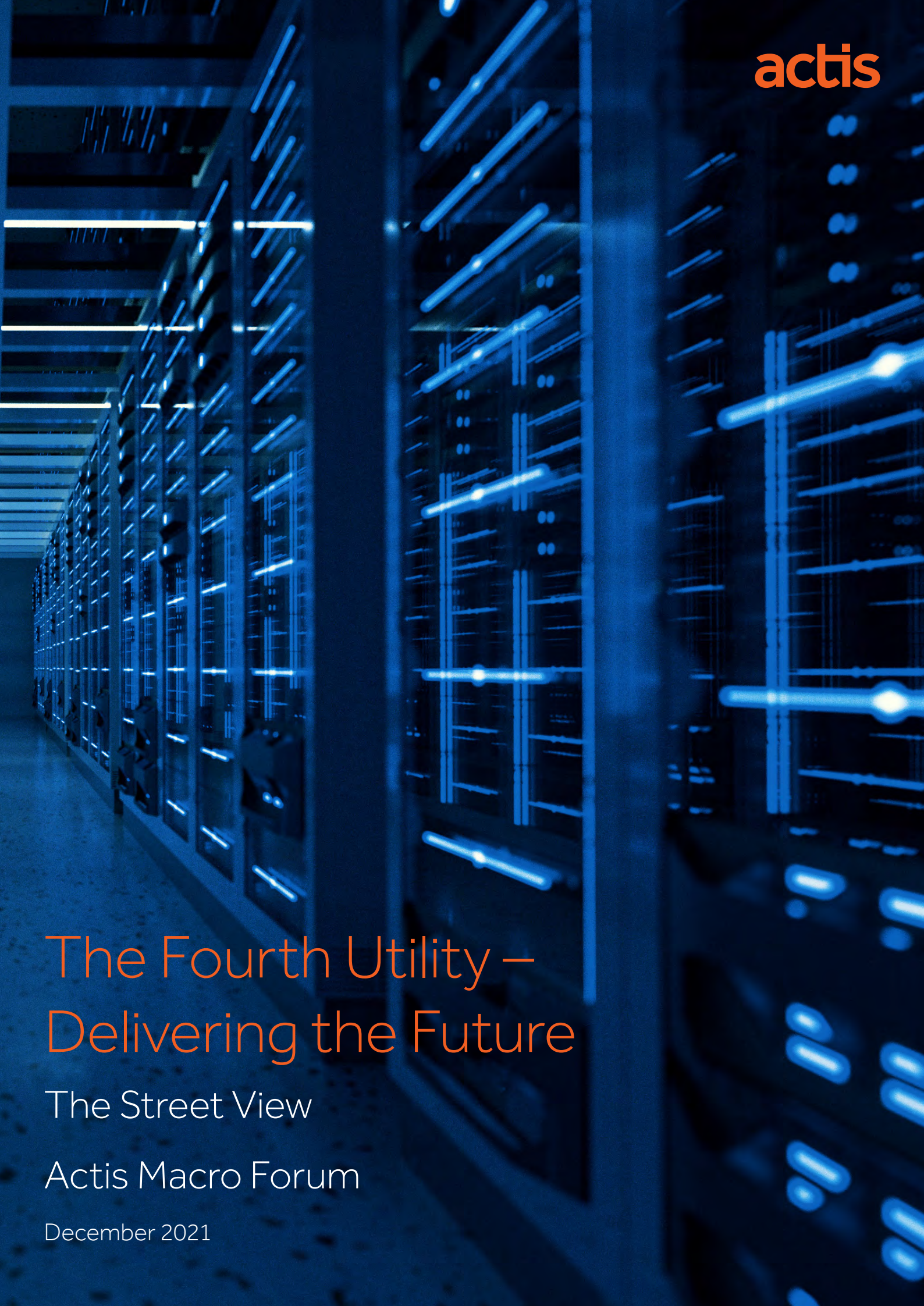


actis

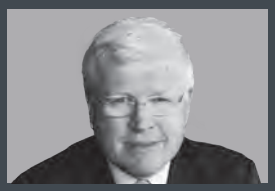
The Fourth Utility – Delivering the Future

The Street View

Actis Macro Forum

December 2021

Welcome



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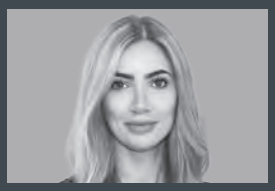

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Contents

In 1969, Apollo 11 landed on the moon with the Apollo Guidance Computer (AGC) onboard as the centre of its guidance, navigation, and control system. The AGC had **32,768** bits of RAM memory[1]

In **1971**, the world's first ever email was sent

By 2001, **31 billion** emails were sent per day[2]

In 2021, approximately **320 billion** emails are sent every day[3]

By 2025, roughly **75%** of the population will have at least one data interaction every **18 seconds**[4]

Global data centre electricity use in 2020 was **200-250 TWh** – equalling around **1%** of all electricity demand globally[5]

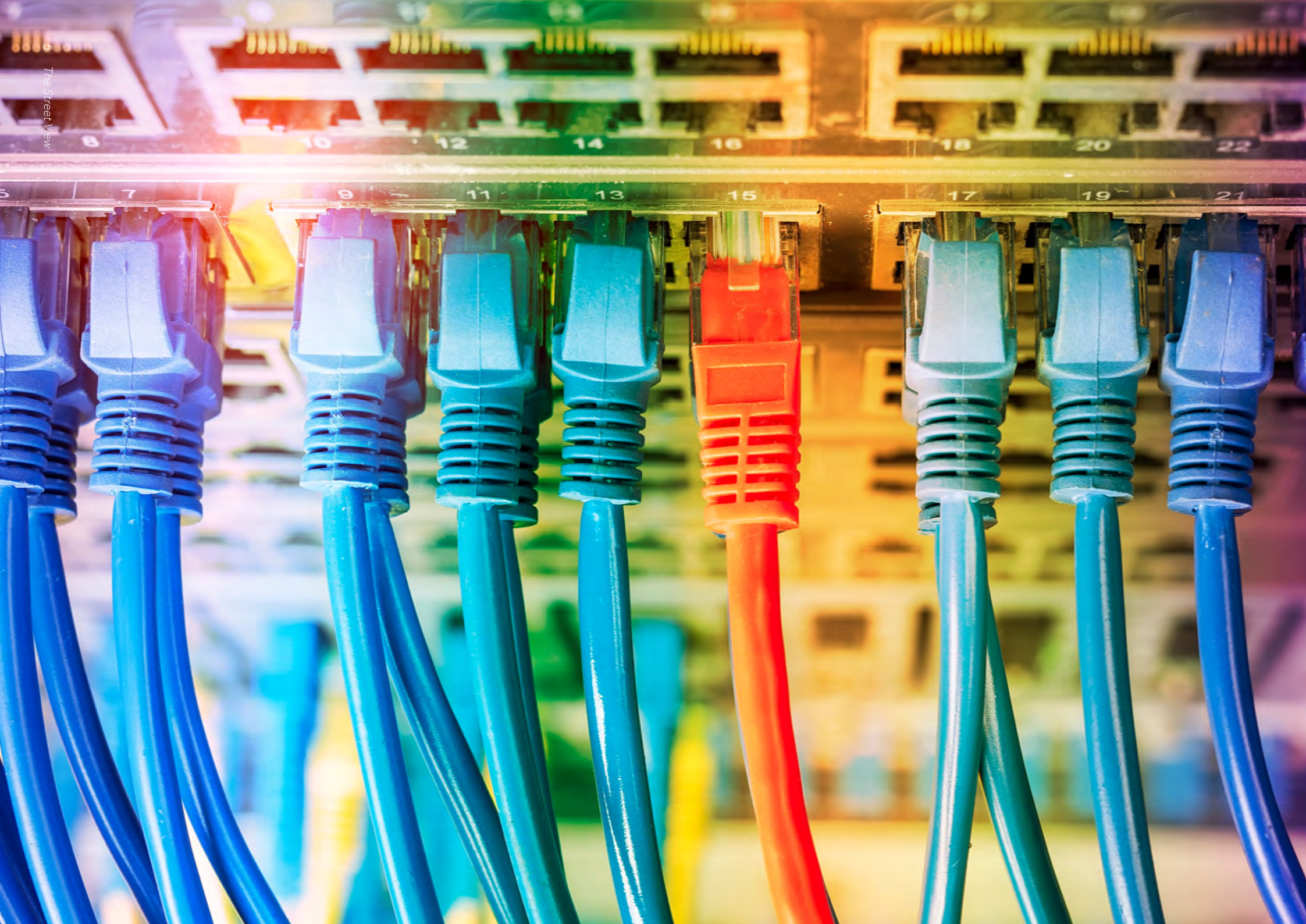
Digital technologies could help reduce global carbon emissions by up to **15%**[6]

Actis has **US$500m** committed to current digital infrastructure assets representing **c.70 MW** in secured data centre IT load and **c.3,000km** of laid fibre

Today, the average phone has **4GB of RAM**, or 34,359,738,368 bits. This is over **one million times more** memory than the AGC on the Apollo 11 spacecraft had in RAM[1]

There are huge gaps in data centre penetration globally. In 2021, the least developed countries have less than **100** data centres, translating into a penetration of **0.11 data centres** per million people – compared to high-income countries which have a penetration of **2.51 data centres** per million people[7]

1 https://www.americanscientist.org/article/digital-ethics-online-and-off
2 https://www.socialmediatoday.com/technology-data/evolution-internet-data-usage-explained-infographic
3 https://www.statista.com/statistics/456500/daily-number-of-e-mails-worldwide/
4 https://technimove.com/blog/2020/06/04/data-centres-reducing-carbon-emissions/
5 https://www.iea.org/reports/data-centres-and-data-transmission-networks
6 https://www.weforum.org/agenda/2019/01/why-digitalization-is-the-key-to-exponential-climate-action/
7 https://www.itu.int/en/myitu/Publications/2021/09/17/11/46/Connectivity-in-the-Least-Developed-Countries-Status-report-2021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The Fourth Utility – Delivering the Future

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In opening this document, you have just created demand for data centre capacity. Even if you close the digital tab now, your enquiry created and used data. When you realise how great this article is and share it on social media, you will have used even more data (you might also want a reality check, but we hope not!)

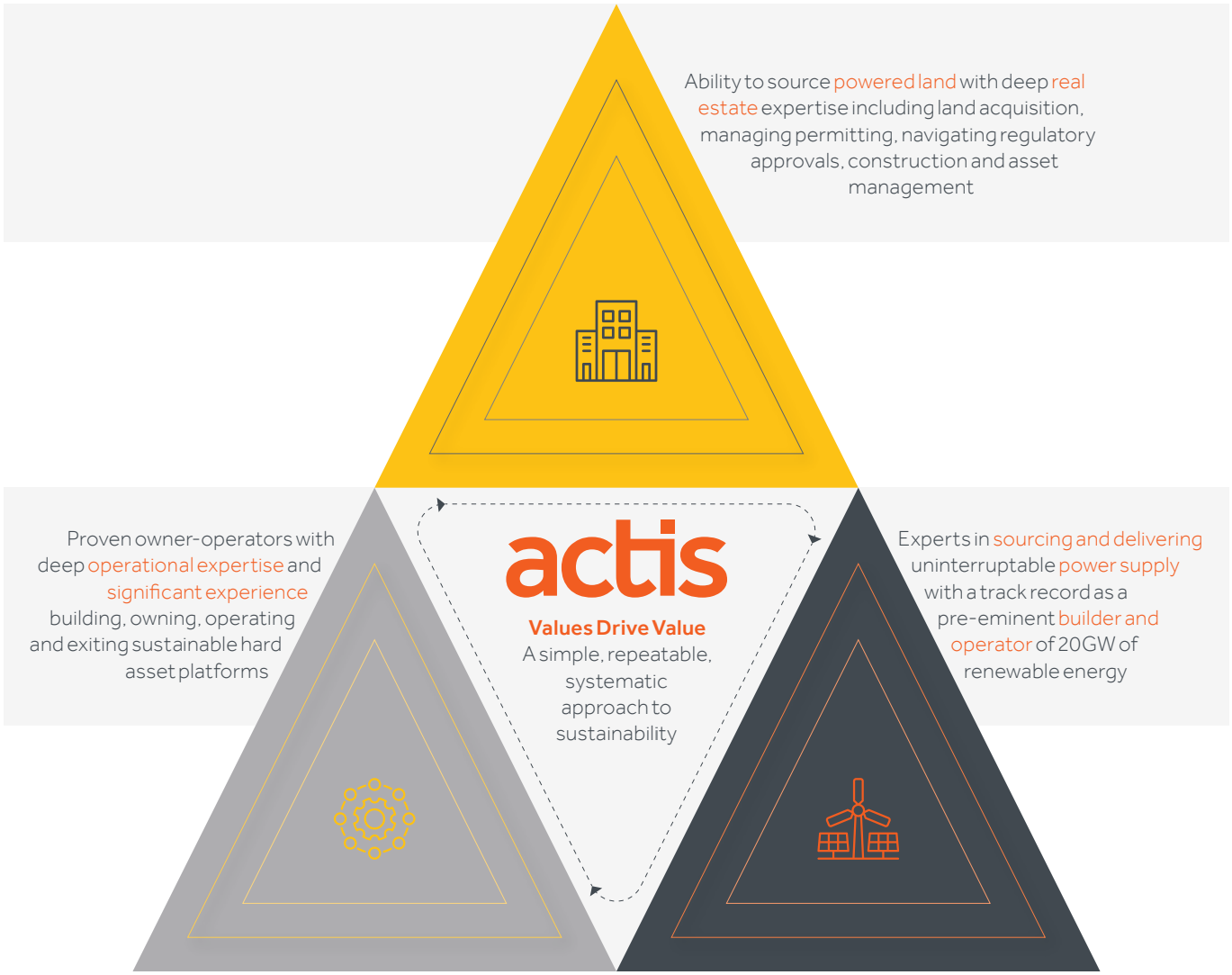
In 2020 - according to market research firm Statista - the total amount of data created, captured and consumed globally was 64.2 zettabytes. By 2025 forecasts are this will nearly treble. Surprisingly only 2% of this data was stored and retained into 2021. This too grows rapidly - 19.2% per annum to 2025 or nearly 150% over the period.

Creating, consuming, distributing, and storing this tsunami requires infrastructure. Which is where digital infrastructure in general and data centres come in.

We all know about infrastructure - the physical assets we see and need, but often take for granted. Together these assets form an asset class much in demand given a global shortage of long duration investments with cash flows uncorrelated to equity and bond markets. Traditionally infrastructure carries, connects, stores or enables economic activity touching all of our lives. Digital infrastructure is the same but involves data. Data is now seen as 'The Fourth Utility', with the first three being electricity, gas and water.

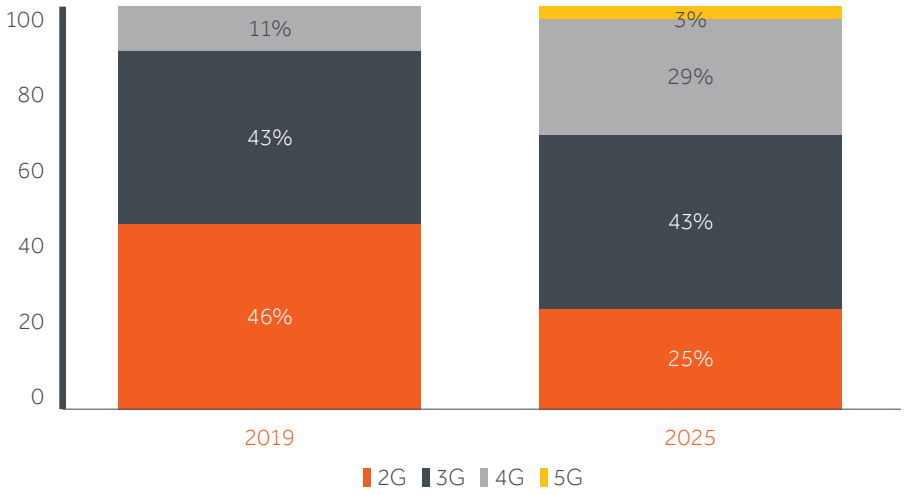
Exhibit 1: A 'One Actis' approach to investing in sustainable digital infrastructure

The digital infrastructure sector is key to delivering the UN SDGs and enabling the low-carbon transition. Actis takes a 'One Actis' approach to investing in sustainable digital infrastructure globally:



Source: Actis

Exhibit 2: Mobile subscriptions by technology, SSA



Source: Ericsson Mobility Report, June 2020

> Data centre operators facing rapid growth are pressing for truncated construction times. Skill and experience are at a premium in meeting these challenges.

Technological progress in transmission drives this growth. 5G for instance, has multiples of capacity and capability relative to 4G. Technology adoption based on digitalisation is a powerful force for growth.

Emerging markets - the core geography where Actis operates - are rapid adopters. Low penetration of digital infrastructure and explosive growth rates are common factors. There is a long way to go with demand growth in these geographies. Best of all digital infrastructure creates jobs and enables social and economic progress.

So, this is a slam dunk asset where secular growth guarantees attractive returns.

It isn't that simple. Capital is flooding into digital infrastructure, diluting returns and driving up costs. Building and operating data centres spans real estate, construction, management and the delivery of uninterruptible power. Sourcing land, managing construction risk, delivering, and managing uninterruptible power supply are core skills. Sustainable investing skills are crucial given data centres' voracious appetite for energy. It is hard to assemble these capabilities and there are acute skill shortages. An annual survey of data centre costs run by Turner and Townsend, reveals that most survey participants see labour and materials shortages driving construction costs up by double digit percentages per annum. At the same time financial capital is chasing the digital infrastructure growth story with consequent dilution of returns. Data centre operators facing rapid growth are pressing for truncated construction times. Skill and experience are at a premium in meeting these challenges. Actis has these skills and has successfully developed and invested in data centres from Seoul to Lagos.

In this rush to stake a digital claim, sustainability matters. Data centres account for around 1% of world electricity demand. No one can claim to be a responsible investor if they are developing the equivalent of billions of 'gas guzzlers' without seeking to limit that growth through operational efficiency and technology. In that sense, digital infrastructure shares many of the characteristics of traditional power generation and distribution. Reducing energy usage also makes commercial success - power can represent over 70% of costs.

Data carriers respond to this by pooling investment in carrier neutral data centres. This trend is even more pronounced as national data laws replace large-scale regional hubs with onshore (sometimes sub-scale) facilities.

A further challenge is the conflict between different national data security laws and practices. Most governments now see data as a national security asset, requiring onshore storage and compliance with local privacy laws. Data carriers are wrestling with the complexity that this engenders. Data centre providers are rather like pipeline builders and operators - spared much of the moral dilemma of data privacy and control but watching developments from a grandstand seat.

The story told in this edition of The Street View is as much about the Actis skill set as the growth opportunity itself, with Gary Wojtaszek highlighting how investors can make sense of these future digital infrastructure trends. We talk about the real estate skills involved - see Julian Kim's despatch from Seoul on building and operating data centres in a fully developed economy with dense urban landscapes. We address the question of power consumption in the article written by Barry Lynch, Head of Operations, Energy Infrastructure and Thomas Liu, Partner. Real Estate and Rodger Du from our Asian real estate practice describe how to navigate the issue of data privacy. And, as sustainable investors, Polly Firman from our Sustainability team outlines the pathways to sustainable digital investment and opportunities to meet the UN Sustainable Development Goals. We discuss the opportunities in our geographic markets through the eyes of our colleagues: in West Africa we profile Rack Centre, Thomas Liu explains how we've delivered a data centre in China, in Latin America (a huge opportunity) we hear from Mauricio Giusti, an expert in digital infrastructure in that region, and in India Ashish Singh and Ankur Trehan report 'from the Street'.

What should be clear is that many skill sets are involved. These include having close in-house expertise and effective experienced advisors. We have been in the power and real estate businesses for decades as experienced investors. Our DNA has an unbreakable commitment to responsible investment, recognised through many sustainability awards over the years. We take a 'One Actis' approach to digital infrastructure, drawing on these world class skill sets. And we see many opportunities to deliver for our investors in the fast growing but challenging world of digital infrastructure.

How Investors Can Make Sense of the Explosion in Digital Infrastructure

Gary Wojtaszek
Industry Advisor

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The digital revolution is transforming our lives in ways that would have been unimaginable just a few years ago. Technology now sits at the centre of nearly everything we do, radically changing the way we work, eat, and interact with other people. We no longer simply use our phones as a means of voice communication, they are a device central to the way we manage our lives.

Yet we are only at the beginning of the lifecycle of changes this transformation will bring. Much of the technology behind the growth in data usage is still relatively new: many of the apps that we are now so familiar with have been created in the last decade. Meanwhile, according to the latest data from the International Telecommunication Union (ITU), only 51% of the world's population is even on the internet at all. Many people perhaps fail to appreciate quite the scale of the growth that is still to come thanks to digitalisation and the increasing use of data.

The acceleration that we are likely to see over the next ten years is driven by two factors. First, the rollout of 5G enables many more new technologies – including some that no-one has even thought of today – to flourish. And second, as data becomes more and more prevalent, it will seed the growth of Artificial Intelligence (AI). Indeed, AI will help us not only to monetise all that data, but also ensure we are able to use it in the most effective way possible.

At the heart of the growth in AI and digital technology sits digital infrastructure. Data centres are essentially digital factories, where computing power and data converge to create new data and other services that are delivered to customers, either through fibre connections or mobile phone towers.

One way of thinking about the value data centres bring is that data is another form of energy – it simply comes in the form of a bit or a byte. Raw electricity goes into the plant, and the output is binary electricity in data form. One of the opportunities from thinking about data as converted energy is that it unlocks the possibility of better tapping energy reserves where there is no means of efficiently extracting it. For instance, in parts of the world where there is energy oversupply, but a lack of distribution capability to move that energy out to the wider market, locating a data centre close by can be a way of harnessing power, exporting it as data rather than electricity.

Another benefit of data centres is that they tend to require a steady input of power, rather than the traditional peaks and troughs of demand that many utility companies require. This makes them an ideal partner for a power generation facility, since they have a predictable, and constant need for the energy that is produced.

> Raw electricity goes into the plant, whose output is binary electricity in the form of data

However, our growing reliance on digital infrastructure presents a challenge. The technology that is, for the most part, improving our lives and allowing communications to flow more easily throughout the world requires a huge amount of energy. Indeed, the energy required to run a data centre is over 70% of costs and often determines site selection, design and operations.

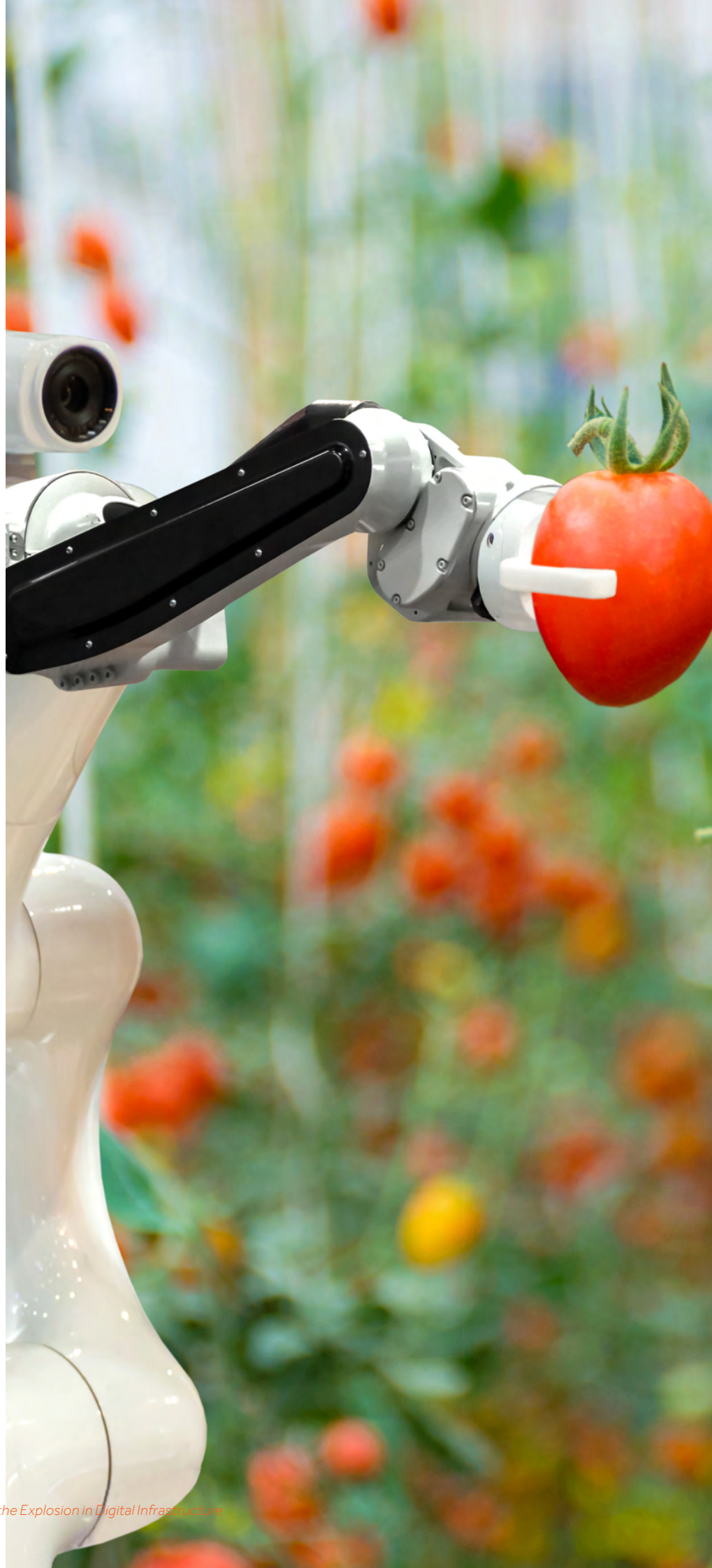
This puts a growing emphasis on society to find renewable solutions, a need that will only increase as data usage continues to explode. For example, many of the largest technology companies are currently looking at digital demand that will require each of them to deploy an additional gigawatt of data centre capacity globally over the next five years. And they are under huge pressure – from governments, investors and even their own employees - to source energy to power this activity from renewables, and migrate their legacy power footprint away from fossil fuels. The need to build out the world's digital infrastructure, as well as help build sufficient reliable renewable energy capacity to meet its demand, is an issue that governments, investors and others need to understand and act on now in order to avoid a much larger problem in the future.

How does this impact the emerging markets? There is, in fact, huge scope for them to be among the main beneficiaries of these changes. Secure energy generation is probably the primary way in which countries can grow their economies and improve the general wellbeing of their populations. Equally important is to provide these countries with access to the digital infrastructure that can help them accelerate their economies even faster. Many people in these markets are, after all, amongst those 49% of the world's population that the internet is yet to reach. It is a huge, untapped opportunity to provide the people that live in these areas with all the benefits that digitalisation provides. A clear priority for many governments will be to build more data centres and get more energy production up and running as quickly as possible. The revolution in digital infrastructure, coupled with the need for secure power generation, is likely to have a huge, positive impact in these parts of the world.

> For an investor, this transformation presents huge opportunities. Harnessing them requires three particular skillsets; the ability to source real estate, expertise in clean energy networks, and operational skills in running uninterruptable power supply

Actis has a long track record of investing in energy and renewables plus a focus on parts of the world where the opportunities are perhaps the greatest. This unrivalled expertise enables successful investment, which is also impactful in the places where it is most needed. This is particularly important for those markets where there is an elevated level of perceived risk: many of the emerging markets are among those. Having a partner with a deep knowledge of the countries they operate in is a way to mitigate that risk and is critical if investments are to have the most significant impact possible.

The digital revolution still has far to go. It will move in directions that are likely to surprise us all and witness the birth of even newer technologies that will change our lives even further. What we do know is that it will happen at speed. And that digital infrastructure, and the renewable energy to power it, will sit at its heart.



Pathways to Sustainable Digital Investment

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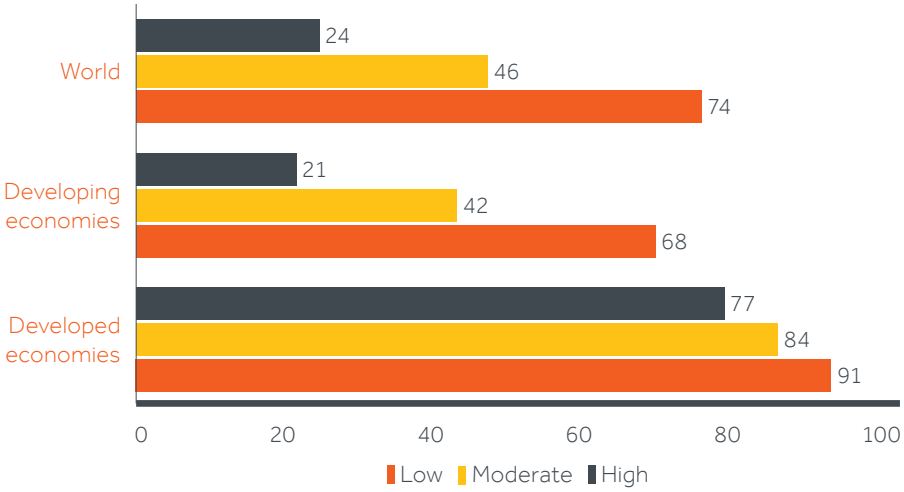
Digital infrastructure has emerged as the fourth utility and today is as fundamental to raising standards of living as traditional utilities like water and electricity. According to the International Telecommunication Union (ITU), almost half of the world's population do not have access to the internet, with access rates significantly lower in the developing world than in developed nations. If the digital revolution is to become as significant as others that have shaped our world today, then we need to establish an inclusive and equitable pathway to digitalisation that also considers our need to decarbonise. Sustainability is key to unlocking shared value when investing in digital infrastructure, especially in markets where the digital divide is greater. Otherwise, we risk exacerbating the very socioeconomic inequalities and environmental challenges that the United Nations Sustainable Development Goals (UN SDGs) aim to tackle by 2030.

The digital divide

COVID-19 has accelerated the digital revolution, firmly establishing digital as core infrastructure that enables economies and people to prosper. However, the socioeconomic impacts of the digital divide were underscored by the pandemic. In many developing markets, connectivity rates are poor and reliance on overseas infrastructure increases latency. Broadband costs are also typically higher in low-income countries, with a monthly broadband subscription costing approximately 12% of gross national income - substantially higher than the UN target of less than 2% by 2025, according to the World Economic Forum. Millions are therefore precluded from access to the digital infrastructure required for social services such as education, finance, and healthcare, as well as from remote working environments. This dynamic has left those who are not connected more vulnerable to the impacts of the pandemic, reinforcing social inequalities, and restricting economic activity. Undeniably, there is an economic cost to the digital divide (see Exhibit 1).

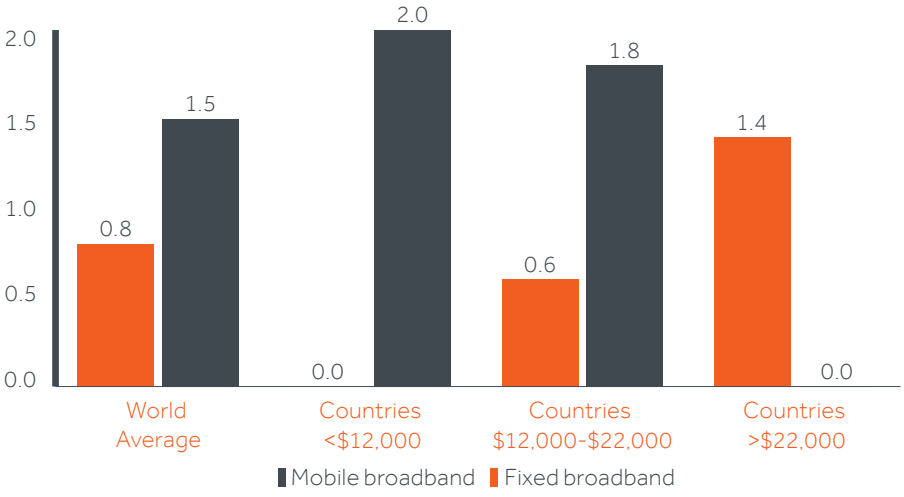
Exhibit 1: Internet access is low among economically vulnerable

Percentage of people with access to the internet based on economic vulnerability



Source: Gallup via Statista https://www.statista.com/chart/22837/internet-access-among-economic-vulnerable/

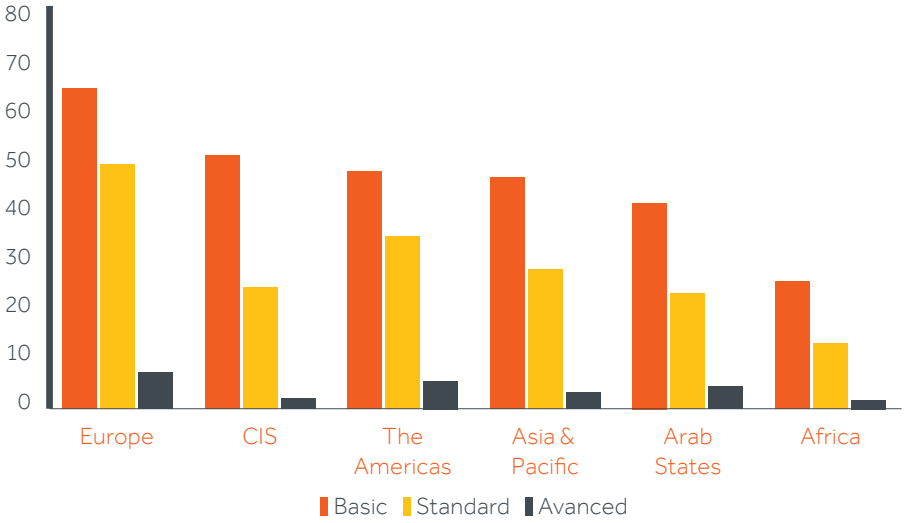
Exhibit 2: Economic impact of broadband worldwide



Source: ITU (Katz and Callorda) 2018 https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-BROADBAND.20-2019-PDF-E.pdf

> Digital is also considered as central to progressing the UN SDGs' targets for climate change

Exhibit 3: Percentage of individuals with ICT skills, by region, 2017



Source: ITU (Katz and Callorda) 2018 https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-BROADBAND.20-2019-PDF-E.pdf

Digital inclusion enabling social impact

Localisation of digital infrastructure contributes to economic development through reduced operating costs for businesses, attracting more commercial activity around areas where infrastructure is built out, whilst boosting productivity through reducing latency. In addition onshoring aligns to growth in data sovereignty laws and improves balance of payments. These create positive indirect impacts through job creation, productivity, and reduced inequality levels, which all help to cultivate long-term sustainable development. **Globally, it is estimated that a 10% increase in mobile broadband penetration can yield a 1.5% increase in GDP per capita**, according to the ITU. **This economic impact is even greater in developing countries, with research showing that in Africa, the same increase would yield a 2.5% increase in GDP per capita** (see Exhibit 2).

However, connectivity does not necessarily correlate with market penetration – in fact, in less developed markets, usage often remains low even when there is network coverage. The World Economic Forum estimate that 40% of the world's population living within the range of a mobile signal are not able to make use of it, with digital literacy being the main barrier. Basic education also plays a role in preventing better adoption rates, and so building digital skills as well as ensuring that people have the basic education required to learn these skills. This is key to enabling the digital economy and in turn improving livelihoods (see Exhibit 3).

Research has also shown that within the challenge of universal digital access, there is a gender divide. Worldwide, the latest data from the ITU estimates that there is a gender gap of 7% in male and female internet access. This divide is again greatest in the least developed countries where it reaches 13%, with Africa being the most affected region at 17%. Women therefore face greater threat to their health, wellbeing, and economic prosperity if digital inclusion does not include a targeted gender component.

> Women face greater threat to their health, wellbeing, and economic prosperity if digital inclusion does not include a targeted gender component

Against this backdrop is an opportunity for digital infrastructure to progress a number of the UN SDGs; Ending poverty (SDG 1), reducing inequalities (SDG 10), gender equality (SDG 5), and decent work and economic growth (SDG 8) are some of the primary social goals that it can address. Alongside this, digital is also considered as central to progressing the UN SDGs' targets for climate change.

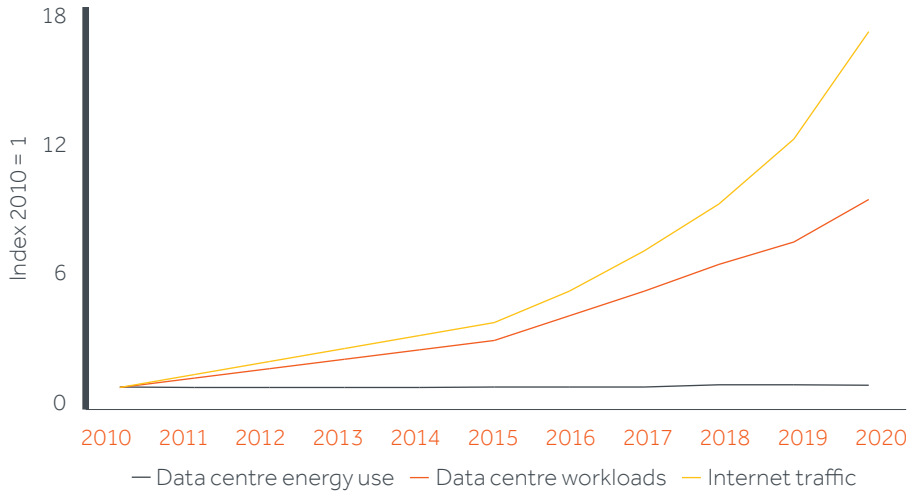
A critical enabler of the low-carbon transition

The global momentum behind climate action (SDG 13) has created a tailwind for digital infrastructure, with digitally-enabled energy efficiency technologies – such as smart grids, 5G, and the "Internet of Things" - playing an important role in the transition to a net zero economy. The World Economic Forum estimate that digital technologies could help reduce global carbon emissions by up to 15% by 2030 in line with the goals of the Paris Agreement. Targeting carbon efficiencies in the digital sector (responsible for 1.4% of global emissions, according to the journal article, 'The Energy and Carbon Footprint of the Global ICT and E&M Sectors 2010–2015', in the journal 'Sustainability 2018') will be key to limit global warming as the sector expands in the coming decades.

Energy efficiency gains and computing advances in data centres over the past decade shows how carbon emissions increase can successfully be decoupled from digital sector growth. Data centre energy use has remained flat since 2010 despite exponential growth in the demand for digital services - with the number of internet users worldwide doubling, and a growth of 15-fold (or around 30% per year according to the International Energy Agency (IEA)) in internet traffic, occurring over the same period (see Exhibit 4). The trend towards colocation and hyperscale data centres, which have much lower power usage effectiveness (PUE) than smaller data centres, has helped to enable this. In addition, targeting top tier PUE in the design of data centres can make them up to 70% - 90% more energy efficient to operate than individual servers hosted on-site.

The IEA reports that data centres account for approximately 1% of total global electricity demand. The top hyperscale corporate off-takers such as Google, Facebook, Microsoft, and Amazon have all set ambitious decarbonisation targets, helping to grow the market for renewables-powered data centres. As a result, we are seeing more capital flow to build data centres in markets where renewables form a greater proportion of the grid energy mix or in cooler climates where power demand is lower, as well as data centre operators looking to procure renewable energy Power Purchase Agreements or build off-grid renewable energy systems.

Exhibit 4: Global trends in internet traffic, data centres workloads and data centre energy use, 2010-2020



Source: IEA (2021), Data Centres and Data Transmission Networks, IEA. All rights reserved. https://www.iea.org/reports/data-centres-and-data-transmission-networks

> The World Economic Forum estimate that digital technologies could help reduce global carbon emissions by up to 15% by 2030 in line with the goals of the Paris Agreement

With digitalisation positioned as central to the low-carbon transition, we will need to continue to seek out opportunities to deliver digital in a sustainable way. Notably, the exponential growth in infrastructure associated with sustainable development and the low-carbon transition is placing unprecedented pressure on raw materials' supply chains, with further environmental and social costs that need to be considered in value chains as well.

Sustainable digital infrastructure

For Actis, sustainable digital infrastructure must consider lifecycle impacts alongside design and operational efficiencies, and the local development needs of where the infrastructure is installed. Evaluating this spectrum of environmental and social risks and opportunities is an important determinant for prioritising the high impact opportunities that can maximise shared value for digital investors and the markets that they serve. This will be key in collectively forging a sustainable, inclusive pathway to digitalisation which truly unlocks digital's potential to successfully deliver on the UN SDGs.

Greening the Data Centre

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Netflix, Spotify, Google Drive, iCloud, VAR, gaming, cloud computing, metaverse... chances are all of us are users or customers of more than one of these services on a daily basis. But while these range from private entertainment to family photo storage, or from business processes to virtual reality, they all have one thing in common, the centralised processing and storage of vast amount of data in data centres.

The sustainable elephant in the room is data centre power consumption. According to the International Energy Agency (IEA) it is estimated that data centre global power usage amounted to about 200-250 TWh, approximately 1% of all electricity demand globally. With 80% of electricity generation still based on fossil fuel and the anticipated exponential growth in data consumption, it is not surprising that investors, developers, operators and customers of data centres are increasingly committing to finding sustainable solutions. As an investor in data centres across growth markets, Actis aims to become an industry leader in this regard.

The four R's for green data centres

The data centre industry has been keenly aware of the need to balance power and data consumption for many years. The approach to sustainability by the industry could be categorised into the "4 R's", namely, Reduce, Renewable, Recycle and Reuse. Recycle and Reuse reduce waste and carbon footprints through the recycling of servers and materials, reusing surplus heat adopting to the infrastructure of differing local markets. Our primary focus is on Reduce and Renewable, with the former adopting technologies that are entirely under our control, and the latter being a unique strength with Actis' vast experience in developing and operating renewable energy platforms across growth markets.

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Reduce

The main driver of the technologies adopted by the data centre industry in reducing power consumption is through the reduction of PUE, which stands for power usage efficiency. This measures the amount of total power consumed by the data centre over the power required for all the IT equipment and servers. While industry standard PUE for older traditional data centres are in the 1.5-2.0 range, new facilities and particularly those developed for large single hyperscale users are all below 1.5, with a race to get as close to 1.0 as possible.

More specifically, the primary focus of such technologies for minimising PUE in data centres is in finding the most power efficient ways to maintain the cooling of the server rooms within the facilities. At Actis we have identified 20 green initiatives that could be adopted during construction and operation stages of data centre projects.

Examples of green initiatives we have adopted in both China and Korea include the use of evaporative cooling systems that could reduce power and water usage by up to 30% and 50%, respectively. We have also adopted distributed uninterruptable power supply (UPS) systems to minimise the use of batteries and also unnecessary power loss. Software control systems are also used to maintain the server rooms with a wider range of optimal temperature, which could increase the time of "free cooling" up to 30%.

While not all 20 green initiatives could apply in every single market due to climate, site and other limitations, we strive to find the right balance to achieve the lowest PUE possible in each of the local markets. For example, in China where the market standard for new data centres is 1.3-1.5 we delivered our facility in 2019 at 1.19. For two projects under development in Korea, we aim to deliver PUE of 1.3 while the market norm for new facilities is 1.4-1.5.

> Examples of green initiatives we have adopted in both China and Korea include the use of evaporative cooling system that could reduce power and water usage by up to 30% and 50%, respectively

Renewable

Actis is uniquely positioned as an investor in both data centres and large scale renewable projects. To date we have delivered 26GW of power projects across the growth markets which includes 12GW of wind and solar assets. We also invest in high growth distribution companies so we understand what it takes to deliver reliable green energy in our markets.

Our focus is on both providing electricity to grids and also through corporate Power Purchase Agreements (PPAs) where we contract directly with a commercial or industrial counterparty that requires renewable energy. In 2021 Bloomberg named our investee company, Atlas Renewable Energy as the number one clean energy developer selling renewable energy to corporate buyers in Latin America during 2020 and occupied 6th place globally with over half a gigawatt contracted for private offtakers in the region.

At this time, our China data centre outside of Beijing has secured 100% green power through PPAs with the power grid and a wind power generator, meaning that the asset is well positioned to play a role in the net zero economy of the future. At Actis we call this a 'smart olive' investment and we will aim to do the same when we expand our footprint to the rest of China. In Africa, our existing location in Lagos, Nigeria has limited access to renewable energy; but the planned expansion into Nairobi, Kenya would allow us to tap into a market where renewable energy accounts for over 70% of the power sources.

Our experience of delivering data centres and large-scale renewable energy projects along with our knowledge of the broader power market is an exciting prospect and is central to our strategy of delivering sustainable infrastructure and attractive financial returns.

> Actis is uniquely positioned as an investor in both data centres and large scale renewable projects

Rack Centre data centre, Nigeria, prior to its expansion

Delivering Sustainable Outcomes at Rack Centre, Nigeria

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Actis' investment in Rack Centre Limited ("Rack Centre") comprised of the acquisition of a majority share in the leading carrier-neutral data centre in Nigeria; one of the most underserved markets in the world but with enormous potential for expansion. To expand the IT load from 750kW to 13MW sustainably, Actis is combining its experience in the sustainable real estate and energy sectors, to minimise the environmental impacts and deliver long-term transformational social impact.

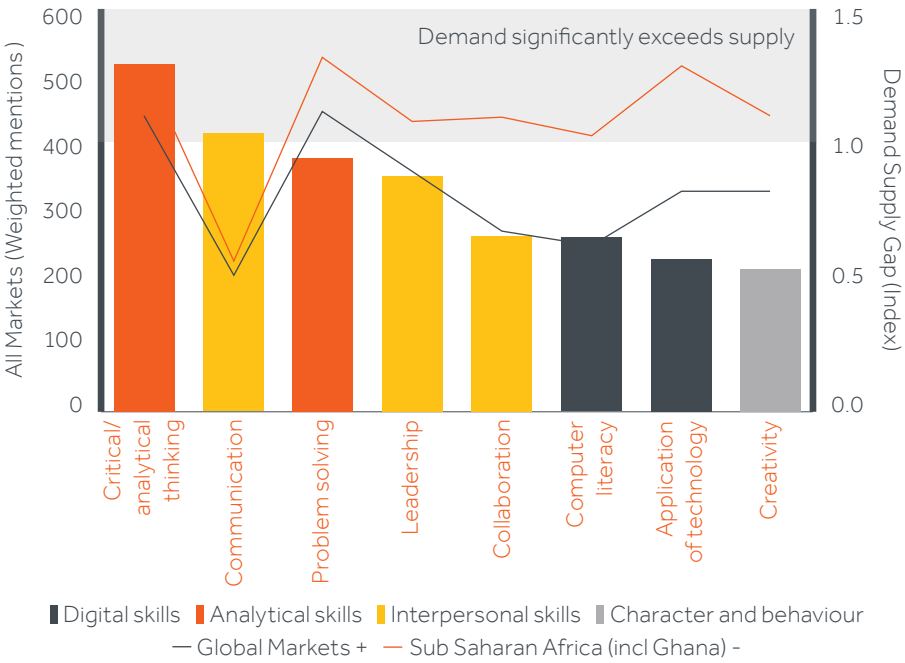
Sustainable design

Rack Centre applies cutting-edge technology and design criteria to maximise the energy and water efficiency of the expanded data centre ensuring it meets the increasing sustainability demands of customers. Rack Centre is forecast to be 25% more energy-efficient than other regional data centres and 16% more energy efficient than the global average. Water consumption will be reduced by 41% and there will be a 53% reduction in the embodied carbon of materials used in construction.

Our sustainable design philosophy, coupled with Actis' status as an official IFC EDGE champion, which means we have been recognised by the International Finance Corporation and other business leaders as endorsing the green building standards established by the EDGE certification, led to a collaboration with the IFC EDGE team and the development of the first sustainability standard dedicated to assessing the design and resource efficiency of data centres in growth markets. Actis' proactive implementation of sustainable design principles is likely to see Rack Centre become the first IFC EDGE certified data centre globally.

Whilst energy efficiency is paramount for sustainable data centres, so too is delivering a reliable yet low carbon sources of power to ensure uninterrupted operations. At the outset of Actis' investment an assessment was undertaken to identify the best technically and commercially feasible low-carbon power solution. Constraints on space for onsite renewables and an unreliable, carbon intensive power grid meant that converting from diesel to gas power generation was identified as the most sustainable option. The conversion is estimated to save more than $10million/ year of operating costs and will avoid over 4,500 tonnes/ year of carbon emissions.

Exhibit 1: Supply and demand for most important workforce skills



Source: https://www.ifc.org/wps/wcm/connect/ed6362b3-aa34-42ac-ae9f-c739904951b1/Digital+Skills_Final_WEB_5-7-19.pdf?MOD=AJPERES

Social impact

Construction work will create approximately 300 jobs whilst the headcount of Rack Centre's Operations Team will double. The direct and indirect jobs created by our investment will support the achievement of United Nations Sustainable Development Goal 8, which has an objective to "promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all". This is a timely creation of employment opportunities given Nigeria's estimated 20% increase in unemployment due to the pandemic, according to the National Bureau of Statistics and the United Nations Development Programme.

To further deepen the social impact and help combat inequalities, Actis and Rack Centre are assisting local people in Lagos to gain the requisite skills to participate in the country's growing digital economy. Demand for digital skills training in Africa will surge in the coming decade as more and more jobs, that did not require digital skills previously, will demand digital literacy.

Given the urgent need for digital skills training in Africa, Actis and Rack Centre have developed a "Skills to Employment Program", which will recruit up to 170 lower-middle-income young people in Lagos to participate in a digital skills development program. The objective of the program is to provide students with the skills to take advantage of the post-Covid employment opportunities and access jobs in the new digital world.

Computer generated image of Rack Centre, Nigeria once expansion is complete

Navigating Data Privacy: Owners and Operators

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The importance of data privacy can't be emphasised enough, as there have been substantial financial and personal losses when confidential data gets in the wrong hands. A breach at a corporation can put proprietary data in the hands of a competitor or dilute customer confidence, while a breach at an online service platform could put users' profiles at risk of identity theft in the hands of criminals. Protecting data privacy against mishandling and unauthorised access has always been at the forefront of the agenda for governments and the private sector worldwide. Establishing and maintaining strong data privacy protocols is fundamental to operating high-value, sustainable corporations and at Actis we recognise that this topic intersects with our aspirations to invest responsibly - and it's part of our overall approach.

Governments and regulators can also be seen as invaders of data privacy. The COVID-19 pandemic has further exacerbated this conflict as many governments increased contact tracing with location tracking apps. Privacy today faces growing threats from increasingly ubiquitous surveillance apparatus that is often justified in the name of security. As an investor/developer/operator of data centre infrastructure in many growth markets that are setting different standards for such fine balance between data privacy, protection and security, Actis needs to be well informed about such issues and position our investment carefully.

Public's concerns on data privacy and protection

In the normal course of business operation, a single company, especially those with near monopolistic power, may possess the personal information of millions of customers who are prone to data theft and misuse if sufficient measures are not in place. One well-known example is the Facebook data privacy scandal centred around the sharing of personally identifiable information to Cambridge Analytica who profited from illegal data harvesting. The backlash against Facebook for inadequate safeguards and oversight on personal data privacy has severely undermined the firm's reputation.

> Actis has existing data centre investments in China and Korea where our investee companies must strictly abide by the associated national laws of data privacy

Government agencies also collect vast amounts of data about individuals and businesses. In China, surveillance cameras equipped with facial recognition technology are frequently used for everything from identifying jaywalkers to mandatory hotel check-in. Many people clock in and out of work by scanning their faces, and these cameras are also being used to screen people entering or exiting campuses, residential buildings and public transport facilities as data feeding channels for Big Data processing. The number of closed-circuit television cameras in use in China has risen to over 600 million in 2020 and as a result, there has been a growing public concern over the inappropriate collection and use of personal facial information in China. As a response, in 2020, China published the first draft of its new Personal Information Protection Law which is intended to unify rights to privacy, personal information collection and protection, and is the country's first ever legislation in the area.

Decentralisation in data processing and storage

The proliferation of data sovereignty regulations and its enforcement is also raising concerns as data storage and processing moves from being centralised in a few regional locations, which tend to be jurisdictions with more transparency and stricter protection of data privacy, to being distributed across more local markets. A prime example is Asia with data centres in regional hubs such as Hong Kong, Singapore and Tokyo holding the bulk of data processed and stored by global operators and service providers across Asia. But many such global players have started to increase their presence in local markets such as India, Indonesia, Malaysia and Thailand. We are seeing similar trends in other developing regions such as Africa and Latin America.

Examples include Yondr who announced a joint venture partnership in October 2021 with Everstone Group. They plan hyperscale developments in the Indian market which will deliver 30MW by 2023 and 60MW of IT capacity when fully developed. In October 2021, Equinix launched a new hyperscale data centre in São Paulo, Brazil with a total capacity of 14.4MW. In Africa, Microsoft Azure opened two hyperscale data centres in both Cape Town and Johannesburg in 2019, while Amazon AWS inaugurated its first hyperscale data centre in Cape Town in 2020, and both are exploring entry into Nigeria and Kenya.

We believe such transitions will become the norm going forward, thus putting more data centres with processing and storage capacity in jurisdictions that may not have the same level of transparency when it comes to data security and privacy protection. It is, however, these early-stage markets with high growth potential that present the best risk adjusted opportunities for an investor like Actis.

Legal and regulatory framework for data centre

In Asia, Actis has existing data centre investments in China and Korea where our investee companies must strictly abide by the associated national laws of data privacy.

In China, obtaining a valid license from the Ministry of Industry and Information Technology ("MIIT") is imperative for any internet data centre (IDC) operators to carry out data centre services. The license approval is subject to close scrutiny by government agencies given that data storage and processing has a bearing on national security, mandating that an IDC operator with the IDC license must work with MIIT when it comes to data security/ privacy.

> With the growing concerns and escalating regulatory stringency in relation to data privacy globally, Actis is keenly aware of the regulatory framework within the markets in which we invest, develop and operate data centres

However, it's noteworthy that Actis and our data centre investment program are primarily focusing on providing the fundamental infrastructure, i.e. land, shell and core, and mechanical, electrical and plumbing (MEP), for built-to-suit or wholesale colocation purposes. Data storage and processing lies with our tenants and customers, who are subject to even more licensing requirements as internet service providers (ISP) and internet content providers (ICP) in addition to IDC in China. Our customers, who range from telecom couriers providing colocation and managed data services, to domestic and international internet/e-commerce/cloud companies providing direct services to individual subscribers/ consumers, are solely responsible for compliance with any regulatory requirement in data privacy or sharing personal data of their customers with the regulators.

We also take a similar approach in Korea, where the key legal and regulatory framework governing data privacy consist of the Personal Information Protection Act (the "PIPA") as a general law, together with several sector-specific laws including the Act on the Promotion of IT Network Use and Information Protection (the "Network Act"). The operators such as Korea Telecom and our customers who will be mostly global cloud services providers (the "CSPs") ensure that their respective data centre modules within our two facilities are equipped with scalable security controls and multiple layers of defence that help to protect the integrity of their customers' information. However, as the operators and CSPs do not have visibility into or knowledge of what customers are uploading onto its service network or platform, customers are ultimately responsible for their compliance with the PIPA and related regulations.

With the growing concerns and escalating regulatory stringency in relation to data privacy globally, Actis is keenly aware of the regulatory framework within the markets in which we invest, develop and operate data centres. Our infrastructure focused investment strategy allows us to deploy capital across many growth markets to satisfy the growing need for data centre capacity from both traditional telecom couriers and global CSPs, while at the same time largely insulating our funds and investments from the increasingly sensitive data privacy and security issues faced by these customers and users of our data centre facilities.

Latin American Digital Infrastructure

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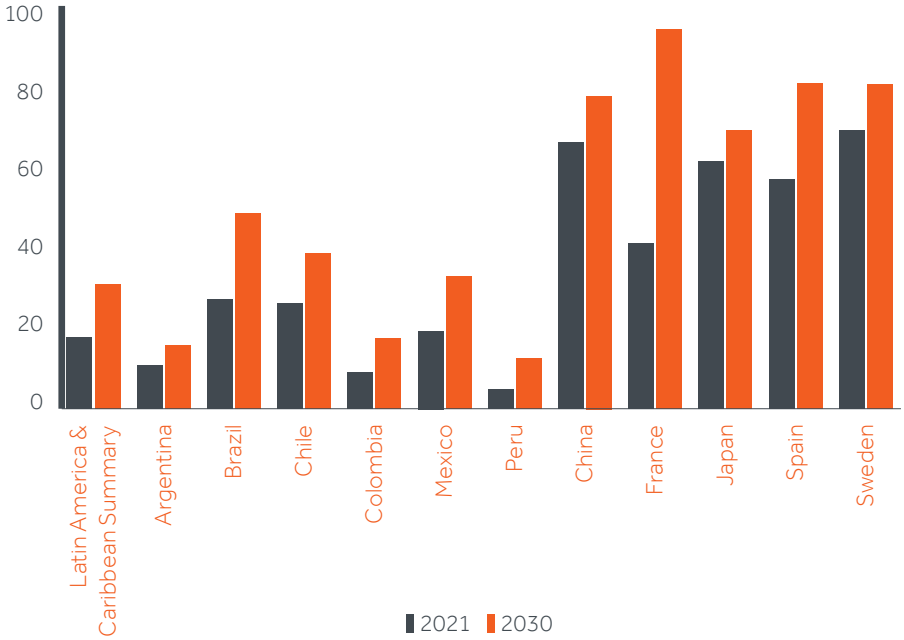
Access to digital infrastructure enables communities to improve economic and social growth prospects. According to the International Telecommunication Union (ITU), globally it is estimated that an increase in 10% of mobile broadband penetration increases GDP growth by 1.5% worldwide. This comes primarily from rising productivity and new job creation. We are increasingly realising that broadband connectivity is essential and becomes just as important as water and power supply. Latin America is no exception to this rule, albeit starting from low penetration rates.

Actis is constantly looking for opportunities with a wide supply and demand imbalance of infra where deep operational expertise and capital deliver positive social impact and long-term return. We see a huge opportunity to do that in the digital space in Latin America. According to Kagan, a media research group within S&P Global Market Intelligence, currently less than 50% of the population in Latin America and the Caribbean has broadband in their homes and an estimated 18% has fibre broadband (FTTH – Fibre to the Home) (see Exhibit 1). According to Cisco 2% of the connections in Latin America are projected to be faster than 100 Mbps in 2023 while the global average is estimated to be around 40% (see Exhibit 2). Despite the low availability of digital infrastructure in the region, internet usage is one of the highest among other regions in the world, proving the great demand and opportunity. For example, among the top 10 countries in the world where internet users spend the most time on social media, four are in Latin America.

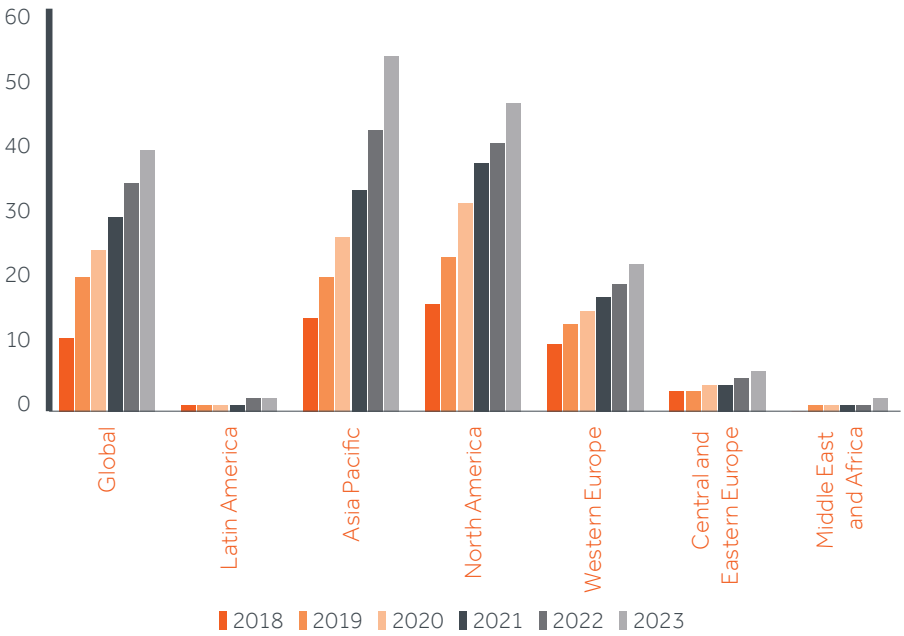
A massive amount of digital infrastructure is needed in the region across all spectra of the digital infrastructure value chain. One major milestone will be the deployment of 5G networks, bringing 10x higher speeds and 10x lower latency. According to an ECLAC study for six selected countries

Exhibit 1: Residential fibre broadband penetration (%)



Source: Kagan, a media research group within S&P Global Market Intelligence

Exhibit 2: Broadband speed greater than 100 Mbps, 2018- 2023



Source: Cisco Annual Internet Report, 2018–2023, https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.pdf

in Latin America, around US$120 bn will be needed by 2030 to implement 5G technology. In addition to traditional towers and antennas, 5G involves deployment of small cells connected with high-capacity back haul (which is the internet connection between the small cells and the network core) thereby enabling better 5G delivery in dense urban areas. It is estimated that 3x more sites will be needed to meet demand for 5G coverage. The increase in traffic will also mean a greater number of data centres with servers running applications in the cloud. In addition to the large and centralised data centres, edge data

centres (which are smaller facilities that provide cloud computing resources and cached content, located close to the populations they serve, to enable organisations to reduce latency and improve the customer experience) will also be needed to allow the 5G service user to experience the low latency.

> A massive amount of digital infrastructure is needed in the region across all spectra of the digital infrastructure supply chain

At this point, it is still not clear how telecom operators will monetise the massive investment required to roll out the 5G network, which will bring a lot of new products and applications but limited short-term revenue opportunity. But the first carrier who deploys 5G will win a large market share. This 'catch-22' dynamic is even more accentuated in Latin American countries where average revenues from users (ARPUs) are one of the lowest in the globe. This is the very reason why we see a strong case for neutral and independent players that could support the large investments required by the 5G in coordination with Telcos.

The development model pursued in 3G and 4G networks involved low sharing, with networks deployed for sole use by each telecom operator. Sharing was limited to passive elements such as telecom towers or real estate sites. This is changing. Networks such as 5G and FTTH require a much higher investment than previous generation networks. Additionally average profitability of telecom operators has been pressured in the last decade since ARPUs for fixed and mobile services do not rise and the penetration of services has reached full potential. The profitability equation for telecom operators in Latin America is even more challenging as the region has a low per capita income which translates into low levels of ARPUs across all services.

Thus, the new network deployment model should strive for maximum network sharing, using the concept of neutral networks, developed for multi carrier use, whether large or small operators focused on niche markets. The savings of this model go beyond capex efficiency, but also opex, as these networks have lower unit costs of energy, space usage, preventive and corrective maintenance, and network management. This increased efficiency will allow the digital infrastructure to arrive sooner and in more places as the economic viability equation of network deployment is optimised. It is well known that one of the most important barriers to the spread of advanced telecom technologies in Latin America is the cost of the service to the final consumer and the impact on the average household income. A more inefficiently developed network leads operators to charge a higher price for the final service. In this way, network sharing creates more conditions for the wide spread of broadband connectivity services.

> The new network deployment model should strive for maximum network sharing...this increased efficiency will allow the digital infrastructure to arrive sooner and in more places

Another important benefit of neutral networks is their sustainability and environmental impact, with less resources and energy needed to provide digital infrastructure. Neutral networks also allow operators to focus even more on customer service, product development and service experience. It will be through these elements that each operator will be able to differentiate itself competitively and not through infrastructure.

Carrier neutrality in Latin America is supported by regulatory trends. In Brazil, for example, Anatel, the local regulator for the telecom sector, created conditions in the 5G spectrum auction for a Neutral Operator. In addition, Anatel is regulating the secondary spectrum market, allowing spectrum to be leased. This creates conditions for investments to be attracted for the development of networks and shared assets in the new 5G mobile networks.

There are opportunities to invest in developing shared network assets such as Fibre Neutral (FTTH) networks, as well as the 5G neutral network model across the region. The 5G spectrum auctions have already started and it is expected that in the next three years most countries will be underway in implementing 5G. Countries with a more competitive environment such as Brazil, Chile, Colombia and Argentina will be the main focuses for a neutral network strategy as sharing can bring greater benefits.

Market development and opportunity is far from homogeneous across Latin America. It is vital to understand country differentials in order to identify the best strategies and opportunities. Some markets are more advanced than others with different market dynamics.

There are two major pathways for opportunities in Latin America: firstly, acquisition/development of assets to establish a neutral and independent player with the opportunity to release value and amplify the infra reaching for other players, and secondly, acquisition and expansion of wholesale infrastructure (tower, fibre, backbone, data centre) to support increasing demand and infrastructure gap in the region. The region is quite diverse.

Latin America's catch up on technology deployment and market development processes suggests momentum towards neutral networks will be intense. Some neutral network examples are appearing in markets such as Brazil, Chile and Colombia and it is expected that more projects should emerge. This profound transformation will generate opportunities for investors to support the development of digital infrastructure by efficiently allocating capital and bringing important impacts to the economy and well-being for Latin Americans, who are avid users of digital services and social networks.

Indian Digital Infrastructure

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Data centres are attracting lots of investor interest in Asia. It is only to be expected as in many of the Asian economies the opportunity is characterised by deep future demand, woefully underserved by the current capacity. In India alone, the capacity may need to increase as much as 3x or 4x the current capacity of around 500MW IT Load, to cater to the increasing demand over the next 6 to 7 years.

Investors debate whether data centres are real estate or energy infrastructure investments. Data centre customers rely heavily on power and fibre infrastructure and may require tailor-made solutions where power supply is unreliable or relies heavily on non-renewable sources. Many infrastructure players have entered the space, looking to exploit the adjacencies.

In reality though, real estate is as much at the core of data centres as energy.

In economies like India, sourcing sites with easy, cheap access to power and fibre in proximity is a winning start. For a successful site acquisition, a skilled data centre developer must deal with a host of factors. Firstly, those that define the physical character of the site such as size, shape, access, topography of the site / surroundings, neighbourhood developments, etc. Secondly, the legal title, tenure, entitlements, etc. And finally, development realities including building bye-laws, massing feasibility, permitting process, planning authority's sustainability framework, etc. It is no surprise that a number of data centres have come up on sites within designated industrial zones, which tend to score better on many of these factors, Navi Mumbai being an example. A real estate developer deals with these every day. In many emerging markets, suitable sites are urban, hence identifying and making a successful acquisition requires the skills of a real estate developer or investor. The granularity of diligence to examine legal title, entitlements and massing feasibility alone requires deep real estate expertise before a successful acquisition.

Then, there is design and planning. Data centre design and planning is closer to specialised industrial facilities than to any other types of buildings. The design process is similar to real estate, and includes preparing a brief followed by hiring consultants and architects for the various stages of design and planning. There are many decisions to be taken during the design phase, each of which can have meaningful impact on cost and marketability to tenants, and the owner must play an active role throughout. In many emerging markets, another aspect developers may struggle with is the lack of proper code guidance for design of data centres because this is still evolving. The developer must be prepared to actively engage with the local planning authority in a consultative manner to find common and acceptable ground on many important design factors. This is not new to real estate developers. However, a number of operators who lack the real estate planning skill set are struggling with it, leading to delays in delivery.

Civil construction expertise is also critical to data centre development, as timely delivery is of essence and penalties for delivery delays can be damaging. Where sites may not be ideally shaped or sized, which is often the case in emerging markets, a developer must possess expertise to design and develop optimally within urban or urban-like constraints. An industrial real estate developer is also familiar with heavy mechanical, electrical and plumbing (MEP) works, and hence can organise and execute sophisticated, modular MEP works.

Real estate experience is central to data centre investors and developers. Those with skills in both real estate and energy infrastructure are thus uniquely positioned to realise the opportunity.

Delivering Data Centres in China

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With total market size reaching almost US$30 billion in revenue in 2020 and anticipated 30%+ compound annual growth rate (CAGR) over the next five years, it's no surprise that the China data centre market continues to attract investors' interests. Such interests have further intensified since the Chinese Government listed data centres as among the key "new infrastructure" projects that the country needs to boost its next phase of development. Nevertheless it hasn't been a smooth ride.

Almost all of the US listed Chinese data centre companies such as GDS and 21ViaNet have seen their share prices more than halved over the last year while global players such as Equinix and DigitalRealty are still trading near all-time high levels, despite the growth of their home markets being much slower than the brisk pace seen in China. What gives?

Politics? Or policies?

While such sell-off could be partially attributed to the stresses of common prosperity implementation and US-China tension, there is an increasing recognition of the regulatory and execution hurdles that even the most experienced in the Chinese market would struggle to overcome in order to meet their very lofty growth targets. Such challenges are also the reason why global leading data centre players, despite their interests and efforts, have so far only managed to have a limited, if any, presence in China. **It is possible though to succeed**.

Through our investment in Chayora, a Chinese data centre infrastructure developer and operator, Actis has worked with the company to amass a development pipeline of over 200MW in IT load and completed our first data centre project in 2020. This wouldn't have been possible if the teams at Actis and Chayora did not have experience in navigating the myriad of policies on land, development, sustainability, power and data security.

Land vs. land and power

Governments see data centres as industrial/infrastructure investment with recurring output/income from production instead of real estate projects with rental of sales income. A lengthy pre-qualification process with the local government is required before a party is even allowed to bid for a plot of industrial land for building data centres.

> With traditional real estate projects, the guidelines and regulations on land acquisition in China have evolved over time to be relatively clear and transparent. Data centres are different. And more complex prepositions. Why?

During this pre-qualification process, the local government vets all proposed investments by balancing the "benefits" such as the capital investment, preferably in the form of foreign direct investment (FDI), and promise of future tax revenue against the "costs" such as any preferential land price, tax benefits and the consumption of infrastructure, most notably power. With carbon neutrality targets being imposed by the Central Government on all municipalities and districts, the energy saving assessment (ESA) process for approving the level of power consumption has become an uphill task for all new industrial projects. In the case of the power-hungry data centre sector, this ESA process is now the Mount Everest of such an uphill task. In recent months, many local governments have even started to enforce strict ESA requirements, instructing older data centres that were built with questionable ESA quota to reduce their capacity or close down.

In this aspect, the technical expertise and the commitment of the Chayora team in designing and delivering a data centre with best-in-class power efficiency has proven to be a crucial factor. While older data centres in China are operating with power usage efficiency (PUE, which measures total power consumption over IT server power usage) close to 2.0, new data centre projects need to illustrate their ability to deliver and operate at PUE at or below 1.4-1.5 in order to be considered for ESA quota. For Chayora, our first project in Tianjin has been designed with new cooling and back-up power features which resulted in PUE of 1.19. This became a key consideration by the local government when we applied for ESA quota for our second project near Shanghai.

With the approved ESA, Actis and Chayora jointly negotiated the detailed investment agreement which not only satisfy the cost/benefit requirement of the Government, but also ensures the financial viability of the project. The project site with secured 80MW in power connection just 50km from Shanghai CBD was recently acquired through the land listing process in November 2021.

Sheds, but with power

Although securing land with power could be considered "winning half the battle", there is still the other half or the "real work" of actually building and operating the data centre project. In addition to data centres, Actis has also been an active investor in logistics warehouses, another industrial real estate sector, across China. Both sectors involve monolithic, windowless, high ceiling "shed like" structures. On paper, all industrial projects require the same dozens of approvals from pre-development planning and construction permits to on-going inspections to the final fire, safety, completion inspections and approvals. But that's where the similarity ends.

Just as the land acquisition process, the high-power attributes of data centres adds multitudes of complications to all the planning and development scrutiny by different government bureaus. And while logistics warehouses are built and fully delivered at one time, data centres with multiple data halls need to install the electrical and mechanical equipment for operation, which accounts for close to 80% of the development costs, in phases to align capital outlay with revenue generation. Each of these phases would need a repetition of all the scrutiny by local bureaus overseeing planning, design, fire and safety, before achieving operational status.

In the case of Chayora, we delivered the first phase of our first of seven Tianjin projects with 4MW of IT capacity for operation in late 2020 and then initiated our second phase development in early 2021. This first Tianjin project is anticipated to reach full capacity of 18MW IT capacity in 2023 with at least two more rounds of vetting, inspection and approval processes, a testing task even for the experienced local teams at Chayora and Actis.

Mission impossible? Or difficult?

Policies and regulations for a data centre project in China are in fact quite clear and transparent, albeit with widely varying local interpretations across the vast country. Just as many Chinese investors have been baffled by how difficult it is to refurbish a hotel in New York City, many global investors and operators in data centre have stubbed their toes with their initial attempts at entering the China market, thus causing others to be hesitant to take on such "mission impossible." For experienced investors who fully appreciate the challenges and understand how to mitigate them, such tasks are surely "mission difficult" that are worthwhile for the potential reward from this sizeable market.

Chayora data centre, China

What It Takes to Build and Operate Data Centres

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Demand in Korea for sophisticated and sizable commercial data centres remains strong. Supply lags demand due to the particular circumstances of development in Korea. While this supply demand dynamic opens up an attractive investment opportunity, capitalising on it poses significant challenges.

Growing demand for commercial data centres

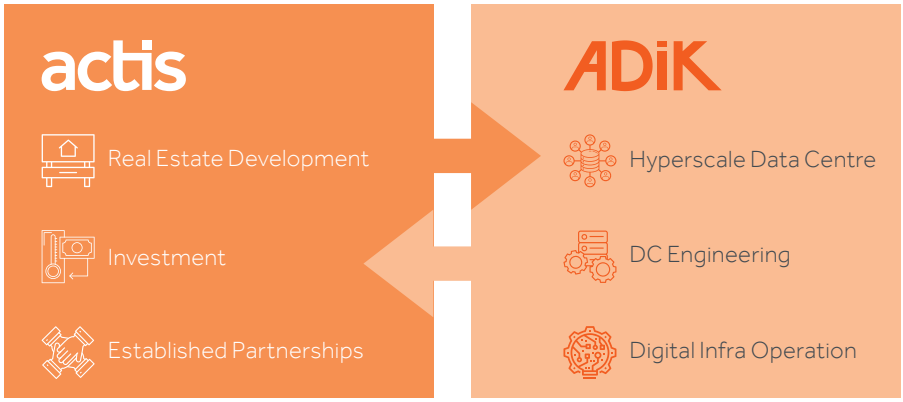
In the early days, data centres were mostly used for those few enterprises with needs for management of a large quantity of data. As businesses grow and diversify and Information and Communication Technology (ICT) continues to advance, utilising ICT for almost every business has become important resulting in growing needs for specialised IT departments.

This transition, however, has been costly for many enterprises and organisations. Data consumption has kept on accelerating driven by fast evolving ICT needs. Large corporates have been driving the search for efficient ways to manage their data focusing on cost reduction, ease of expansion, and easy and reliable access to data. Consequently, needs for cloud services meeting these objectives have risen and are expected to continue to grow. Moving into the cloud requires a growing number of sophisticated and sizable commercial data centres to attract global cloud service providers (CSPs).

Exhibit 1: Actis Korea: partnership with ADIK

An exclusive partnership with ADIK to generate synergies between Actis with proven development capability and ADIK with in-depth knowledge of the Korean IDC industry and hands-on operation capabilities.

- ADIK is a specialised data centre advisor and operator in Korea with industry experts who joined from local carrier and global CSP.
- ADIK will be providing Actis with exclusive advisory services covering technical and design requirements, efficiency improvement, cost reduction and operation monitoring.



Source: ADIK

Exhibit 2: ADIK (Actis Digital Infrastructure Korea)

Leadership

Yoon-Sik, Jeong	Young-Jin, No	Jeong-Kang, Lee
CEO	**CTO, Senior Managing Director**	**CSO, Managing Director**
– 27+ years experience in Korea ICT industry – KT: EVP, Enterprise Customer Business Unit – IBM Korea : Senior VP, Global Business Service – PWC: Team Leader, Finance Sector – Oracle Korea: Consultant, Finance Sector	– Technical expert in IDC design and development with 20+ years – AWS: Cluster DCEO Manager – LG U+: Team Manager, IDC Business Team	– Sales veteran with 16 years of experience in KT. – Recognition received while at KT – KT: Director, Global CSP/ OTT/CDN Sales Team Lead – 2018-9: The Best Employee Award of the Year – 2015-7: The Best Sales Award by CEO

Specialty/service qualification

Source: ADIK

Exhibit 3: ADIK's expertise as a data centre ("DC") specialist

	Key capabilities required for DC operators	What ADIK delivers
Development		
DC development	– Reviewing of development plans and respective permits and approvals through collaboration with real estate developers and architects. – Identification of potential demand for data centre space in target areas through engaging with the potential end-users.	– Detailed analysis on select sites based on a deep understanding in the target end-users from an architectural perspective. – Verification of suitability as a data centre based on the development plan. – Network distance and path investigation and analysis on the associated risks.
DC sales	– Client management focusing on the global CSPs. – Review of service agreements and management of commercial issues from pre-marketing phase.	
Delivery		
DC design	– Consult on selecting a dedicated data centre design company and development of an optimal building design including detailed specs by co-working with the design company. – Review of the DC design and consult on major issues and alternatives from the concept to basic to detail design stages (e.g., Uptime Tier, CSP Spec, PUE).	– Development and review of stable infrastructure designs with Uptime Tier III (or higher) specs embedding standard spec requirements of the global CSPs. – PUE improvement through development of an optimal design while meeting target clients' operational requirements.
DC construction	– Quality control including identification of construction errors and verification of remedies by engaging with CM and commissioning agents. – Final performance test for commissioning, execution of delivery process, and completion of an initial operating plan.	– Review of and compliance with domestic EHS regulations and related laws for construction. – Project on-time schedule management.
Operation		
DC operation	– Consult on selecting a FM partner with which the DC operator to engage for DC operation. – Prompt responses to technical issues related to customer delivery stage and management of Facility Build projects. – Customer support for operation/technical issues through active communications.	– Identifying long-term and strategic FM partners. – Development and application of a performance/cost optimised operating model.
DC training	– Development and provision of training programs on data centre technology – Basic/Advanced Training course	– Development of training curriculums to improve operational capabilities. – Training and recruiting operation specialists to improve integrated operating capabilities.

Source: ADIK

However, supplies are not following up

Demand for effective facilities is sprinting ahead of supply. This is the legacy of telecommunications having been a government-driven industry with national infrastructures dominated by a handful of large players with strong government influence over activities. Carriers still depend on KT's wired communication networks as KT was a state-owned carrier that established nationwide networks. As a telecommunication bureau, the state-owned company holds land in key locations in Seoul (mostly for telephone exchanges) giving a clear cost advantage in development and operation of data centres. This has had inevitable consequences allowing major CSPs to have established their initial foothold in some of the most prime areas of Seoul with limited room for expansion.

However, the carrier-driven Korean data centre sector is changing. Development in virtually all of the prime areas owned by the carriers has been completed meaning their cost advantage relative to new entrants is reduced. Legacy carriers who have exclusively carried out the development with their own sites have limited experience in some critical development areas including power procurement and securing permits and approvals.

In addition to land scarcity, carriers face growing capex to support their core businesses. Unlike some developed markets, the major local carriers build and own telecommunication infrastructures. Establishment of 5G networks is still in an early stage and needs to be laid more

densely than the existing 4G. Space for such expansions is only getting more constrained resulting in growing costs. Local carriers have been aggressively growing digital platform businesses including media streaming services that will continue to require a significant amount of investment capital. While data centre development is certainly an attractive business, this capital intensive activity is increasingly falling behind in priority, particularly given that they no longer have prime land available for development. Identifying this transition that is still in an early stage, we have taken a leading position by successfully closing transactions for two sizable data centres and one mid-sized urban data centre development that collectively require c.92MW total capacity load in prime areas of Seoul.

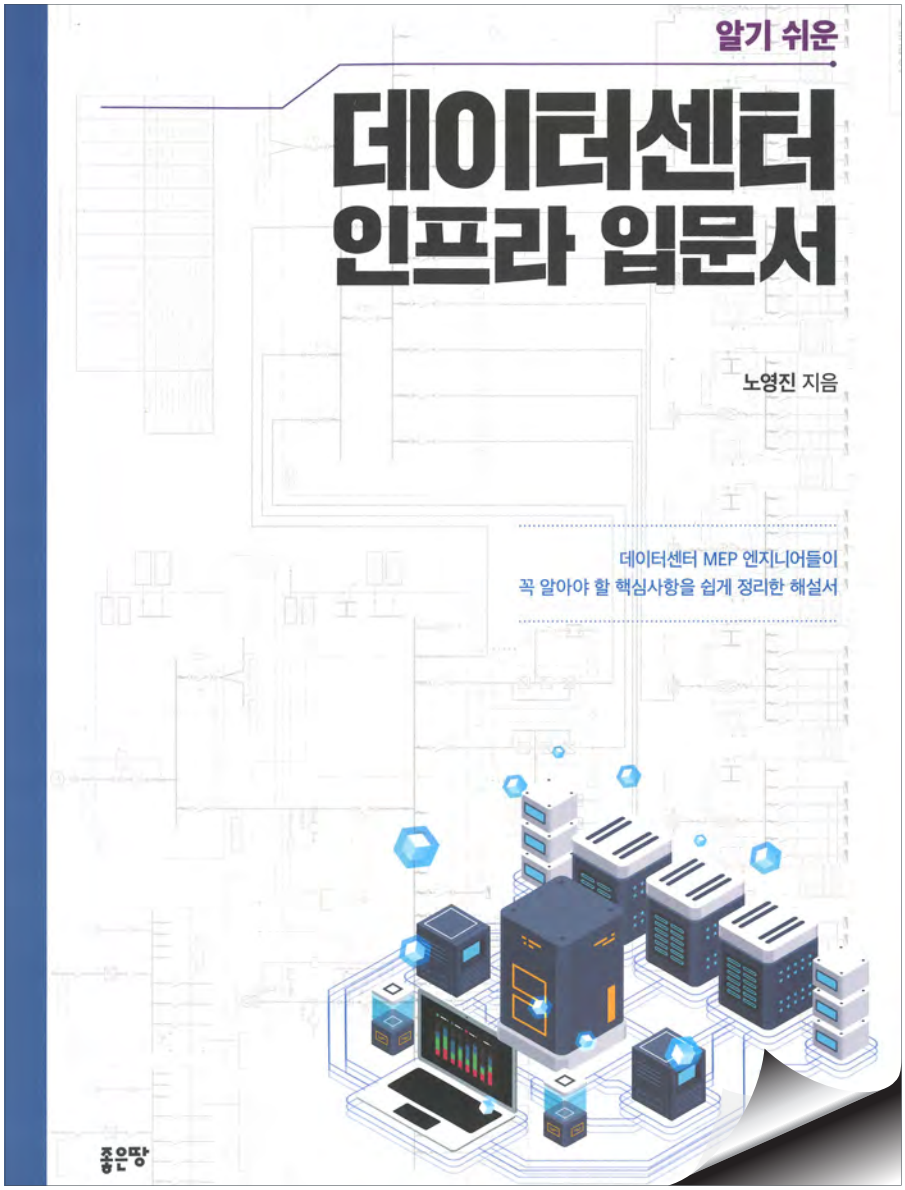
What it takes to develop a data centre

The successful transactions we closed required particular capabilities to overcome key challenges in data centre development and operation. As described earlier, the CSPs have established their foothold in some of the most prime areas in Seoul. Such areas have extremely limited sizable land parcels and power grid. Whilst Korea generates plenty of electricity additional installations of power grid in such prime areas are challenging due to land scarcity, lengthy and complicated permit and approval processes, grid system monopolized by KEPCO and a risk of civil complaints that can delay the construction for years. So you have a market where the key end-users prefer sizable data centres located within their existing clusters and this requires large land parcels in the prime areas with access to substantial power fed from the existing grid that is already under pressure with a highly limited expansion opportunity for the foreseeable future.

In addition, developers need to have a deep understanding in technicalities of data centre building deigns, knowledge that is scarce in the Korean real estate investment sector since this is a new asset class. Data centre operation is dominated by the major local carriers serving the growing needs of the CSPs, and presence of the global operating platforms such as Equinix and Digital Realty is currently low. With the proven capabilities through many years of operations, the carriers have continued to remain as an attractive operator for the CSPs. That said, these carriers have their limitation as their core revenue driver is network businesses meaning their key professionals are not exclusively dedicated to data centre operations. Understanding this, we have secured an exclusive contract with a local operating partner ADIK that has been established by top calibre professionals coming from both major local carriers and a global CSP. ADIK has been engaging in our data centre development projects from the beginning providing critical expertise and feedback on building designs, lease marketing, and operation plans. Not something our competitors in the local market have.

Exhibit 4: Book written by Young-Jin No, Chief Technology Officer, Senior Managing Director, ADIK

In late 2020, Mr. No (CTO, Senior Managing Director), published a book on data centre development and operation (translated as "Easy-to-understand Data Centre Infrastructure Primer"). This is considered a textbook in the local market for data centre engineers and those exploring a career in the data centre industry.



Source: ADIK

Computer generated image of Epoch data centre development, Korea

A 'One Actis' approach to investing in sustainable digital infrastructure

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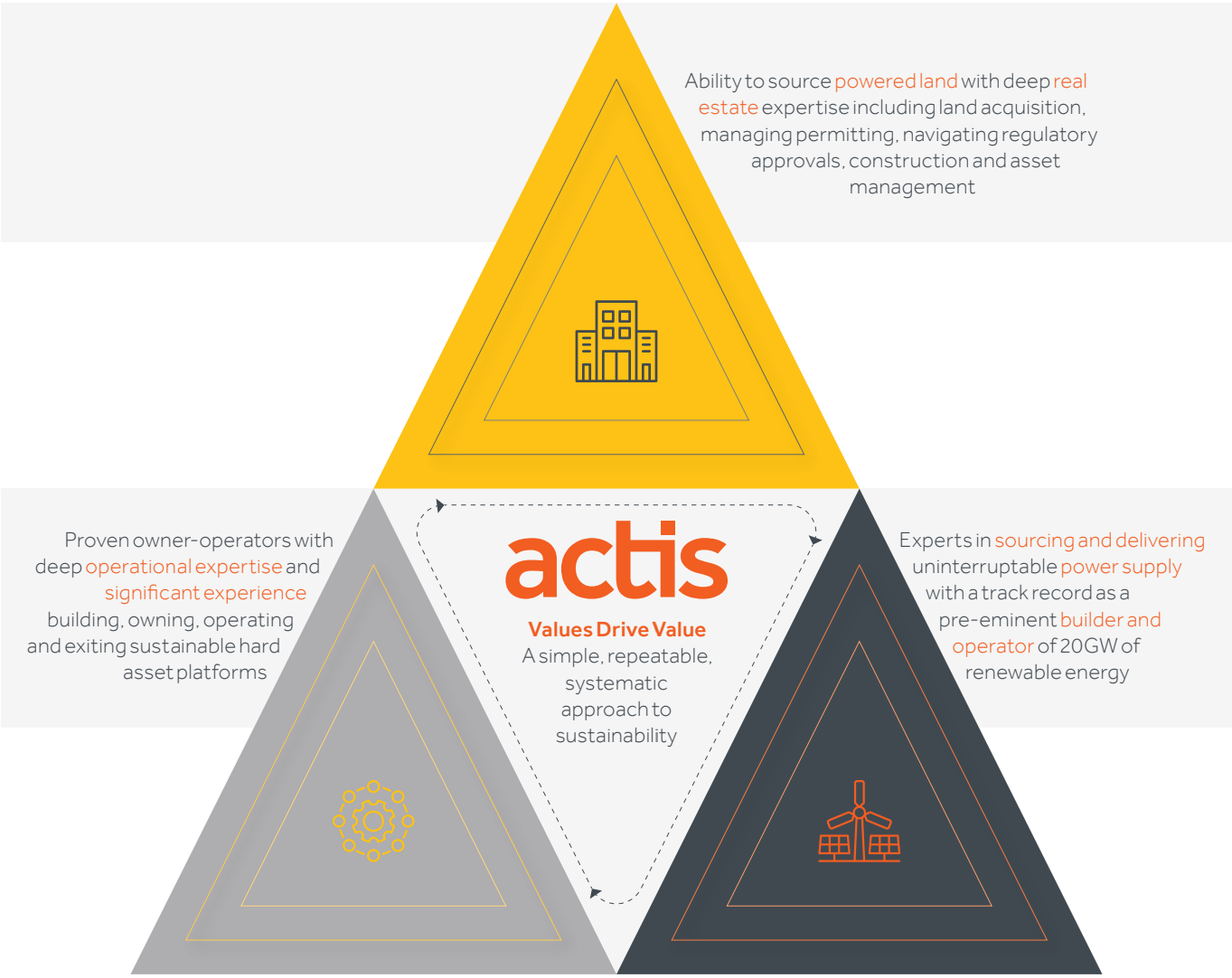

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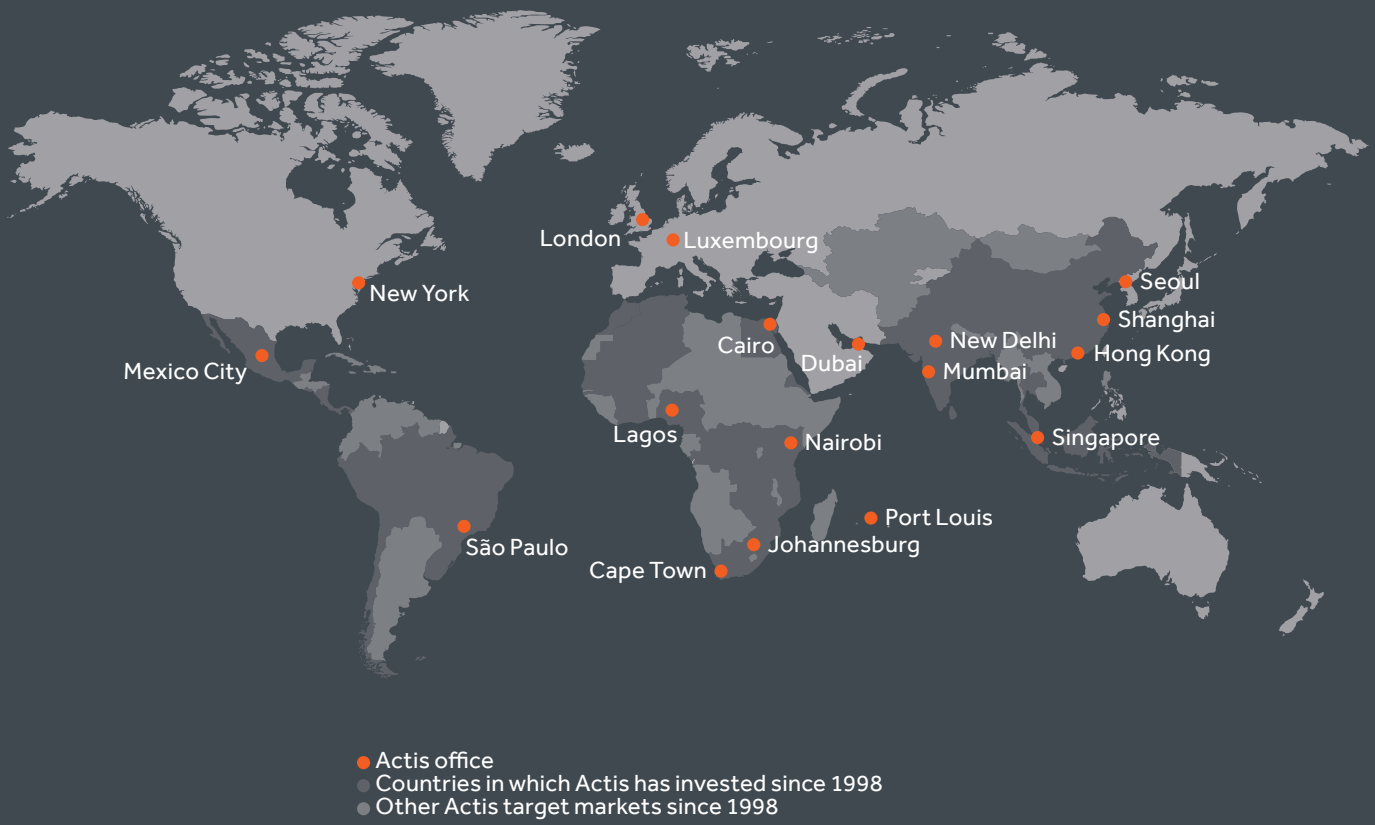

For more information, please contact

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