, a blockchain-based land property cadastre system can deliver a secure and transparent record of ownership, making it easier to track and verify land ownership. This is particularly relevant for Africa, where double ownership cases are commonplace, land titles are unclear and registries rely on incomplete paperwork. For instance, around two-thirds of Kenya's land is traditionally owned by communities without formal land titles, while this is the case for 80% of Ghana's landowners – a situation that can result in corruption in land sales and leases. Therefore, by storing contracts and assets in a blockchain, governments and businesses would prevent lengthy disputes and fraud. Similarly, blockchain allows for the creation and storage of

smart contracts, which are self-executing with the terms of the agreement between buyer and seller being directly written into lines of code. This can help to automate and streamline contract processes and make them more secure and transparent, resulting in not only real estate sales, but also any type of transaction, faster, easier and paperless. Within the

context of the full implementation of the AfCFTA, blockchain smart contracts can greatly improve trade facilitation by empowering trade finance, customs, logistics and intellectual property management. By deploying blockchain technologies, traders both reduce cost and transaction times while accessing a more transparent and secure system.

Estimated revenue in cryptocurrencies in Africa (\$m)



Artificial Intelligence

With the growing demand for DC resources, artificial intelligence (AI) is playing a crucial role in development. AI is essential for enhancing energy efficiency, leveraging machine learning to anticipate potential spikes in IT loads and energy consumption. This, in turn, enables cooling systems to adapt for lower power usage effectiveness (PUE). In certain systems, real-time communication between cooling sensors and management systems further enhances overall efficiency. For example, Huawei's iCooling solution in a DC in Ningxia, China helped reduce the facility's energy consumption by 3.2%, lowering costs and carbon emissions. The Chinese firm has similar solutions for power and operations management, with the latter including cloud-based tools for operators overseeing multiple sites. Elsewhere, Google's DeepMind has been deployed in one of the tech giant's DCs to reduce energy used for cooling by 40%. Siemens offers a dual approach that controls chilled water delivery in tandem

with a platform that monitors air supply and temperature data, and adjusts airflow accordingly. Siemens has deployed the technology in one Tier-4 DC to bring PUE down to 1.2 (a PUE of 1 denotes zero energy loss). While Google's technology is proprietary, Siemens' is provided by private vendor Vigilent, demonstrating how far-sighted DC operators can purchase AI solutions to suit their needs.

Turning to predictive maintenance, AI allows DC operators to foresee and remedy system faults and component failures. Sensors are capable of detecting undesirable vibrations or sounds in IT equipment, identifying potential failures before they manifest. Simultaneously, algorithms can optimise server workload distribution, alleviating system stress and minimising the risk of data outages. Machine learning also plays a role in enhancing cybersecurity by analysing data inflows and outflows, identifying anomalies indicative of malware or hacking attempts.

Impact of AI on DC operations



Improves security

AI-based cybersecurity can screen and analyse incoming and outgoing data, detect malware and implement behavioural analytics to protect data



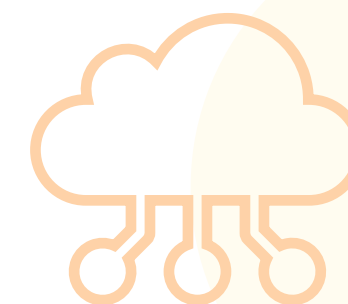
Optimises servers

AI-powered analysis can help distribute workload across various servers



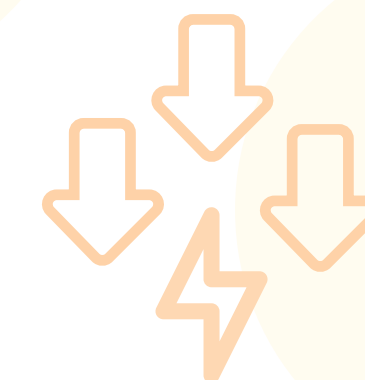
Monitors equipment

AI uses pattern-based learning to identify equipment defects



Reduces downtime

AI can monitor server performance, network congestion and disk utilisation to detect and predict data outages



Conserves energy

AI can learn and analyse operations to identify and remedy sources of energy inefficiency, reducing overall consumption

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Part 3: Addressing challenges

Investment & Finance

After regional data centre (DC) expansion slowed resulting from the Covid-19 pandemic, growth is set to return in the coming years. Indeed, in 2020 DC investment in Africa was valued at \$2bn and it is set to rise to \$5bn by 2026. In July 2023 the International Telecommunication Union reported that demand for DCs on the continent had doubled between 2016 and 2023.

As a result, the African DC construction market is seeing rising demand across industries, and acquisitions and joint ventures enable new actors to enter the market, expand their customer base and boost their market share. According to a 2023 report by research firm Arizton, the African DC construction market was valued at \$763.7m in 2022 and is projected to reach \$1.4bn by 2028, with a compound annual growth rate of 10.7%.

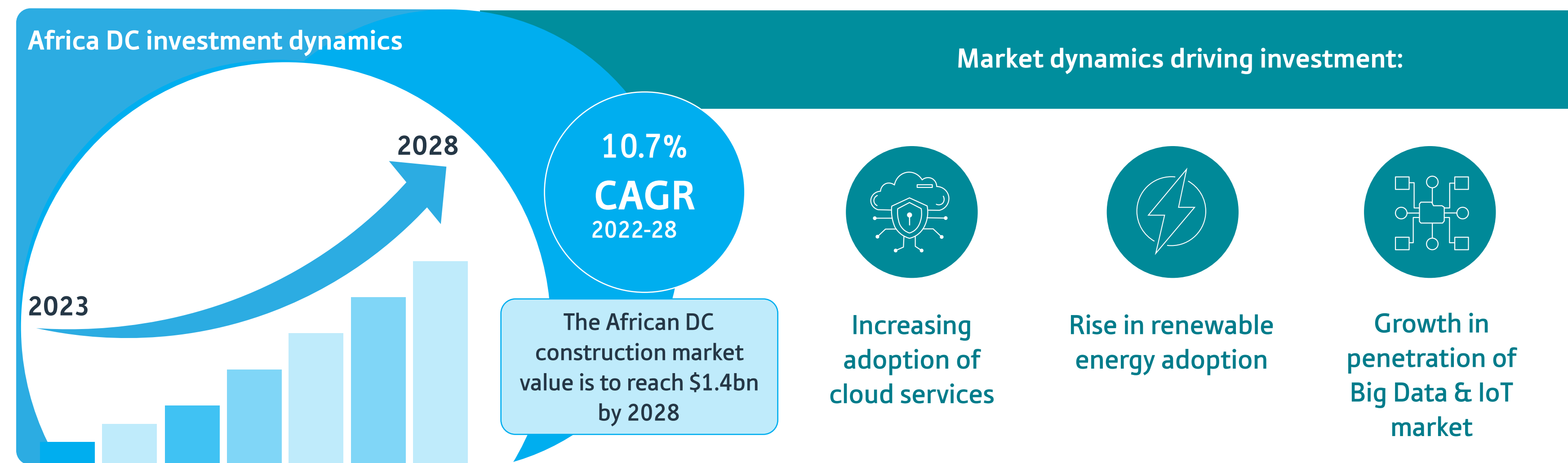
Key factors driving this investment in Africa's DC market include an increasing trend of cloud service adoption. Notable cloud service providers, including Amazon Web Services, Google Cloud, Microsoft Azure, Oracle Cloud

Infrastructure and Huawei Technologies operate DCs in South Africa, where the DC market is expected to see \$3.2bn of investment between 2022 and 2027. Additionally, Raxio Group, part of the US-based Roha Group investment firm, is establishing five facilities across Angola, Côte d'Ivoire, the Democratic Republic of Congo,

Ethiopia, Mozambique and Tanzania, which are expected to be fully operational by 2028.

The anticipated adoption of the AfCFTA's Sustainable Investment Protocol could also bolster foreign investment flows to and within Africa in the long term, particularly to special

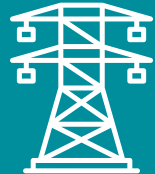
economic zones. North Africa, for its part, is expected to benefit from the agreement and in August 2022 saw the launch of the Saudi Egyptian Investment Company, which seeks to attract \$40bn between 2022 and 2026 in key sectors such as tourism, health, infrastructure, digital technologies and financial services.



Part 3: Addressing challenges

Access to Land & Power

African DC requirements

Peer country	Benchmark type	Power requirement (MW) 	Land requirement (m sq metres) 	Number of DCs needed* 
India 	Low	120	1.4	~80
South Africa 	Medium	1000	3.5	~700
the Netherlands 	High	6000	52.5	~7000

**assuming a size of 3 MW*

Building DCs poses challenges due to the need for a combination of challenging-to-source inputs. One crucial factor is securing expansive real estate covering several thousand sq metres, ideally near a city’s business district to minimise latency, which tends to rise with increased distance. Acquiring such land can be costly, particularly in the absence of supportive government policies. According to a February 2021 report by Xalam Analytics and the Africa Data Centres Association, Africa needs to find 1.4m to 3.5m sq metres of well-located and adequately provisioned land to facilitate the buildout of the DC infrastructure necessary to address a growing capacity deficit, around half of which is in Algeria, Egypt, Ethiopia and Nigeria.

DCs also require a significant amount of energy. In 2013 DCs in the US were consuming an estimated 91bn KWh of electricity. Xalam found that the rest of the continent requires about 1000 MW of combined additional DC capacity to achieve capacity equivalent to that in South Africa. Africa’s deficit is broadly distributed, with

15 countries requiring 5-10 MW of capacity and another 20 needing more than 10 MW. According to African Infrastructure Investment Managers, Africa’s economy requires a 1200-MW increase between 2023 and 2030 in order to support the growth of the continent’s digital economy.

In January 2023 South Africa amended its June 2021 regulation that increased the maximum capacity for private power generation plants to 100 MW. The new regulation exempts any generation facility linked to the transmission or distribution power system from the requirement to apply for and hold a licence for the operation of any generation facility, under certain circumstances. The amendment represents a significant move towards the liberalisation of the South African energy market.

However, in numerous other African countries, government-owned entities continue to dominate the delivery of power, potentially causing elevated costs for large industrial users or service disruptions that lead to blackouts.

Part 3: Addressing challenges

Market Reform

South Africa's prominence in the continent's DC market largely stems from the relatively early stage at which it liberalised its telecoms sector. By embracing an open market and inviting multiple carriers to compete for market share, the country established a competitive telecoms market, leading to decreased prices and increased adoption of data-intensive services.

Nigeria shares a similar vibrancy, boasting four major carriers and numerous independent service providers. Liberalised environments are key for data centres to support economies with high data storage needs, and carriers represent significant demand for interconnection services.

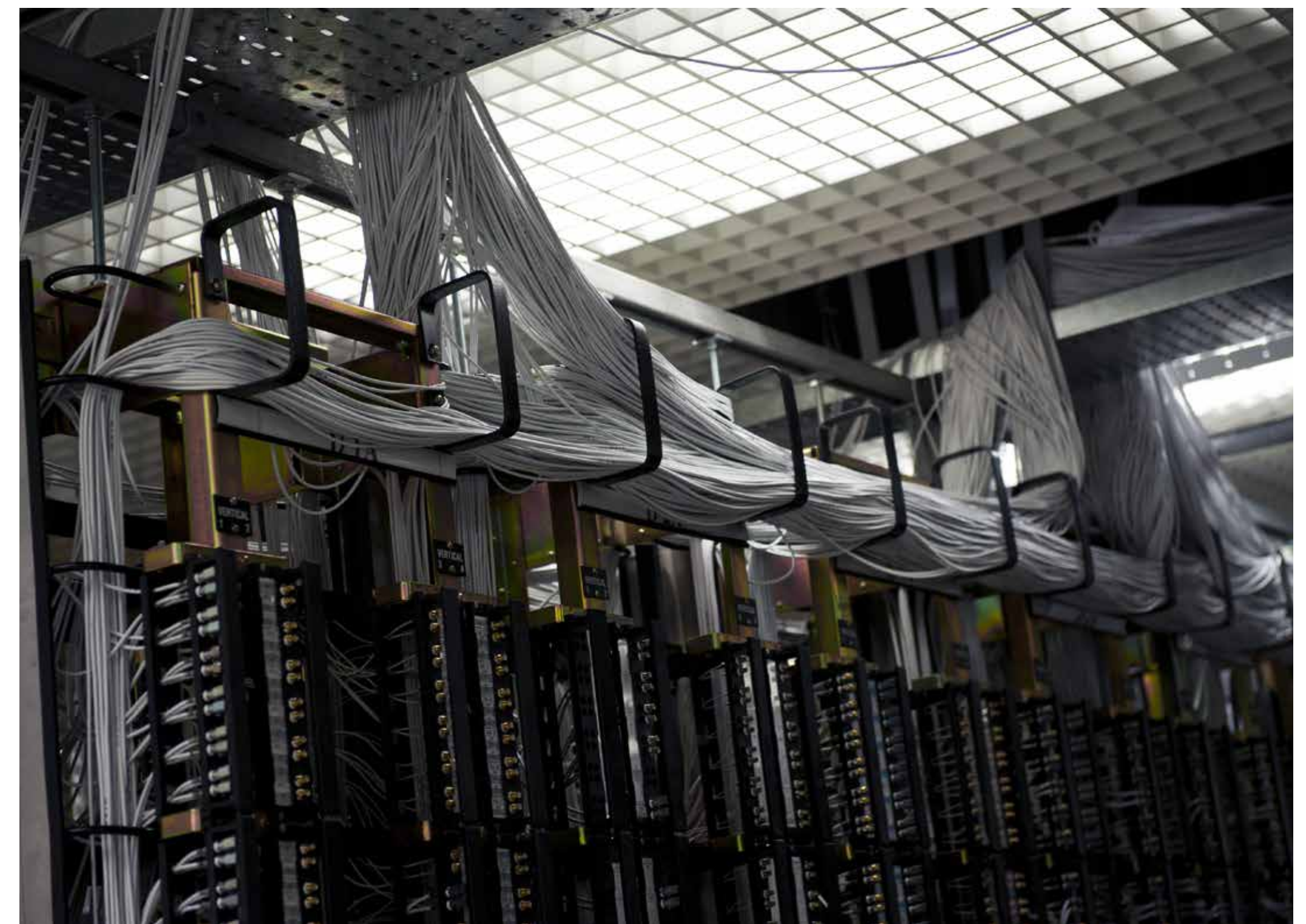
Regulatory reform has progressed unevenly across the continent. In Cameroon and Senegal, for instance, governments maintain a de facto monopoly over telecoms infrastructure, with a single dominant provider. Despite this, French operator Orange established new DCs in Cameroon in 2017 and in Senegal in 2019, following limited market competition.

In June 2019 the Ethiopian Parliament approved a law to liberalise its government-controlled telecoms sector and the privatisation of its public operator, Ethio Telecom. While ongoing, these reforms have prompted DC operator Raxio to plan the establishment of a carrier-neutral Tier-3 DC on the outskirts of Addis Ababa, which launched in November 2023, facilitating the country's first internet exchange point.

Ethiopia's first internet exchange point launched in **November 2023**



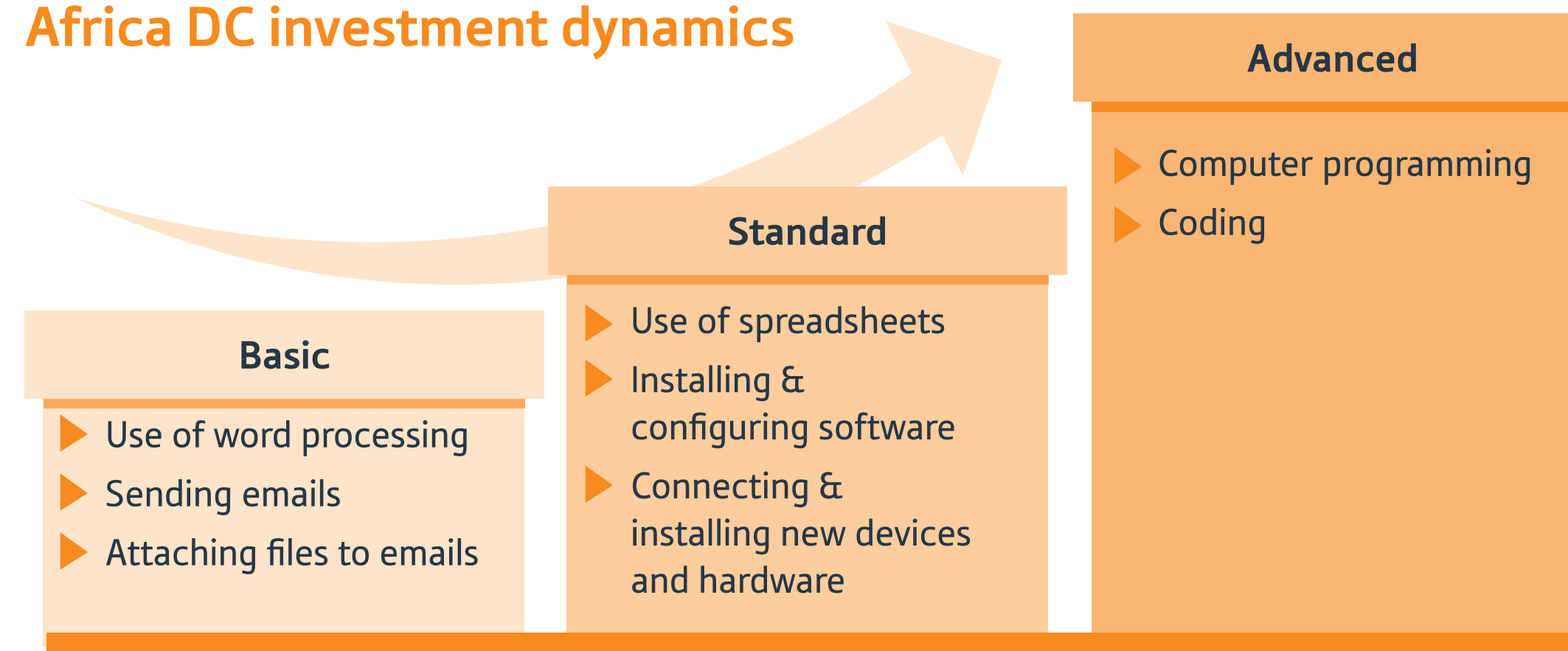
Governments play a pivotal role in creating a supportive regulatory environment for the DC market and the entities utilising their services, especially start-ups. This necessitates regulators working collaboratively with the industry to prevent legislation from becoming excessively burdensome. Additionally, regulators must establish viable frameworks that penalise violations of data protection laws – an area of uncertainty in much of the continent that presents unquantifiable risks to investors.



Part 3: Addressing challenges

Improving the ICT Talent Pool

Africa DC investment dynamics



Information regarding digital skills in Africa tends to be limited, and the methodology used to categorise levels of digital skills attainment is widely deemed outdated. According to a 2022 survey of mobile users living in low- and middle-income countries by mobile network industry association GSMA, a lack of literacy and digital know-how was cited as the second reason for not using mobile internet, after affordability.

Bridging the gap in ICT skills therefore serves as an opportunity for the broader adoption of internet services on the continent. Expanding the knowledge base would result in an increase in demand for data centre capacity.

Nearly half of the world's uncovered population lives in sub-Saharan Africa, an estimated 210m people in 2020. The use of digital technologies

among local companies is low, with 7% of informal firms in sub-Saharan Africa using the internet for business purposes before the pandemic.

A variety of professionals with the cybersecurity skills necessary to protect Africa's growing digital infrastructure has stepped in to fill this knowledge gap. The South African government's Digital and Future Skills Strategy 2021-25 is a digital skills programme focused on fostering digital skills for meaningful employment opportunities among youth. Recognising that individuals aged 18 to 35 constitute the generation pivotal to empowering the South African economy and society through digital skills, it is noteworthy that more than 8m young people are not engaged in some form of employment, education or training.

Uganda and Rwanda are allocating resources to university-level science, technology, engineering and maths education, including funding for scholarships. While this is a positive base, there is room for more to be done to integrate digital literacy into school curricula and life-long learning

initiatives. To this end, in September 2019 the International Telecommunication Union launched four digital transformation centres in Africa that aim to develop citizens' digital skills to the intermediate level. The first phase ran from January 2020 to September 2021. One of the centres, the Smart Zambia Institute, cooperated with US-based technology giant Cisco to equip 72 master trainers with the knowledge to pass on basic digital literacy to local citizens.

The second phase of the initiative builds upon the success and lessons from the first phase, with the goal of expanding the number of DTCs and enhancing the overall impact of the network. Following a call for applications in June 2021, five new DTCs joined, and the application process will continue, accepting more submissions from July 2022 onwards, with ongoing accessibility.

Africa's network of start-ups acts as a key centre of digital skills training and information. In 2021 there were 1031 tech clusters in Africa supporting and training technology-oriented businesses.

Part 3: Addressing challenges

Closing the Digital Divide

Sub-Saharan Africa has seen significant 4G growth rates. In 2022, 65% of the population had access to 4G coverage, up from 19% in 2017. Achieving universal access to broadband in Africa by 2030 requires some \$100bn in funding, 250,000 new 4G base stations and at least 250,000 km of fibre links.

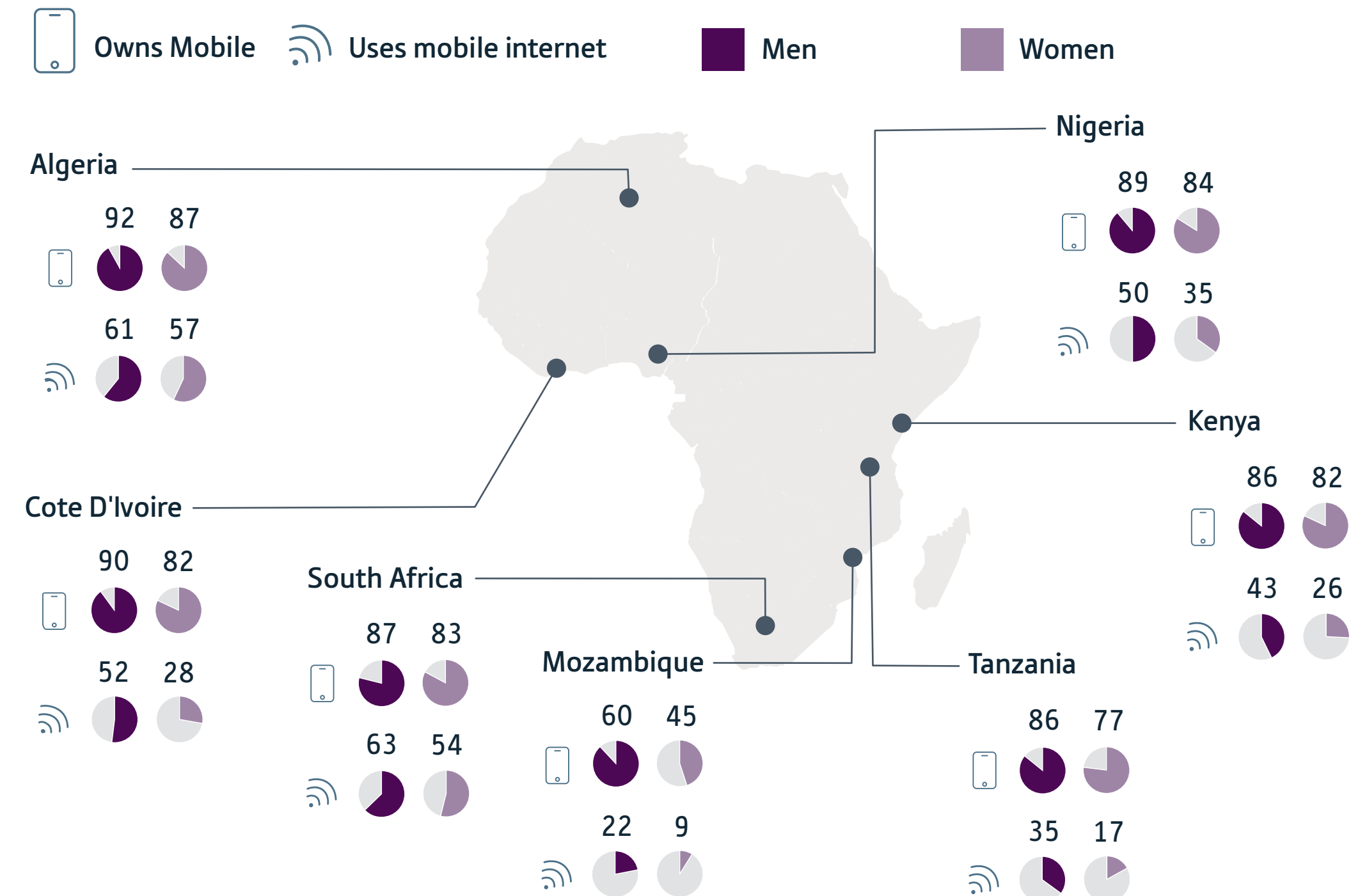
The use of solar-powered equipment, such as Starlink service and Amazon's plans to launch 3000 satellites that allow for high-speed broadband, offers a promising approach to tackle power availability challenges. Furthermore, Huawei's Ruralstar mobile broadband programme proves effective in cutting both capital and operational expenses and has already been successfully implemented in both Ghana and Kenya.

New satellite technologies and deployments will work in tandem with microwave backhaul networks to connect remote areas of sub-Saharan Africa. The mobile broadband usage gap is considerable, with the GSMA indicating that about 45% of people in sub-Saharan Africa live in an area covered by mobile broadband but are not using mobile internet.

Affordability is another key factor hindering access. Africa experiences some of the least affordable prices for ICT and telecoms services, but this is starting to change as mobile operators lower handset prices to boost the adoption of 4G services. Despite this, in a 2022 GSMA survey, handset cost was the top barrier to mobile internet use in Egypt, Ethiopia, Ghana, Kenya, Nigeria and Senegal.

The benefits of greater ICT investment move beyond the sector. In a 2023 survey by South Africa-based tech-oriented think tank ICT Africa, small companies in sub-Saharan Africa that used smartphones and computers reported productivity rates 2.8 times higher and sales levels six times higher than non-users. Moreover, maintaining an open data environment is vital to closing the digital divide. Africa is second only to Europe in subscribing to the IMF's data standards initiatives. Enforcement is weak, however, with only 14 countries having ratified the African Union Convention on Cybersecurity and Personal Data Protection as of July 2023. This suggests that more can be done to create a secure online environment for customers.

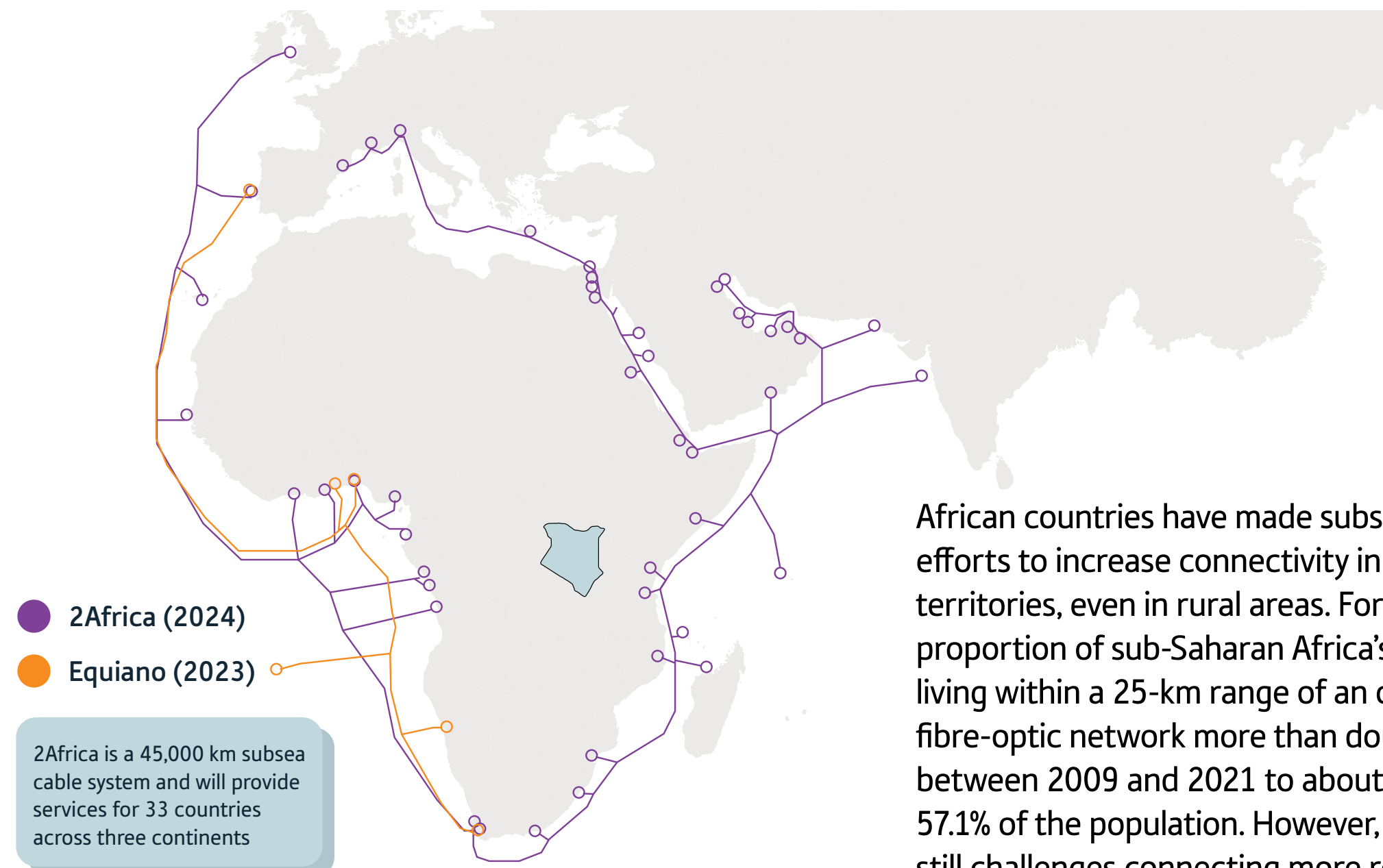
Mobile and mobile internet penetration (% of adult population)



Part 3: Addressing challenges

Regional Integration

Two major subsea cables set to increase Africa's connectivity



African countries have made substantial efforts to increase connectivity in their territories, even in rural areas. For instance, the proportion of sub-Saharan Africa's population living within a 25-km range of an operational fibre-optic network more than doubled between 2009 and 2021 to about 669m, or 57.1% of the population. However, there are still challenges connecting more remote areas. For instance, the World Bank estimates that around 45% of Africa's population is further

than 10 km from fibre network infrastructure – a higher percentage than on any other continent.

Africa's principal form of fibre-optic connection is through subsea cables. All but one of the continent's 38 countries with a connection to the sea have at least one subsea cable landing – the exception being Eritrea. These links make each country a viable regional DC host, where international subsea cables connect to fast cross-border fibre-optic networks. The 2Africa project spans 45,000 km, making it the world's largest cable project. The \$1bn project aims to circumnavigate the continent by 2024, linking 23 countries along a 37,000-km cable and adding 180 Tbps to design capacity. Meanwhile, Google's Equiano cable, which was launched in March 2023, runs from Lisbon to Cape Town via Lagos.

At the same time, terrestrial cross-border fibre connections remain limited on the continent. Of the total bandwidth of 16.630 Tbps available in sub-Saharan Africa as of December 2021, 15.255 Tbps, or 91.7% of the total, was delivered directly by submarine cable, while just 678 Gbps, or 7.8% of

the total, was supplied by cross-border networks connected to submarine cables.

Various initiatives are under way to address this imbalance, comprising rollouts of national backbone fibre and cross-border networks. Liquid Intelligent Technologies (LIT), for instance, announced in June 2021 that it had completed a 100,000-km fibre-optic network across 14 African countries, linking Egypt with South Africa over land. LIT is also partnering with Facebook to build a 2000-km network between the Democratic Republic of Congo and Rwanda that is expected to considerably improve connectivity in Central Africa.

Orange, meanwhile, has linked up its national fibre-optic deployment in West Africa under the name Djoliba, billed as the first pan-African backbone, which loops 10,000 km of terrestrial fibre with an equivalent length of subsea cable, serving eight countries. As uptake of broadband services accelerates across the continent, terrestrial fibre rollouts will have to keep pace to facilitate higher demand for interconnection services.

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ICT Ecosystem

Digital technology is a key enabler of sustainable development, and is essential to addressing challenges in food security, education, health, energy and competitiveness. In a March 2021 report, the IMF highlighted the pandemic as an opportunity for African governments to increase funding to develop ICT skills, infrastructure and technologies. It also offered a chance for policymakers to rethink economic structures, service delivery and social contracts.

The pandemic accelerated digitalisation, market consolidation and regional cooperation, the last of which is set to receive a significant boost after the full implementation of the African Continental Free Trade Area. In line with digitalisation efforts, the rising use of mobile technologies and digital payments has the potential to accelerate industrialisation in Africa, as access to smartphones enhances consumer information, networking opportunities, job creation and financial inclusion. According to a December 2019 study by *Harvard Business Review*, South Africa leads the continent in terms of the ease of creating digital jobs, with its ecosystem supported by strong

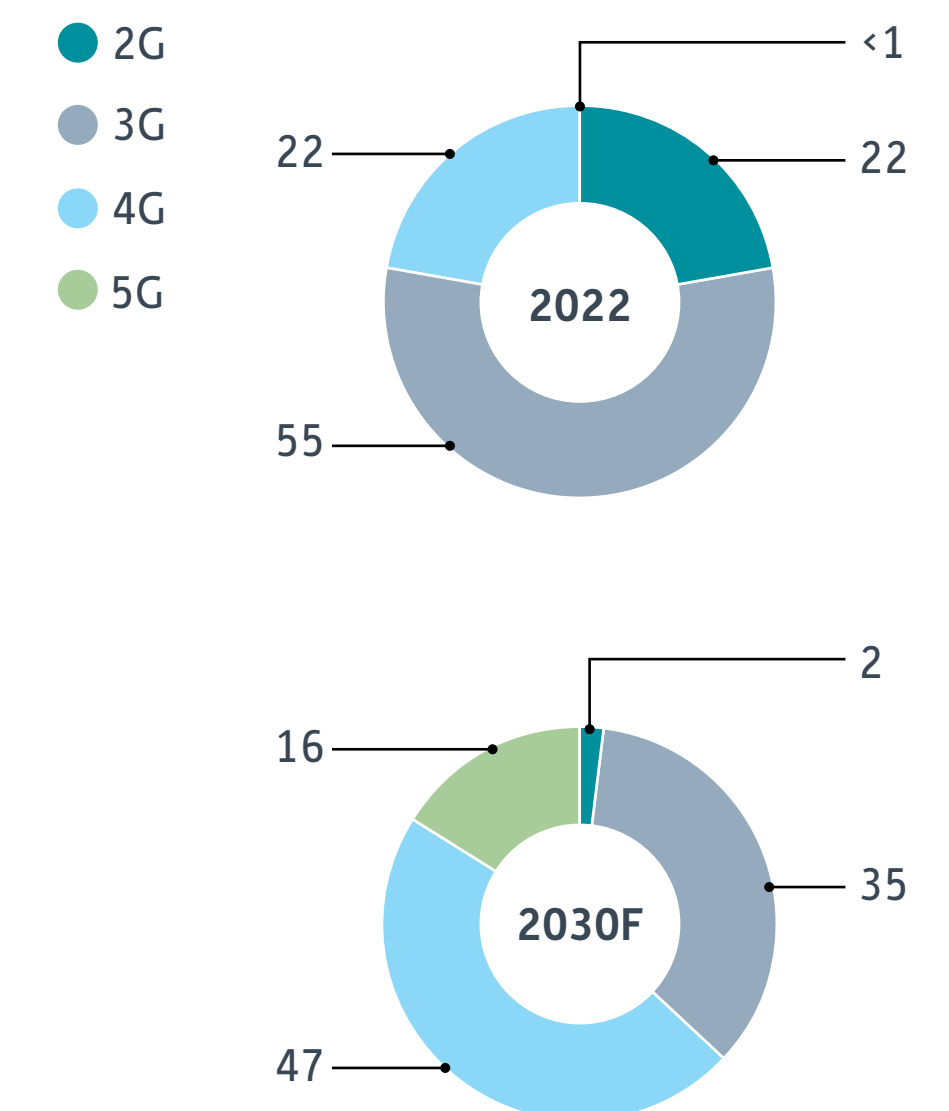
consumer demand, a supportive policy environment, the deployment of emerging technologies such as biometric data and payment cards for social security, and the lowest rate of power outages on the continent. However, South Africa's standing as the most electrified African nation has diminished amid ongoing and extensive nationwide power outages. Meanwhile, Kenya – where mobile money penetration stood at 76% in March 2023, largely due to the success of M-Pesa – is another digital leader. The country's policymakers are keen to capitalise on the shift to mobile payments, and have engaged with industry leaders to establish data governance laws that encourage digital payments. In May 2019 the country launched the Digital Economy Blueprint to bolster its digital ecosystem. The plan identifies five critical pillars of the digital economy: digital government, digital business, infrastructure, innovation-driven entrepreneurship, and data skills and values.

Elsewhere, Rwanda is an emerging digital economy that is leveraging improved 4G coverage to expand the penetration of mobile money. Underpinned by

an increasingly affordable suite of local content and services, Nigeria leveraged its digital infrastructure to attract more than \$166.5m in venture capital in the first half of 2023, the fourth-highest deal value on the continent. This has supported ICT ventures in education, financial technology, agriculture, health care, logistics and travel. In Ethiopia the government committed to training 70% of its students in science, technology, engineering and maths. Digital technology in Egypt is also fast growing, underpinned by a vibrant e-commerce market that bolsters widespread entrepreneurial activity.

The future growth of Africa's ICT ecosystem will require sustained improvements in the continent's fragmented network of data and ICT standards, and greater regional cooperation between both governments and industry leaders will be key towards meeting this goal. The entrance of new data centre (DC) operators and cloud service providers should heighten the need for interconnection services, enabling large markets to leverage their fibre connectivity to support the wider ICT ecosystem.

Mobile technology mix in sub-Saharan Africa, 2022-30F (% of total connections)



Digital Agenda

Several governments have committed to digital-first agendas to boost the economy and create jobs as more technology centres emerge and existing ones expand, such as Silicon Savannah in Nairobi, Kenya or Yabacon Valley in Lagos, Nigeria. Africa had 716,000 professional developers in 2021, marking a 3.8% increase from 700,000 in 2020, according to a February 2022 report by Google and Accenture.

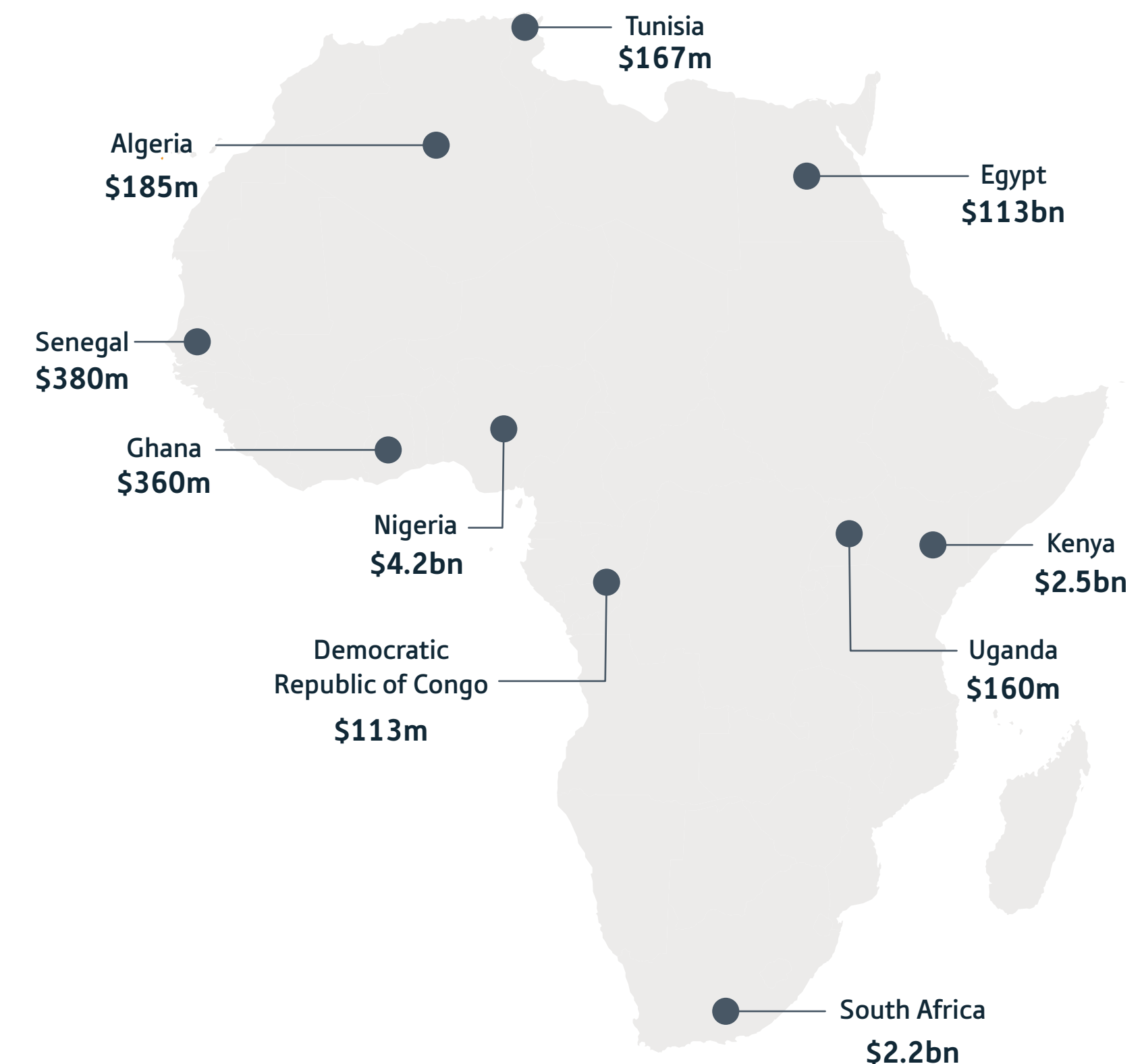
The opening of Microsoft's \$100m Africa Development Centres in Lagos and Nairobi underscores Africa's deepening engineering talent pool. This has helped boost the mobilisation of foreign capital for the rapid expansion of Africa's digital landscape.

Africa had **716,000** professional developers in 2021, marking a **3.8% increase** from 700,000 in 2020

The number of African start-ups securing venture funding expanded between 2015 and 2022, growing at an average of 27.1% per year to reach 633 start-ups, according to start-up news portal Disrupt Africa's 2022 annual funding report. However, most do not survive beyond the Series-B stage, with 3% doing so in 2019.

This is a consequence of a range of factors, including political and economic instability, weak consumer purchasing power, inadequate data communications infrastructure and the limited supply of digital talent. Growing the digital economy is vital to overcoming these challenges – an imperative African start-ups have responded to by filling critical public service gaps in areas such as health care. In Kenya, Morocco and Rwanda, for example, local start-ups created track-and-trace apps to monitor the spread of Covid-19 infections. Meanwhile, in Ethiopia, several local ride-hailing apps and e-commerce markets have emerged, as well as an agri-tech incubator and a seed fund that are designed to boost the local logistics and agri-food systems.

Funding raised by start-ups in Africa from 2019-October 2023, equity and debt



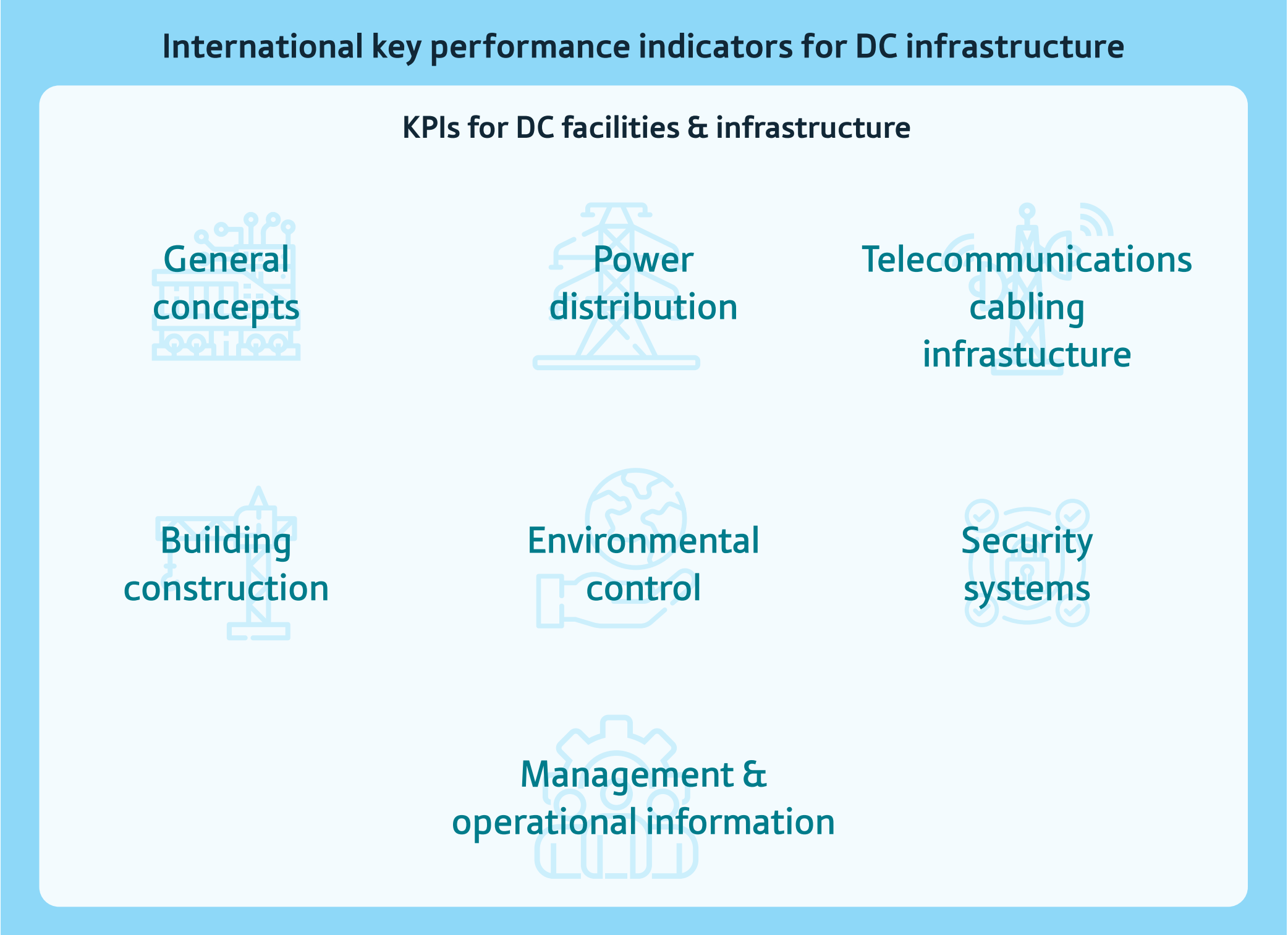
Unifying Standards

The development of global standards that will give investors and customers alike the confidence to engage in the rapidly expanding DC industry is paramount, and bodies such as the Africa Data Centres Association (ADCA) are working with regional officials to establish such protocols. Regulatory divergence often undermines clarity and inhibits growth, underscoring the need for a more uniform and globally recognised set of standards to enable African DC operators to deliver reliable services and expand to meet growing demand.

Recent developments offer an opportunity to establish a pan-African DC standards framework. The International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC) are cooperating to produce globally applicable best practice guidelines for DCs. African countries are eligible to participate in the process and contribute to the creation of a set of key performance indicators (KPIs) to guide the industry towards sustainable growth.

The first set of full standards focusing on DC resource efficiency, published in May 2023, has the potential to harmonise the industry’s understanding of energy efficiency under the power usage effectiveness (PUE) standard. A complementary set of KPIs will address physical architecture such as power distribution, cable infrastructure and security systems. Enhanced engagement between international organisations such as the ISO and the IEC, and regional bodies such as ADCA, will help to unify DC standards and ensure that the industry adopts internationally recognised best practices.

To ensure these standards are effectively implemented and maintained, robust monitoring and compliance will be required, centred around regular audits and assessments of DCs to ensure adherence to the established KPIs and best practices. This process will require a collaborative effort between DC operators, regulatory bodies, and international standard organisations. Training and certification programmes for DC professionals could further support compliance, enhancing the skill set within the industry for alignment with global standards.



Sustainability

Incorporating sustainability into DC design is especially important in Africa because higher temperatures necessitate additional cooling power – which is often in limited supply. Access to renewable energy sources is therefore essential, particularly for multinational, hyperscale providers such as Google and Microsoft that are committed to global sustainability targets.

Solar power has particular potential for operators on the continent. Nine African countries are building up their solar capacities, and Egypt and South Africa are already members of the so-called solar “GW club” of countries with installed capacity of at least 1 GW of solar power, according to a 2021 report from the Africa Solar Industry Association. Morocco is working towards the 1-GW target, with its 1200-ha, 580-MW Noor Ouarzazate Solar Complex – the world’s largest concentrated solar power facility. Meanwhile, in West Africa solar capture and storage

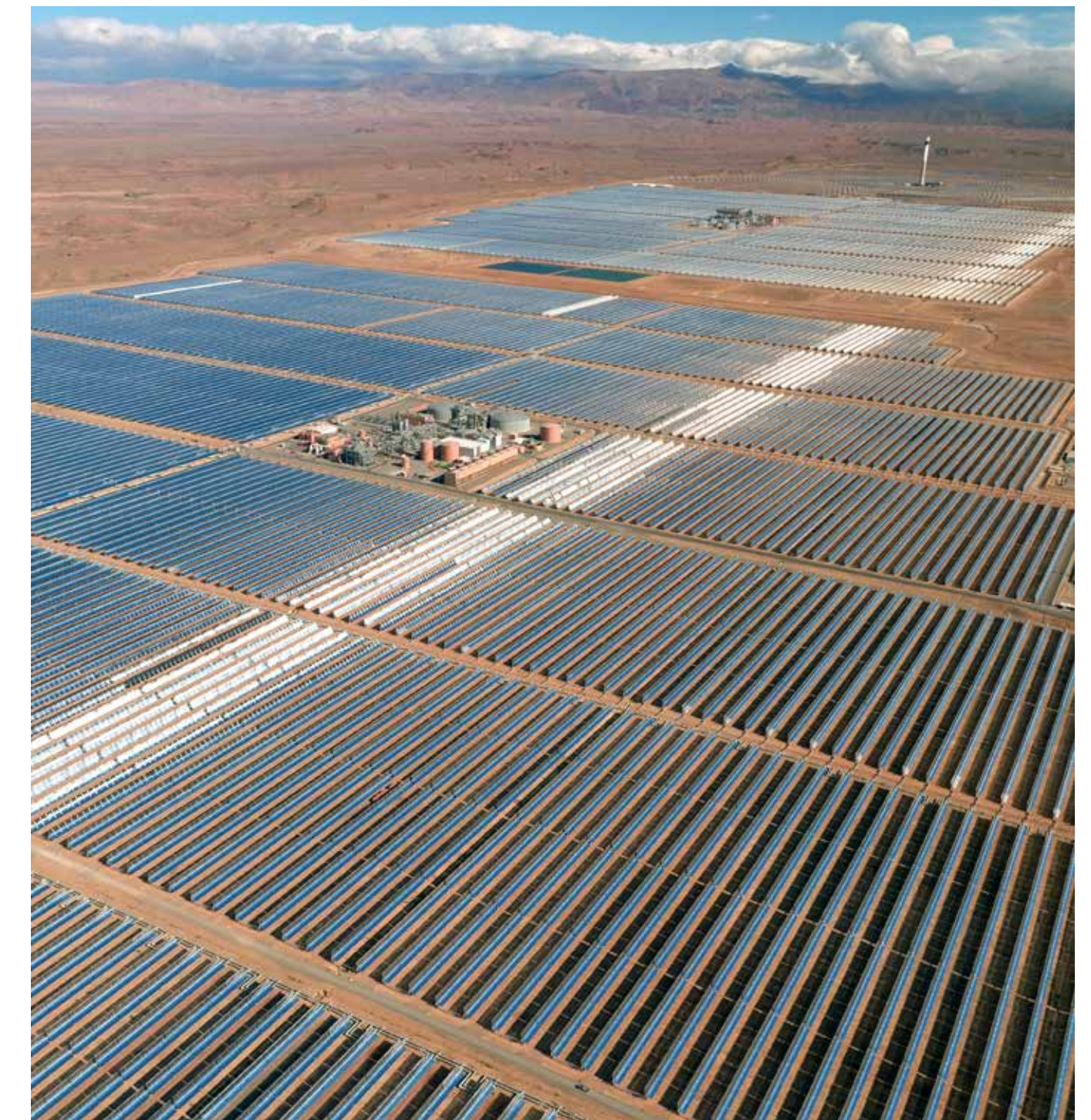
projects are making progress in resolving the limited storage capacity of the region’s grids.

Africa is also an emerging leader in micro-grid capacity – grid-connected, on-site energy generation or storage plants that can help DCs lower power bills by saving on peak demand costs. Co-location and enterprise operators are also adopting renewable energy sources to power DCs. Through its Distributed Power Africa unit, for example, Zimbabwean telecoms firm Econet is overseeing the integration of alternative energy solutions into its DC assets in Burundi, Kenya and South Africa.

ADCA and other organisations are working to establish an energy-efficiency code of conduct. They are drawing inspiration from the European Commission’s best-practice guidelines for DC energy efficiency, which outlines roles and responsibilities for various stakeholders in the construction, retrofitting and maintenance of a DC. The guidelines

recommend a modular rather than monolithic DC design to limit excess provisioning of space, power and cooling. They also include guidance on energy-efficient equipment and airflow management to reduce the need for cooling – often a DC’s largest source of energy loss. Moving forwards, advanced building-information modelling will allow for taller building designs and direct-liquid cooling systems that focus air movement on servers alone rather than entire buildings.

While the industry has traditionally focused on reducing power consumption, due in part to the use of PUE ratios as an indicator of DC sustainability, water consumption is another area of concern, with cooling systems in older facilities accounting for up to 30% of total DC energy demand. Operators in Africa have an opportunity to spearhead a global drive to include metrics for sustainable water use metrics in their reporting, and promote the wider use of water recycling in data facilities.



6 Key Takeaways

1

Infrastructure Development

Africa's DC capacity is growing significantly, with a 50% increase expected between 2021 and 2026. The distribution of DCs across the continent is uneven, as some areas lack adequate facilities. Africa offers promise for DC investment, with a large portion of economic output and broadband connections already served by existing capacity.

2

Growth Potential

Africa is forecast to see significant population increases, particularly in urban areas, leading to a surge in internet users and a growing digital economy. Governments are actively driving DC capacity growth, with initiatives to transfer data to national DCs and partnerships with international cloud service providers.

3

Broadband Expansion

Africa's growing demand for DC services is driven by increased broadband internet penetration, which is expected to double to over 500m users by 2030. Despite this, there is still a significant gap in broadband subscription rates compared to the international average, indicating a need for further infrastructure development.

4

Enhancing Digital Skills

Bridging the ICT skills gap could lead to broader internet adoption and increased demand for DC capacity. A number of digital professionals have stepped in to fill this knowledge gap, and Africa's network of start-ups plays a key role in providing digital skills training.

5

Regulatory Environment

A significant portion of African data is currently held offshore, limiting African operators' ability to provide high-speed data services. However, African countries are increasingly focusing on data sovereignty, aligning with global regulations and passing laws to store data locally, which could affect DC growth in the coming years.

6

Green Drive

Incorporating sustainability into DC design is crucial in Africa due to high temperatures requiring additional cooling. Efforts are under way to establish an energy-efficiency code of conduct. Addressing water consumption, particularly in cooling systems, is another key focus for sustainable DC operations in Africa.

In collaboration with





Lacina Koné

CEO, Smart Africa

What progress have you seen in Africa's data centre industry in recent years?

The sector has undergone a number of changes over the past several years and is gaining momentum. We have seen growing interest in the data economy in Africa. The continent's population is more than 1.2bn, so this digital transformation presents an immense opportunity for potential players. Significant efforts have been made to implement adequate frameworks and infrastructure, and the unprecedented wave of investment in recent years is set to help sustain the sector's development.

There are only 80 data centres located in Africa serving more than 50 countries, and research shows that governments and citizens on the continent have less confidence in those facilities compared to ones in Europe and elsewhere in the world. Boosting the number of data centres on the continent is likely to help expand the use of related technologies. It is pivotal that trust in local data centres grows, and increasing

the number of such facilities would boost the importance of multi-tenant data centres and cloud technology in Africa, in addition to improving the continent's data sovereignty. More than two-thirds of Africa's data centre capacity is in South Africa, Nigeria, Kenya, Egypt and Morocco, so it is imperative to increase and diversify data centres' geographical footprint.

To what extent does the African Continental Free Trade Area (AfCFTA) affect data centres?

The AfCFTA, if fully agreed upon, promises a broader and deeper economic integration throughout the continent. The agreement is expected to help attract more investment, as well as boost trade and provide better jobs. E-Commerce is a substantial part of the African Union agenda, so a free trade zone should have a significant impact on the data centre industry in Africa. We expect the negotiations between countries to result in the implementation of a digital trade protocol across Africa, playing a prominent role in the AfCFTA framework.

How can data centres and the digital economy support more sustainable and inclusive economic models for the continent?

The data centre industry and the digital economy have a substantial role to play in the development of sustainable economic models. Africa has seen increased investment in recent years in its data centre capacities. In fact, data centres are one of the most highly valued assets in the continent's digital ecosystem. Having enough of them in combination with an adequate regulatory framework is expected to enhance Africa's digital sovereignty, and expand the accessibility and affordability of internet services. It should also maximise any socio-economic benefits.

Stakeholders should work together to push the African digital agenda. The economic model of member states is likely to create more sustainable and inclusive business environments that support people and companies. Data centres and cloud infrastructure are set to be instrumental in fully achieving this agenda.

