actis

GLOBAL DIGITAL INFRASTRUCTURE INVESTMENT

ENABLING A JUST TRANSITION

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EXECUTIVE SUMMARY

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As a leading global investor in sustainable infrastructure, Actis recognises that investing in digital infrastructure is one of the fastest ways to transition to a more equitable, efficient, and prosperous society.

Digital infrastructure underpins better-functioning, more inclusive and more connected economies and is critical to delivering the UN Sustainable Development Goals. Despite the outsized benefits, there is a significant supply-demand mismatch, which is currently estimated at $50 billion and expected to reach nearly $1 trillion by 2040. Closing this gap represents a major investment opportunity.[1]

The prize is worth it; increasing internet penetration from 35% to 75% in underserved regions could create 140 million jobs.[2] Digitisation is also a critical enabler of climate action: we cannot deliver on net-zero emissions targets, tackle environmental degradation, or increase physical resilience without improving the efficiency of the energy system, ensuring transparent supply chains, and better predicting, preparing for and recovering from natural disasters and other disruptions. All require a massive investment in core digital infrastructure.

We are living in a decade with surging internet demand but a significant supply gap. Covid-19 has accelerated the shift to a digitised world, with the number of people online since the pandemic began increasing by 17%. But as education, healthcare and jobs moved online in many parts of the world, the disadvantages faced by the 2.9 billion people not connected to the internet increased.[3]

While covid lockdowns deepened the inequalities that underpin today's system, it also revealed where the biggest gains can be made in terms of financial security, access to essential services, and health outcomes by investing to rapidly digitise the economy. The biggest social gains are typically low-income regions and/or rural areas – "under-served" markets – where scaling core digital infrastructure will connect people to healthcare, education and job opportunities while enabling financial inclusion for many of the 1.7 billion "unbanked" people in the world.[4] To deliver these outcomes, investment in core digital infrastructure needs to be accompanied by initiatives to improve digital literacy.[5] Failing to address access barriers will increase the digital divide, further entrenching existing inequities, particularly as more services move online. Improving connectivity does not have to come at a high cost: in Latin America and the Caribbean, for example, creating universal broadband access would cost only 0.12% of the region's annual GDP.[6]

Investing in digital infrastructure is also a key enabler for climate action, accelerating progress to a net-zero, circular, and nature-positive economy. New technologies help to streamline and accelerate the integration of renewables into energy systems and dramatically improve energy efficiency. Digital infrastructure alone could reduce power sector emissions by 1.3 gigatons CO_2e a year by 2030 – more than the annual emissions of Japan[7]. Digital technologies also facilitate a shift to a circular economy, unlocking service-based business models that reduce resource consumption. Finally, protecting natural ecosystems is critical to achieving net-zero; digital tools support enhanced monitoring and data collection that enables real-time forest protection, fisheries management, regenerative farming and many other nature-based solutions.

Closing the funding gap represents an unmissable opportunity to improve the social, environmental and financial resilience of society over the next decade.

About Actis

Actis is a leading global investor in sustainable infrastructure. We deliver competitive returns for institutional investors and measurable positive impact for countries, cities, and communities in which we operate. Our global experience, operational knowhow and strong culture allow us to create global sustainability leaders. We do it at scale. And have been doing so for decades. Since inception, we have raised US $24 billion to invest in a better tomorrow.

About SYSTEMIQ

SYSTEMIQ is a systems change company that partners with business, finance, policy-makers, and civil society to make economic systems truly sustainable. We combine high-level research with high-impact, on-the-ground work. We're a "think-and-do" tank that sparks good disruptions and operates with purpose at our core.

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INTRODUCTION

Inequality is rising, posing a threat to political and economic stability and our ability to effectively tackle climate change

The Covid-19 pandemic has shone a light on vast inequalities that underpin today's economic system, revealing a gulf in economic security, access to essential services and health outcomes. While the pandemic has made this divide much more visible, these trends are not new: the gap between the richest and the poorest has widened consistently, and the share of the middle 40% has shrunk since 1985. In emerging markets, the richest 10% has remained constant despite high levels of growth, illustrating that this growth is concentrated among a small minority.[8]

This inequality is fuelling instability and reducing society's resilience to deal with major shocks, which will increase in frequency and severity as the effects of climate change accelerate. And the world's poor will be disproportionately impacted – 70% of the countries which are most vulnerable to climate change are also among the world's most economically and politically fragile.[9] Improving social outcomes and tackling climate change are therefore inextricably linked, and solutions that achieve both are critical to delivering the UN Sustainable Development Goals and to limit global warming to 1.5°C.

Digital infrastructure has the potential to drive positive social, economic, and environmental outcomes, playing a critical role in the transition to net zero and delivering the SDGs

Without a significant increase in digitisation, most sectors and countries will struggle to achieve their social and environmental targets - AI solutions alone can be applied to nearly 80% of SDG targets, representing a significant opportunity for impact. Indeed, as services such as healthcare and education have increasingly moved online – a trend accelerated by Covid-19 – the provision of broadband, backed up by powerful data centres, is now considered a basic necessity.[10] For example, the UN has set a target of increasing global broadband penetration from 55% to 75% by 2025, and from 28% to 35% by 2025 in the lowest-income countries.[11]

Digital infrastructure can drive positive social outcomes by providing access to services such as healthcare, education and banking, while helping communities build physical and financial resilience to climate change. Digital infrastructure is also a critical part of achieving net zero by 2050. It has already played a central role in increasing efficiency of the energy system, scaling renewables and supporting a more circular and lean use of emissions-intensive materials like metals, plastics and cement. Despite the potential impact, there is a significant unmet funding need for digital infrastructure and services. Without concerted efforts, this funding gap is predicted to reach nearly $1 trillion by 2040.[12]

As essential services are increasingly provided online, the lack of global access deepens the digital divide and intensifies structural inequalities. Scaling investment in digital infrastructure is therefore an urgent global priority.

Defining digital infrastructure and technologies

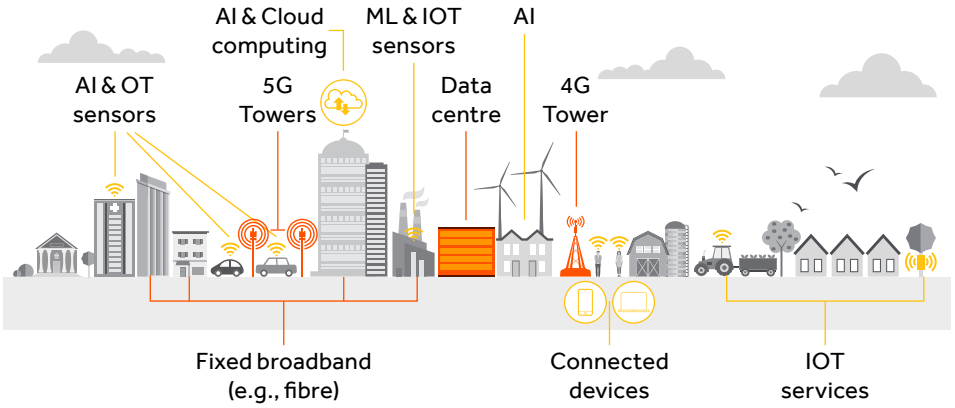
The emergence of digital infrastructure and advanced digital technologies is sometimes referred to as the Fourth Industrial Revolution. Digital infrastructure can cover a range of different assets and technologies. For Actis, digital infrastructure comprises **core digital infrastructure** assets, which are constructed in the regions where they are used. This includes data centres, fixed broadband networks, and telecommunications towers.[13] Data centres are comprised of physical computers which provide computing power and data storage capacity. Fixed broadband comprises networks of telecoms equipment and technologies which provide high-speed internet access (e.g., fibre optics, cable, DSL). Mobile networks are similar to fixed broadband, but provide access via cellular connection (e.g., towers for 4G or 5G).

Advanced digital technologies (ADTs) are software-based, and are dependent upon core digital infrastructure assets to function; hence the social, environmental and economic benefits of ADTs can be partially attributed to core digital infrastructure. In this report, we explore the benefits of ADTs, such as Artificial Intelligence (AI) and Machine Learning (ML) software, and the hardware-based Internet of Things (IoT), although this is not exhaustive.

Exhibit 1 illustrates how these elements of the digital infrastructure ecosystem might feature in the real economy. Exhibit 2 shows how these different elements are used together to provide essential social, economic and environmental services.

EXHIBIT 1: THE DIGITAL INFRASTRUCTURE ECOSYSTEM

Core digital infrastructure asset Advanced digital technology



Source: SYSTEMIQ analysis

EXHIBIT 2: EXAMPLE DIGITAL INFRASTRUCTURE USE CASES

SMART BUILDINGS

Core digital infrastructure asset
Advanced digital technology

ONLINE EDUCATION

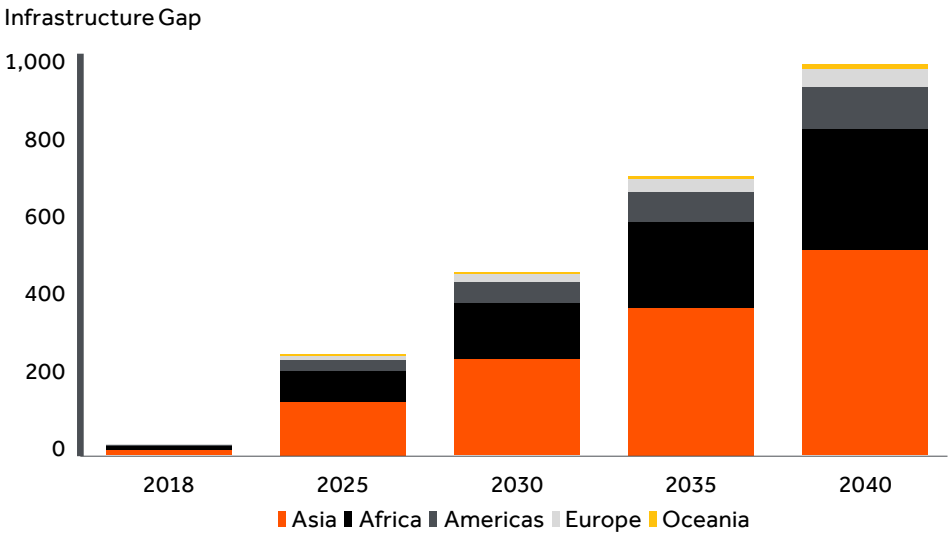
Core digital infrastructure asset
Advanced digital technology

Source: SYSTEMIQ analysis

THE DIGITAL DIVIDE

Access to digital infrastructure is unequal, disproportionately affecting the poor and vulnerable in under-served regions of the world. Globally, 45% of households are not connected to the internet and so cannot engage with online healthcare services, education and work.[14] The worst internet penetration rates are in Africa and Asia, 28% and 48% respectively (vs 94% in Western Europe - Exhibit 3). Internet access is also a gender equality issue: globally, women are 23% less likely than men to use mobile internet, increasing to 50% among a sample of lowest-income countries across Africa, Asia, and South America.[15] Across the board, rural populations are more likely to have no internet access than urban ones.[16] For example, of an estimated 21 million Americans who don't have access to broadband, 17 million live in rural areas (81%).[17] These urban-rural differences are often in parallel to, and further entrench, existing income inequalities.

EXHIBIT 4: DIGITAL INFRASTRUCTURE FINANCING GAP, BY REGION ($BILLIONS)



Source: AIIB (2020) Digital Infrastructure Sector Analysis

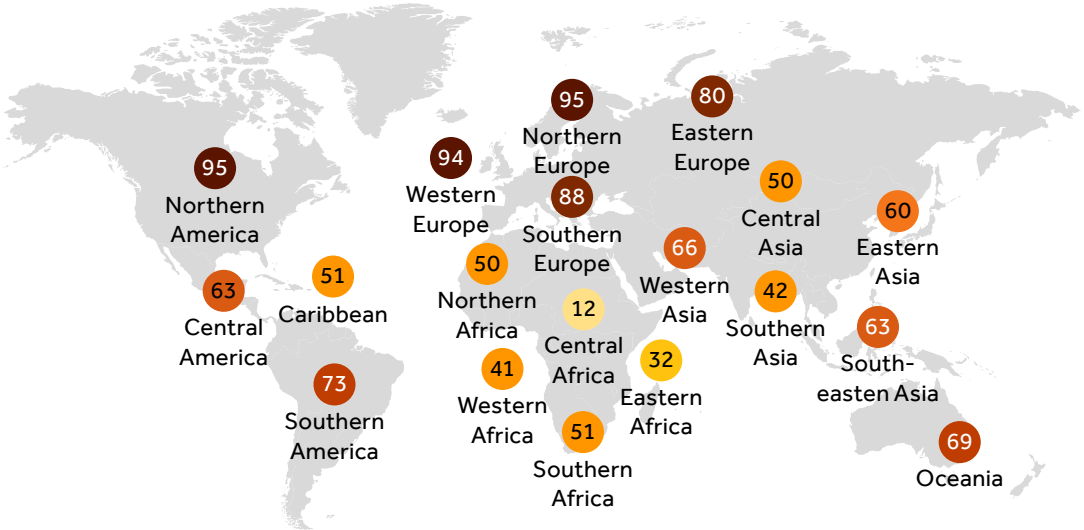
Lack of core digital infrastructure is a barrier to new technologies being adopted, compounding the digital divide.

Newer technologies such as cloud computing rely on internet access, high computing power, and AI, meaning its rollout is happening much faster where core digital infrastructure already exists.[18] The result is an uneven distribution of the benefits this type of technology can provide, such as increased security, cost savings, and data loss prevention. The same applies to mobile infrastructure. 4G coverage improved by only 22% in low-income countries, 2014-19, compared with 65% in middle-income countries during the same period.[19] In Latin America and the Caribbean, the ten years to 2017 saw average mobile connection speeds rise by 155%, but a doubling of the gap between best- and worst-ranked countries.[20]

Compounding the digital divide is the funding gap for digital infrastructure, which is still growing and particularly significant in Africa and Asia.

Despite the massive growth of the digital economy, reaching 15.5% of global GDP in 2016, investment gaps are widening, especially in under-served regions.[21] In Asia, the gap is expected to reach $512 billion by 2040, more than half of the global total (Exhibit 4).

EXHIBIT 3: PERCENTAGE OF POPULATION CONNECTED TO THE INTERNET BY SUB-REGION



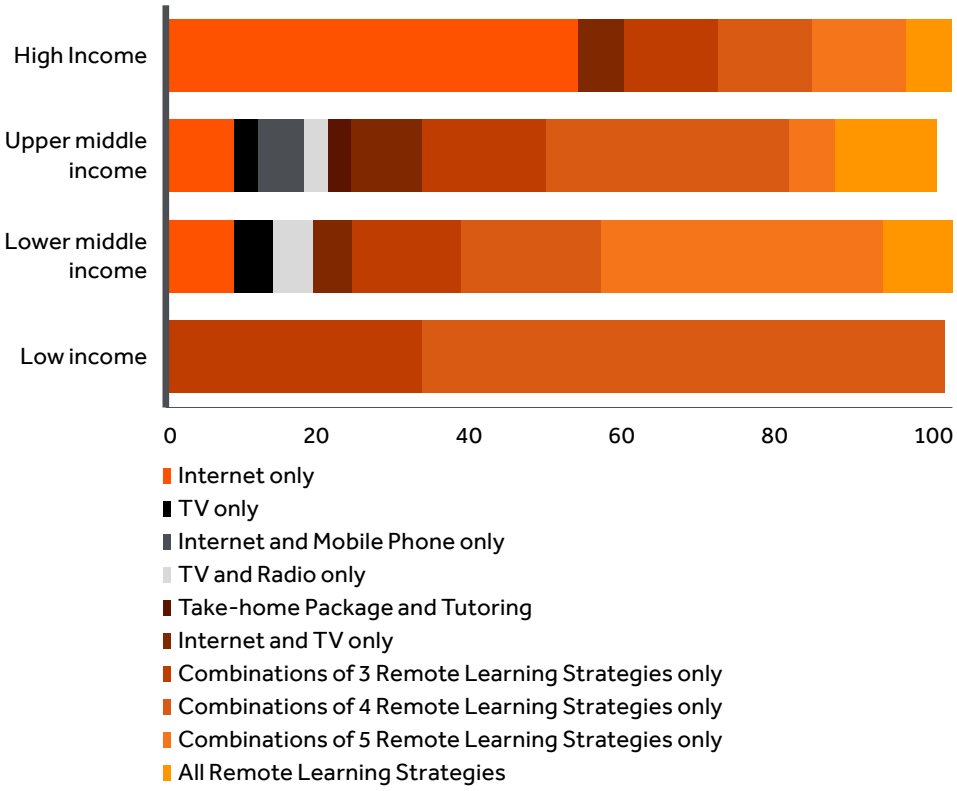
Note: Darker circles indicate a higher rate of connection
Source: International Telecommunication Union (2019)

The impacts of Covid-19 on the digital transition

Covid-19 lockdowns forced schools online, meaning communities without reliable internet connection were unable to access education. By the end of April 2020, 70% of countries had gone into lockdown. Internet usage rose by 70% as workplaces, schools and healthcare providers moved their operations online.[22] However, the ease with which these moved online, and the accessibility to services was not consistent. More than a billion children were unable to physically attend school while in lockdown, but the alternatives put in place varied significantly.[23] In high-income regions, most lessons were delivered via the internet, whereas in lower-income regions the approach was more fragmented, combining TV, radio, and take-home packs to deliver education (Exhibit 5). This disparity led to different education outcomes: Actis' South African fibre-to-home company, Octotel, observed pass rates in schools covered by its fibre of 89% during 2020, compared to 79% in unconnected schools.

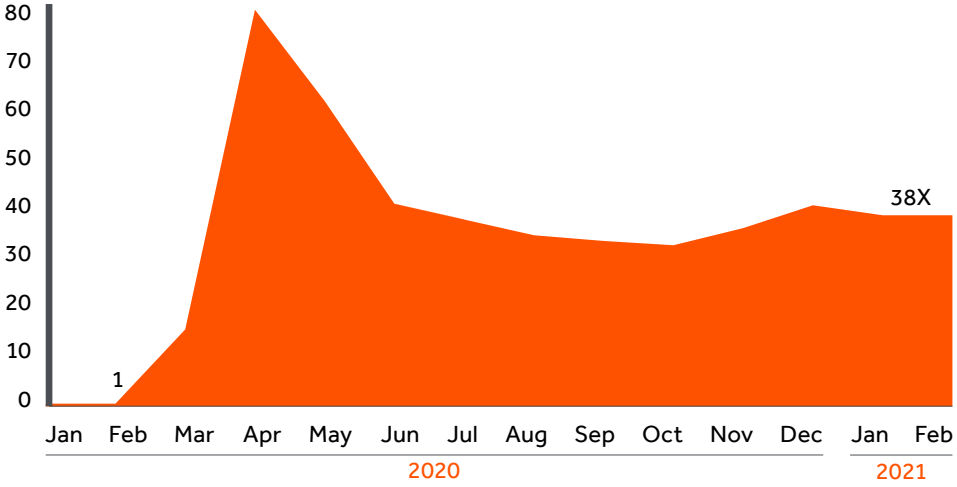
Covid-19 has accelerated a trend for the digitisation of healthcare services in many parts of the world, disrupting the status quo and leaving those without connectivity with limited access to essential services. For example, 71% of countries in Latin America and the Caribbean saw delivery of care for non-communicable diseases disrupted during initial lockdowns.[24] Essential pandemic updates and information were also most readily accessible online. In the US, unconnected rural populations struggled to access information and services for Covid-19, leading to higher illness and mortality rates in these regions (vs urban centres).[25] Without improved connectivity, disparities in access to healthcare are likely to worsen as telehealth plays an ever greater role in delivering healthcare (see Exhibit 6).[26]

EXHIBIT 5: PROVISION OF REMOTE LEARNING STRATEGIES BY INCOME LEVEL



Source: World Bank (2021) Remote Learning During Covid-19: Lessons from Today, Principles for Tomorrow

EXHIBIT 6: GROWTH IN TELEHEALTH CLAIM VOLUMES DUE TO COVID-19

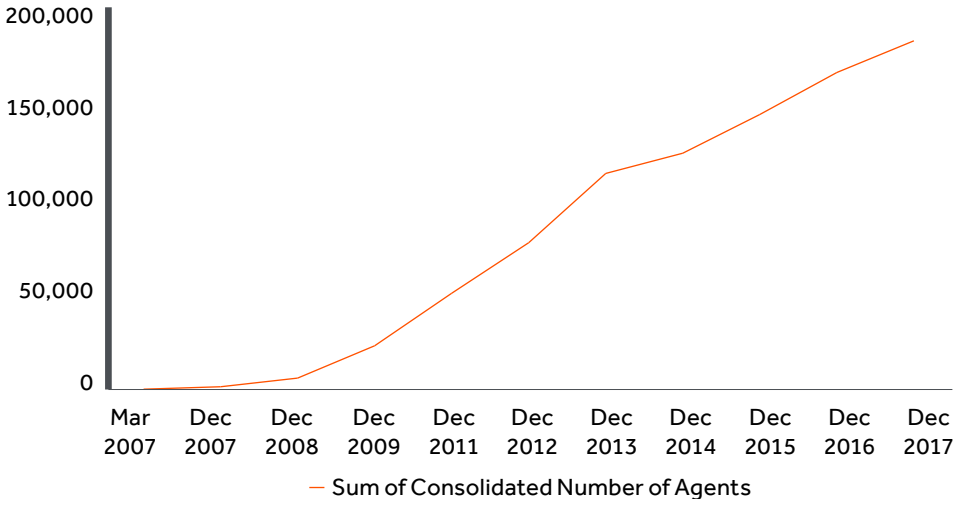


Source: McKinsey (2021) Telehealth: A quarter-trillion-dollar post-COVID-19 reality

THE OPPORTUNITY: DELIVERING POSITIVE SOCIAL OUTCOMES

Investing in digital infrastructure is a major part of the answer to closing the digital divide, whilst reaping a multitude of social benefits.

EXHIBIT 7: NUMBER OF MOBILE FINANCIAL SERVICES AGENTS IN KENYA



Source: Ndung'u (2018) Next steps for the digital revolution in Africa

The scale up of carrier neutral networks can reduce costs, making connectivity accessible to more people.

Historically, telecommunications companies have deployed their own fibre and mobile networks, leading to low asset utilisation and efficiency, and higher consumer costs. In carrier neutral networks, multiple operators can use the same core infrastructure to provide their services. This improves asset utilisation and makes expanding these networks to more remote areas more economically viable.[27]

Investing in digital infrastructure in under-served regions helps progress towards universal healthcare access.

In Indonesia for example, doctors are heavily concentrated in urban areas, with 49% of all hospitals located in Java and Bali, whereas Lampung (for example) has only ten doctors per hundred-thousand inhabitants.[28] There is also a stark gap between these regions in terms of internet connectivity. By improving mobile network coverage in rural areas, and moving healthcare services online, more people would be able to access healthcare regardless of where they live. As well as delivering consultations virtually, technology can also be deployed to deliver medicines to under-served areas, for example by using drones, making healthcare more affordable and accessible.[29] The adoption of digital technologies can also strengthen health systems themselves. The use of Electronic Health Records (EHR), for example, has been linked to improving disease surveillance and monitoring, as well as general health system enhancements such as the tracking of diagnostic patterns relating to cancer patients.[30]

Digital infrastructure is a proven catalyst for financial inclusion, providing access to useful and affordable financial services.

The rise of electronic payment systems and e-banking has been critical in formalising economies, making transactions more secure and reliable. For example, in Kenya, growing mobile network coverage has enabled the growth of a booming mobile-based financial services ecosystem and with it a 50% growth in financial inclusion from 2006-16.[31] With this, micro, small, and medium enterprises are transitioning to formal retail payments, virtual savings, and online micro-finance applications.[32] The growth of the financial services sector has also presented a major employment opportunity (see Exhibit 7).

Digital technologies also represent a huge upside for employment opportunities, by improving access to opportunities through increased connectivity.

Increasing internet penetration in low-income countries from 35% to 75% would create 140 million jobs, providing opportunities for remote-working.[33] Digitally-enabled jobs are also more resilient to disruptions, with 10% of the global workforce (300 million people) able to work from home during Covid-19 lockdowns.[34]

Greater internet coverage helps stimulate growth in rural regions by allowing entrepreneurs, SMEs, and farmers in under-served regions to connect to more customers via online marketplaces and to scale their operations.[35]

A number of new businesses are harnessing digitisation to improve farmer livelihoods. For example, Big Basket – a recent Actis portfolio company – delivers fresh groceries directly from farmers to customers across India. Big Basket's website and mobile app provide farmers with access to: advice; visibility on pricing; reliable payment via digital channels, and; cost savings and better sale prices. Online marketplaces can also provide opportunities for women to build their businesses by providing them with a route to markets from which they might typically be excluded or experience high barriers to entry.[36]

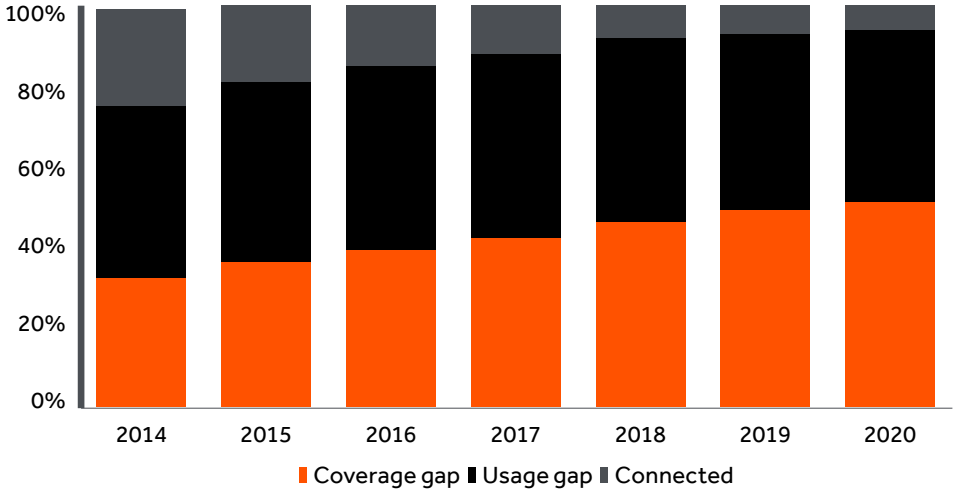
Technology is facilitating increasingly advanced climate and weather models that build physical and financial resilience to growing climate risks and natural disasters.

Companies like Jupiter Intelligence – a market leader in climate analytics – use high-resolution, forward-looking, science-based predictive modelling to assess the risk of events like flood, fire and extreme heat, calculating the value-at-risk on physical assets from these perils. Together with ultrafast communications infrastructure, more sophisticated climate risk analytics are key to predicting and adapting to climate change through further-reaching early weather warning systems which help target efforts to prepare for disasters and optimise where investment is needed in resilient infrastructure. This is key to avoiding property damage, loss of human life, and destruction to natural ecosystems. For example, these systems can include traffic data (or mobile phone usage as a proxy) to identify busy areas and put in place pre-emptive closures which avoid human casualties.[37]

Enhancing social outcomes through digitisation.

Action to improve digital literacy is essential to bring more people online and reap the full benefits of digital infrastructure investment. It is estimated that the 'usage gap' – people who live in areas with high-speed internet coverage, but do not use it – applies to 3.4 billion people; 7x more than those living in areas with no internet.[38] The usage gap has stayed relatively constant in recent years (Exhibit 8), showing how critical accessibility through affordability and digital literacy is in reaping the benefits of digital investments.

EXHIBIT 8: EVOLUTION OF GLOBAL MOBILE INTERNET CONNECTIVITY, 2014-20



Base: Total population, 198 countries
Source: GSMA (2021) The State of Mobile Internet Connectivity

Digital literacy and upskilling will also be critical to mitigate the risks to employment posed by the increased automation that comes with the proliferation of advanced digital technologies, which could lead to 30% of existing jobs being automated by the mid-2030s.[39] The majority of jobs displaced by automation are likely to be clerical (often poor/unskilled workers), which are typically based in urban regions.[40] Where this is the case digital training programmes will be essential to upskill workers and mitigate redundancies, boosting employability in the future economy. In the private sector, Actis portfolio company, Rack Centre – the leading carrier neutral data centre in Nigeria – launched a 'Skills to Employment Program' to address this issue by developing the digital skills of up to 170 low-middle-income young people in Lagos.

A tailored approach is required per region to determine which communications assets will deliver the most impact, balancing this with feasibility of implementation. In densely-populated urban areas, fibre can be installed in every home relatively cheaply to provide internet connection. 5G towers can produce a similar – but mobile – connection, potentially requiring lower up-front investment costs.[41] In sparsely-populated regions, however, fibre-to-home deployment is uneconomical, and 5G has too small a cell coverage range to be viable. 4G towers, which have high coverage and lower construction, running, and usage costs, are a more efficient option for bringing rural demographics online.[42]

INCREASING ACCESS TO DIGITAL TECHNOLOGY WILL DRIVE ECONOMIC GROWTH AND REPRESENTS A SIGNIFICANT BUSINESS OPPORTUNITY

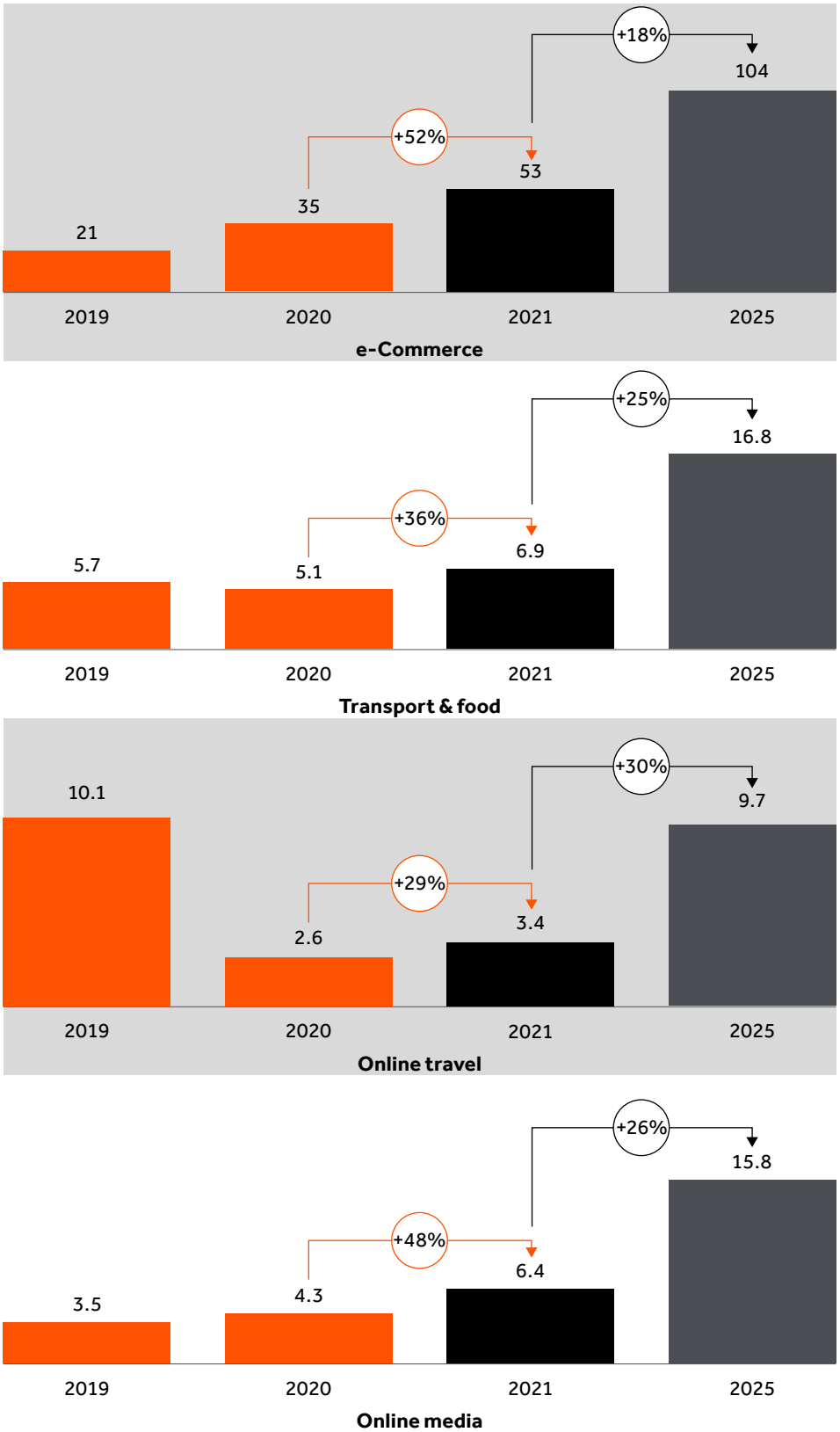
Digital infrastructure opens up under-served regions to new sectors and business opportunities, with ripple effects at the macro-economic level.

In Indonesia, for example, the internet economy is forecast to reach $146 billion in gross merchandise value by 2025 (see Exhibit 9). A rise of 10% in mobile broadband coverage could bring about a rise of up to 2% in the GDP of low- and middle-income countries.[43] The global 5G value chain alone is expected to generate $13.2 trillion USD in global sales activity by 2035.[44]

Actis case study: Leveraging cloud connectivity to provide clean drinking water in Rajasthan

Having established the Ostro Energy platform in India in 2014 – targeting a capacity of 1GW of wind and solar projects in 4-5 years – Actis developed a community investment strategy for each Ostro project. In Rajasthan, Ostro set up solar-powered water dispensers, or 'ATMs for water', which provide access to clean drinking water 24 hours a day via the use of top-up cards. By connecting the ATMs to the cloud, Ostro's ESG team are able to remotely track the impact of the innovation; for example, over 1.5 million litres of water has been delivered via the ATMs to date.

EXHIBIT 9: INDONESIAN INTERNET ECONOMY – GROSS MERCHANDISE VALUE BY SECTOR ($ BILLIONS) WITH COMPOUND ANNUAL GROWTH RATE (CAGR)



Source: IHS Markit (2019) The 5G Economy: How 5G will contribute to the global economy

THE OPPORTUNITY: ENABLING THE NET-ZERO TRANSITION

Digital infrastructure is critical to achieve net-zero targets by 2050. Digital infrastructure assets and technologies can reduce the GHG-intensity of electricity grids and drive efficiency in the real economy, enabling circular and service-based business models which use less resources, and embedding transparency into supply chains to support a nature-positive economy.

Reducing ghg-intensity of the energy & power sector

Digital infrastructure helps integrate renewable energy sources into the power mix and improve reliability of supply.

Renewable energy generation is on a rapid growth trajectory, with Bloomberg New Energy Finance forecasting that up to 13% of global power capacity in 2050 could come from photovoltaic (PV) energy and batteries, up from 4% today.[45] While the growth is promising, these decentralised and intermittent wind and solar energy sources – known as variable renewable energy (VRE) – require careful integration into the power mix to ensure grids can be operated safely and reliably. By utilising digital technologies, grids can be made smarter and more connected as they become more complex.[46] This allows VRE to be used when the sun shines or the wind blows, but avoids supply outages when demand is higher than VRE output. For example, internet-enabled sensors (known as IoT sensors), placed within the grid can measure the precise flow of energy, allowing for real-time optimisation of distribution and more efficient balancing of supply and demand.[47] Advanced digital technologies can further drive efficiency by collecting data on how energy usage varies depending on time of day, weather, and historic usage patterns, minimising the need for GHG-producing back-up generating capacity.[48] For consumers, AI can be used to automate switching between the grid, rooftop solar, and batteries as electricity sources based on individual preferences.[49] AI and cloud-based automation can facilitate autonomous charging and discharging of batteries to optimise power distribution.[50] These types of applications could reduce power sector emissions by 1.3 gigatons of CO_2e a year by 2030 (10% of 2020 power sector GHGs).[51]

Data Centres and Climate Action

Data centres are sites which house servers that process the data that comes from accessing emails, social media, e-commerce, and other online services. Data centres make up about 1% of global electricity usage (205 TWh) and have done so for nearly the past decade despite increasing output and demand thanks to improved efficiencies. But how to mitigate the climate impact of data centres as demand continues to dramatically accelerate will be key to ensuring that our digitised economy is a contributor to climate action and not a major driver of emissions.[52] This should be carefully considered by any digital investment strategy.

In 2019, tech and telecoms giants filled the top five spots of the USA's biggest renewable energy buyers.[53] By investing heavily in renewable generation, data centre operators are sending a strong demand signal for renewable energy. Big Tech firms such as Amazon, Facebook and Google – whose growth has fuelled energy demand for data centres – are implementing renewables-based strategies to reduce the carbon footprint of their operations. For example, Amazon Web Services (AWS), the largest hyperscale developer in the world, reached 50% renewable procurement in 2018. Google aims to decarbonise its data centre energy usage by 2030.[54]

The rise of hyperscale data centres is also tackling data centre emissions. Hyperscale data centres are centralised data centres which provide computing power, cloud computing, and big data storage to numerous users at once. This centralisation allows utilisation rates to be much higher at hyperscale centres than their on-site counterparts, at around 30-50% rather than <5%.[55] As an example of hyperscale efficiency, AWS reported that on average their hyperscale centres require 16% of the power needed by on-site centres for the same amount of computations.[56] This efficiency delivers positive outcomes both for sustainability and business, helping develop a hyperscale centre market forecast to grow to $128 billion by 2026.[57]

Building energy efficiency into the design and planning is fundamental to climate-smart data centres. Chayora, a Chinese data centre provider and Actis portfolio company, built efficient cooling and back-up power features into the design of its first project in Tianjin, resulting in a power usage effectiveness (PUE) score of 1.19, versus typical local government requirements of 1.5 or lower (where 1.0 would mean all energy is used by IT equipment with no waste).

Driving energy efficiency in the wider economy

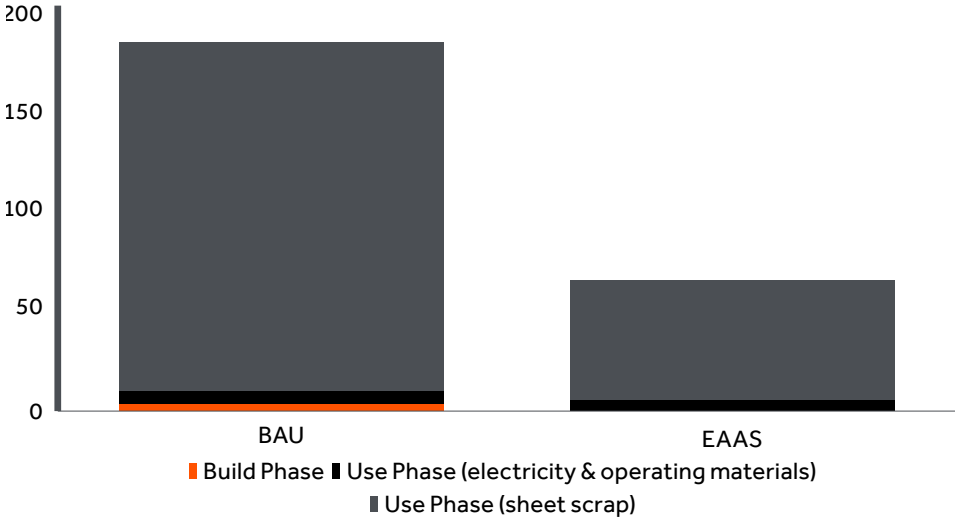
Digital infrastructure can also play a pivotal role in reducing energy consumption across a range of heavy emitting and/or high energy-consuming sectors.

The ability to collect and process data allows businesses to optimise energy consumption of their assets and processes.[58] For example, in the real estate sector, passive infrared (PIR) sensors (motion sensors) can be used to automatically switch off lighting and heating, ventilation & air conditioning systems when not required.[59] Advanced 5G-enabled sensors can be used in transport to track vehicles in real-time and optimise routes to minimise congestion, a major driver of tailpipe emissions.[60] Other digital solutions can further drive energy efficiency in transport, by enabling load-pooling and dynamic rerouting of delivery vehicles, both of which are used by Ninjavan, the e-commerce logistics company and Actis investee. These solutions help reduce emissions associated with e-commerce, which are 36% lower on average than those produced by shopping in-store.[61]

Promoting circularity

"IN OUR CURRENT ECONOMY, WE TAKE MATERIALS FROM THE EARTH, MAKE PRODUCTS FROM THEM, AND EVENTUALLY THROW THEM AWAY AS WASTE – THE PROCESS IS LINEAR. IN A CIRCULAR ECONOMY, BY CONTRAST, WE STOP WASTE BEING PRODUCED IN THE FIRST PLACE" – ELLEN MACARTHUR FOUNDATION

EXHIBIT 10: EQUIPMENT-AS-A-SERVICE GHG SAVINGS IN THE SHEET METAL PROCESSING SECTOR (KG CO2)



Source: SYSTEMIQ (2021) Everything-as-a-Service XaaS

A circular economy is based on three principles: (i) eliminate waste and pollution; (ii) circulate products and materials; and (iii) regenerate nature.[62] Digital infrastructure can help deliver on all three across a range of industries.

For example, waste along the supply chain can be reduced through textile identification technology to increase recycling rates.[63] Digital watermarking of plastic packaging can also streamline waste management processes, enabling new, more efficient models for sorting and recycling waste. And the use of plastic packaging for food preservation can be reduced in the first place by using digital trackers to better manage supply chains, helping to minimise both plastic use and food waste. As well as the impact on material use, this reduces the burden on the natural systems upon which our food supply depends.

Digital infrastructure can also enable the growth of service-based business models which help to decouple economic growth from emissions and resource use.

The 'X-as-a-Service' (XaaS) model promotes a move away from individual ownership of equipment (such as cars) to the provision of services instead (such as a car sharing platform).[64] Producers often retain ownership of the product for its full lifecycle, meaning they are incentivised to adopt circular economy strategies: to design longer-lasting products and to incorporate repair, reuse and recycling into their business. Digital technologies allow vendors to monitor and streamline the service they provide. For mobility, this helps to improve the attractiveness of shared transport options ('Mobility-as-a-Service') reducing the demand for personal vehicles and the number of cars on the road, tackling both embodied and tailpipe emissions. XaaS can also be applied to manufacturing: an 'Equipment-as-a-Service' approach can help reduce GHGs from sheet metal processing by up to 54% via higher utilisation, demand pooling, and cutting aggregation to minimise scrap (see Exhibit 10).

Unlocking nature-based solutions and improving agricultural practices

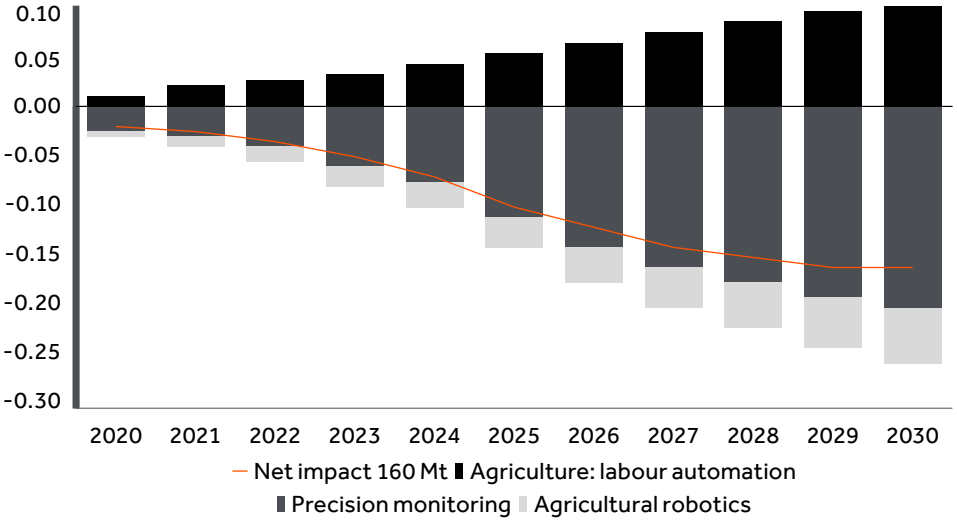
Technology can play a critical role to accelerate investment & transparency in nature-based solutions by improving monitoring e.g. of deforestation or over-fishing.

For example, Nature Map harnesses data to develop a global map of terrestrial biodiversity and ecosystem carbon stocks, which can help governments identify priority areas for protection and regeneration.[65]

Communications technology and solutions that harness big data can also improve the efficiency and resilience of agricultural practices – critical to reducing emissions given the food and land use system is responsible for around a third of man-made emissions.

As well as delivering positive outcomes for farmers through increased connectivity, digital solutions can also reduce inefficiencies in agriculture via enhanced monitoring and analytics (see Exhibit 11).[66] Digital precision agriculture tools can help protect biodiversity by unlocking significant reductions in agro-chemical input requirements (fertilisers, pesticides, herbicides, and fungicides) for a given yield by integrating data across whole crop production systems. In India, farmers can access real-time soil quality information on their smart phones thanks to AI-enabled tools.[67]

EXHIBIT 11: POTENTIAL IMPACT OF AI ON AGRICULTURAL GHGS (GT CO2E)



Source: Microsoft and PwC (2019) How AI can enable a sustainable future

THERE IS NO NET-ZERO WITHOUT NATURE-BASED SOLUTIONS. DIGITAL INFRASTRUCTURE IS CRITICAL TO DEPLOYING THESE SOLUTIONS, ENABLING REAL-TIME FOREST PROTECTION, SUSTAINABLE OCEAN MANAGEMENT AND REGENERATIVE FARMING.

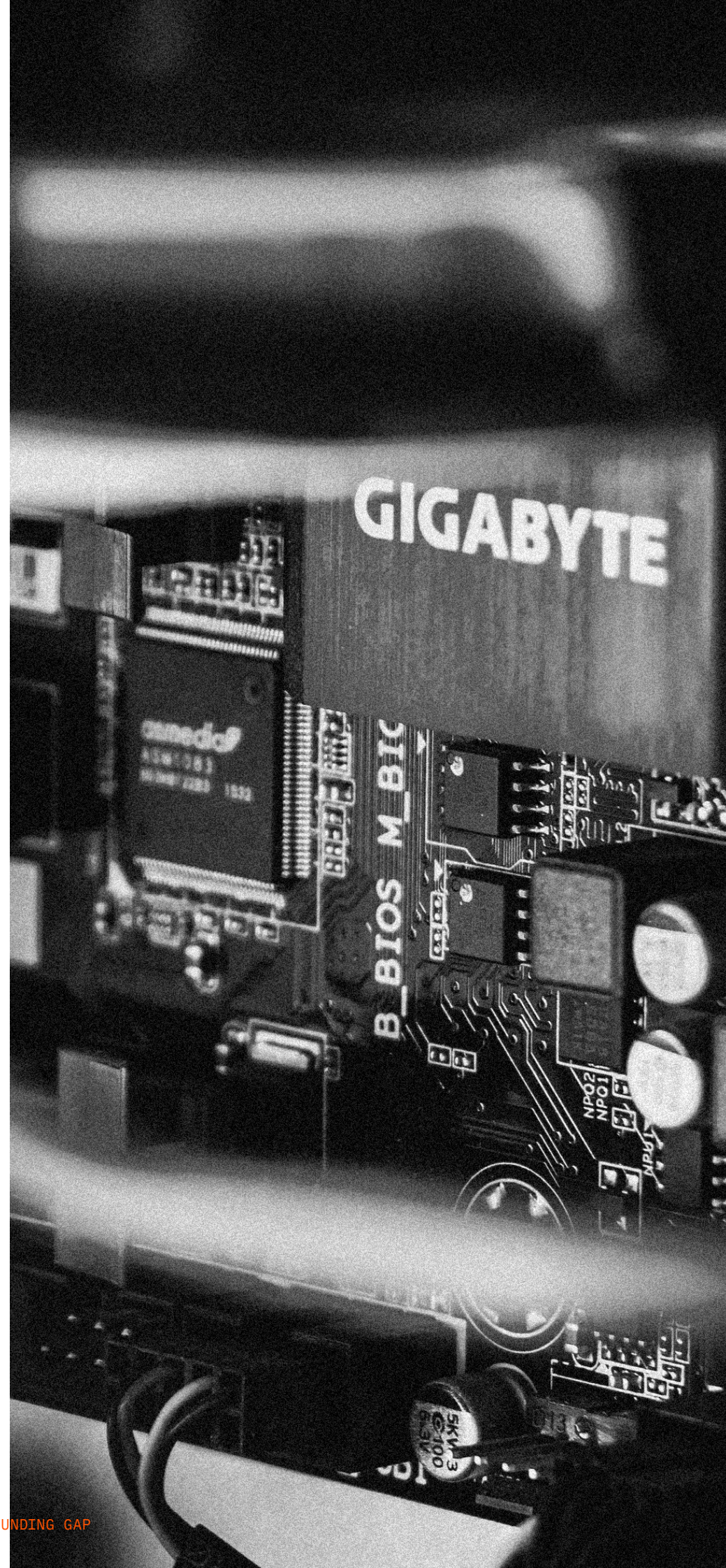
Chayora, Actis Asia Real Estate Fund Investment

CLOSING THE FUNDING GAP

Unlocking the social, environmental, and economic benefits of digitisation requires rapid, targeted investment in core digital infrastructure. The global funding gap is currently estimated to be $50 billion and forecast to grow to around $1 trillion by 2040.[68]

Universal access to broadband by 2030 would cost an estimated $428 billion, with 69% of this required in low income countries and other under-served regions.[69] Investing capital to improve coverage and accessibility will immediately drive better economic, social, and environmental outcomes.

Investors have a critical role to play in developing core digital infrastructure and Actis believes that closing the funding gap represents an unmissable opportunity to deliver for people and planet and rapidly improve the social, environmental and financial resilience of society over the next decade.



LIST OF TERMS AND ABBREVIATIONS

AI – 'Artificial Intelligence' – Intelligence displayed by high-performance computers (software).

Carbon stock – The carbon stored in an environment or ecosystem which has the capacity to accumulate or be released back into the atmosphere (e.g., forests are a valuable and significant carbon stock).

GDP – 'Gross Domestic Product' measures the monetary value of final goods and services—that is, those that are bought by the final user—produced in a country in a given period of time (e.g. a quarter or a year). GDP counts all of the economic output generated within the borders of a country.

GHGs – 'Greenhouse Gases' are the gases that trap heat in the atmosphere, which are released through natural processes and human activity. Carbon dioxide (CO2) is a GHG and is the largest single contributor to climate change. The United Nations Framework Convention on Climate Change covers the below GHGs: CO2, methane, nitrous oxide, F-gases.[70]

IoT – 'Internet of Things' – Products embedded with computing devices (hardware), which can send and receive data from other objects via internet connection.

Low-income country – A country with a gross national income per capita per year of $1,045 or less.[71]

ML – 'Machine Learning' – Computer algorithms (software) which can make predictions based on vast amounts of data.

Nature-based solutions – Actions to protect, sustainably manage and/or restore natural and modified ecosystems that simultaneously provide climate, human well-being and biodiversity benefits.

Net-zero – A state in which the amount of anthropogenic GHGs are balanced by removals of atmospheric GHGs via technical or natural means (i.e., net zero emissions means that GHGs emitted is equal to GHGs removed). Removed emissions are not the same as avoided emissions (where fewer GHGs are released into the atmosphere).

SDGs – 'The UN Sustainable Development Goals' – A set of seventeen targets adopted by the United Nations in 2015 as a universal call to action for people and planet, recognizing that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

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