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Digitalization and Development

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Digitalization and Development

Development Committee

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List of Acronyms

AI/ML	Artificial Intelligence and Machine Learning	ID	Identity Document
AWS	Amazon Web Services	ID4D	Identification for Development
CASA	Country Advisory Services and Analytics	IDA	International Development Association
CIF	Climate Investment Fund	IFC	International Finance Corporation
CO2	Carbon Dioxide	IoT	Internet of Things
CRISP	Crisis-Resilient Social Protection	JET	Jobs and Economic Transformation
CSIRTs	Cyber Security Incident Response Teams	LDCs	Least Developed Countries
DC	Data Centers	LICs	Low-Income Countries
DFS	Digital Financial Services	LMICs	Lower Middle Income Countries
EM	Emerging Markets	MIGA	The Multilateral Investment Guarantee Agency
FCV	Fragility, Conflict & Violence	R&D	Research and Development
FDI	Foreign Direct Investment	SMEs	Small and Medium Enterprises
FIFs	Financial Intermediary Funds	TMT	Telecoms, Media, and Technology
FY	Fiscal Year	UNICEF	United Nations Children's Fund
G2P	Government-to-Person	US	United States of America
GDP	Gross Domestic Product	VC	Venture Capital
GHG	Greenhouse Gas	WBG	World Bank Group
GRID	Green Resilient and Inclusive Development	WDR	World Development Report
GSMA	Global System for Mobile Communications		
ICT	Information and Communication Technologies		

Digitalization and Development

The pandemic has rapidly accelerated the uptake of digital products and services in developing countries. Digital platforms and services have enabled innovations that helped reduce the health, social and economic costs of COVID-19. They offer great potential for helping build resilience and preparedness against future crises and for mitigating and adapting to climate change. However, the pandemic also demonstrated the importance of building strong and inclusive digital foundations during normal times for countries to rely on digital solutions for mitigating crisis impacts effectively, and more broadly, to contribute to the twin goals of reducing poverty and promoting shared prosperity sustainably.

This paper aims to present key trends that have emerged due to the pandemic in the digital economy space and propose a set of policy priorities for maximizing digitalization's development dividends while managing risks. The paper first describes the essential role that digital connectivity and services have played in recent years and provides evidence on the significant gaps in digital access and uptake that the pandemic has exposed. It then proposes a framework for client countries to maximize the development impact of digitalization, focusing on four foundational policy areas: digital infrastructure, digital platforms, digital enablers, and digital safeguards, and two cross-cutting areas.

The paper highlights the WBG's commitment to supporting countries in this development agenda, using its knowledge, financial instruments, convening power, and partnerships. The paper underscores the many ways in which digitalization contributes to the WBG's corporate alignment around Green Resilient and Inclusive Development (GRID). The concluding section summarizes and proposes questions for the Development Committee's discussion.

I. The pandemic led to a surge in Internet usage but also exposed huge digital connectivity gaps

Before the pandemic, a rich economic literature had already provided significant evidence of how digital connectivity and services contribute to growth, productivity, employment, equity and poverty reduction, thus supporting efforts towards achieving the WBG's twin goals.ⁱ In a joint study with Google, IFC estimates that Africa's digital economy potential can reach \$180 billion by 2025, or 5.2% of the continent's GDP.ⁱⁱ

Digitalization is transforming "analog" sectors, such as healthcare, education, financial services, and agriculture, among others. It is improving the delivery of social protection programs for those in need, creating new jobs, and expanding financial inclusion. Digital solutions can increase the quality of government services and enhance accountability by providing new channels for public engagement and reducing opportunities for corruption. Digital technologies also foster entrepreneurship and unlock new economic opportunities for businesses by creating new markets and reducing barriers for new entrants.

The onset of the pandemic both demonstrated the remarkable ability of digital technologies to contribute to economic and social resilience while also exposing the growing digital divide and its grave implications for social inclusion.

While the pandemic boosted connectivity, stark inequalities in access and usage impede full inclusion

Data traffic in emerging markets increased by 25% to 50%,ⁱⁱⁱ and the number of Internet users increased by 800 million. However, as of 2021, 2.9 billion people remain offline.^{iv} More than 43% of the population in developing countries are not using the Internet – in LDCs, the figure is 73%.^v Fragility, conflict, and violence (FCV) conditions also affect the coverage and use of digital technologies. Only 29% of the population are mobile internet users in FCV countries, compared to 47% in non-FCV developing countries.

The disparities between regions are enormous. Less than 15% of the population in Africa has broadband Internet access, compared to 88% of North America and 84% for Europe and Central Asia. In all but 8 African countries, broadband penetration is below 15%.^{vi} A vast digital divide is manifest between urban, peri-urban, and rural dwellers, as well as by gender. Internet use is 76% in cities, compared to 39% in rural areas.^{vii} Across gender, men are 52% more likely to be online than women in developing countries.^{viii}

At the same time, digital connectivity and services helped build critical resilience to pandemic impacts

By permitting online service delivery and remote work, digital applications proved critical for both firms and governments to continue operating during lockdowns.^{ix} Governments relied on digital solutions to deliver services, including expanded social protection programs and digital applications in education and public health. Digital financial services – including payments and Internet banking – were vital for expanding e-commerce and providing fast economic relief to individuals and businesses. Many countries deployed new or expanded social assistance programs, relying on digital infrastructure and databases to onboard new beneficiaries and deliver payments (Box 1).

With school closures affecting more than 1.6 billion students, many countries resorted to digital technologies to respond to the learning crisis created by the pandemic (Box 2).^x However, the education sector also clearly illustrated how the digital divide prevented large parts of the developing world from benefiting from the deployment of digital solutions. According to UNICEF, the lack of access to the relevant technologies prevented at least 463 million – or 31% – of schoolchildren worldwide from accessing digital and broadcast remote learning.^{xi} Internet-based remote learning reached only 6% of children in LICs.^{xii}

Digital technologies were a critical component of the public-health response to COVID-19. They were used for epidemiological surveillance, interruption of community transmission via contact tracing and mobility pattern analysis, rapid case identification, public communication, and clinical care (Box 3).^{xiii} Digital solutions also facilitated the development and delivery of COVID-19 vaccines. Beyond the human development sectors, the pandemic further increased awareness of the potential of digital-based government service delivery to improve public sector efficiency and transparency.

Private telecom and technology companies undertook several initiatives to reach and support their poorest customers. Telecom operators pivoted business models to adapt to increased demand^{xiv} while digital platforms expanded remote delivery of essential products to consumers.^{xv}

The pandemic accelerated ongoing trends in innovation with the potential to boost development further

Cloud computing

In recent years, cloud computing solutions boomed, offering substantial economic potential for LMICs by making advanced productivity tools available to small and medium firms at relatively low costs.^{xvixvii} The industry is almost entirely led by the private sector. In the future, increased adoption will require investments in data infrastructure, high-capacity networks, and international connectivity.^{xviii} While many LMICs are investing fast to develop the underlying infrastructure for Cloud services, significant gaps remain in local or regional Data Centers (DC) needed to enable Cloud computing.^{xix} As data volumes expand, greening data infrastructure will become only more critical.

Digital platforms

Digital platforms of all types multiplied during the pandemic and showed a strong potential for reshaping traditional sectors and accelerating private sector innovation. E-commerce boomed, accelerating the "delivery as a service" trend and creating diversification opportunities in financial services, e-Logistics, and

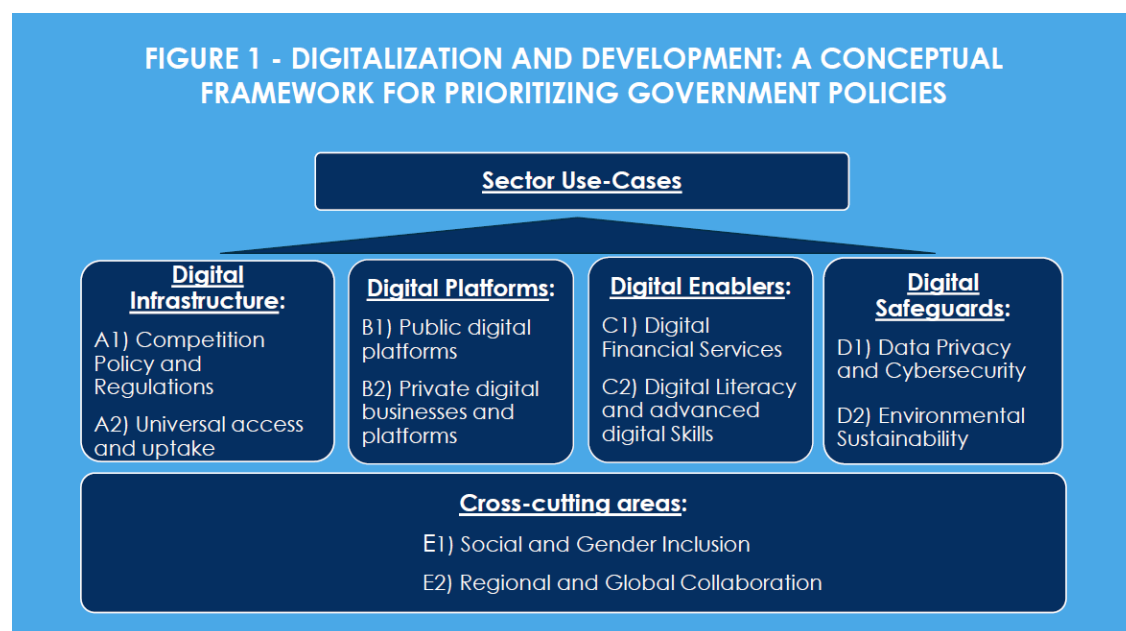
last-mile connectivity.^{xx} In the future, the widespread adoption of affordable and 'off-the-shelf' Artificial Intelligence and Machine Learning (AI/ML) tools will be a crucial driver of digital innovation.^{xxi} Technology startups are already spurring entrepreneurship in emerging markets, with over 400 new technology companies exceeding \$1 billion of valuations created in 2021 in China and India alone^{xxii}. The example of a startup from Senegal – the first "unicorn" in Francophone Africa – illustrates the power of digital innovation to reshape economic sectors and ultimately lead to more affordable services for consumers.^{xxiii}

Digital Financial Services

Before the pandemic, digital financial services (DFS) had played a critical role in enabling the rapid expansion of financial inclusion in many countries, including Kenya, Uganda, Tanzania, and India.^{xxiv} Access to affordable financial services has proved critical for poverty reduction, economic growth, human capital^{xxv}, and resilience against financial emergencies^{xxvi} – such as job loss or crop failure.^{xxvii} During the pandemic, DFS helped financial institutions continue to serve customers despite lockdowns and proved vital for enabling e-commerce and government-to-person (G2P) payments. DFS will continue to be an essential enabler for the digital economy – by facilitating increased numbers of financial transactions in digital platforms, access to finance for new businesses and business models, and the adoption of digital technologies.

II. Policy Priorities to maximize digitalization's development dividends while managing risks

Developing a vibrant, inclusive, and safe digital economy requires building solid foundations in four critical policy areas, covering digital infrastructure, digital platforms, digital enablers, and digital safeguards (Figure 1). The policy priorities listed under these four areas are not meant to cover all aspects of the digital economy, only those deemed most important for maximizing the development dividends of digitalization while managing its main risks. The relative importance of each policy priority varies across countries, depending on their level of development and context. However, a comprehensive, whole-of-government approach is generally required for maximizing digitalization's development impact.



In addition to advancing reforms in those four foundational areas, a cross-cutting focus on social and gender inclusion is needed across all policy areas, together with a proactive reliance on regional and global collaboration to address common policy challenges that are best addressed at the international level. Establishing solid foundations in these selected policy areas allows for a growing array of use-cases to become viable, involving the application of digital technology across various economic sectors. A good use-case example illustrating digital technologies' contributions to GRID is "smart farming" (Box 4).

Digital Infrastructure

Working toward high-quality, affordable, and reliable broadband internet that is accessible throughout the developing world is a vital policy priority so that the digital economy yields inclusive development impact and further enhances social resilience. It entails leveraging competition policy and sector regulations to encourage private entrants and strengthen competition in digital infrastructure markets.

To achieve universal access and uptake, competition policy and sector regulation need to be complemented with well-targeted government interventions to facilitate infrastructure rollout in commercially unviable areas and ensure adequate demand for digital services among the broader population (Box 5).

Priority A1: promoting competition to expand private investment in digital infrastructure

More investment into infrastructure is needed throughout the digital value-chain in LMICs, from submarine cables to last-mile connectivity, requiring a strong focus on creating an enabling environment for expanding private sector investments. Competition between private operators on a level playing field, subject to a good regulatory environment, is the best way to benefit consumers by reducing prices and improving quality while still providing adequate commercial returns to operators. Foreign Direct Investment (FDI) can play an essential role in financing substantial investment needs.

To that end, enhanced competition policy needs to play a fundamental role in ensuring that broadband and other digital markets are effectively competitive. Both mobile and fixed telecoms markets tend to be more concentrated in LMICs than high-income countries^{xxviii}. A higher concentration in retail mobile markets is associated with lower uptake^{xxix}. Weak competition is of particular concern in Africa, where monopolies and duopolies still exist in many countries, including crucial bottleneck markets such as international connectivity.^{xxx} They also persist in domestic fixed networks, essential for backbone and backhaul to expand broadband beyond major urban areas and deliver high-speed connections in urban and industrial areas.^{xxxi} Currently, high concentration levels coupled with vertical integration of large operators operating bottleneck infrastructure restricts effective competition in many countries.

Broadband markets

Expanding network coverage continues to be a challenge, particularly in low-income countries where a significant proportion of the population still does not live within reach of a mobile broadband signal. Large-scale investment in networks is needed to provide national broadband coverage. To deliver adequate 4G, Africa alone needs at least half a million new kilometers of fiber, at the cost of anywhere from US\$15,000 to US\$30,000 per km^{xxxii}

A critical policy priority is for countries to eliminate remaining high entry barriers that limit competition in markets for digital products and services, especially in international access and broadband. Regulatory frameworks promoting shared infrastructure models (towers, wholesale fiber networks and carrier neutral data centers) are also vital to drive down costs and make services more affordable in urban and rural areas. Also critical is to allow new market entrants to leverage existing public sector fiber assets and

spin-off for commercial usage underutilized and unused government-owned telecom infrastructure: Africa has about 40% of its fiber networks, over 400,000km, owned by government, and underutilized^{xxxiii}.

The persistence of weak competition in digital markets in many LMICs is due to policies restricting entry and reinforcing dominance or discouraging rivalry based on a level playing field. One important priority is thus to implement pro-competition rules through obligations on dominant operators to eliminate barriers to entry or expansion of smaller and new service providers, provide cost-oriented access to bottleneck infrastructure, and reduce consumer switching costs. Similarly, rules limiting exclusivity and allowing for open access are essential for competition in international connectivity. Ensuring sound governance of state-owned enterprises operating in digital markets is also a priority, including enhancing competition in the digital value chain.^{xxxiv}

Ex-ante regulatory measures are also needed to reduce costs. Rules that allow for the quick and affordable installation of towers and fiber are critical. Also essential are regulations to streamline and reduce the cost of securing rights of way over network assets (such as power transmission lines, roads, and government buildings). Furthermore, countries that have not adopted the global free trade agreement in IT equipment are likely to face substantial barriers to developing their manufacturing industry. As countries move towards more advanced 4G and 5G technologies, the efficient management and allocation of limited spectrum resources will become increasingly critical. Governments will need to make trade-offs between revenue generation and universal access objectives.

Increasing attention should also be paid to the affordability of smartphone devices and data plans, which represent a significant barrier to access for poor consumers. Finally, countries need to ensure that the digital sector tax regime balances the need for incentives to invest and innovate with that of raising revenue in an equitable way (from a distributional perspective).

Data infrastructure

As more activities migrate onto the Internet, countries have an increasing need for the data infrastructure required to exchange data (through Internet Exchange Points), store data (at colocation data centers), and process data (through on-ramps to cloud computers). The majority of developing countries that lack adequate data infrastructure incur much higher costs for these data operations. The private sector can predominantly undertake the development of such data infrastructure. To that end, a supportive regulatory environment needs to be in place, together with a competitive market, good sector governance, and abundant, low-cost renewable energy. It is also vital to create a supportive environment for trade in data-enabled services, which entails balancing data protection measures to safeguard data exchanged across borders while respecting the applicable legal frameworks.

While small countries may lack the economies of scale to develop the necessary data infrastructure, physical cross-border integration of networks and regulatory harmonization of digital markets at the regional level may allow them to benefit from shared infrastructure.

Priority A2: using public funds to close gaps in people's access to and use of digital technology

Competitive, well-regulated markets with the right investment incentives will fill much of the coverage gaps in digital connectivity. However, some communities will remain commercially unviable for broadband networks to serve for the foreseeable future, requiring targeted public policies to ensure universal access. Even where digital connectivity is available, a large share of the population faces affordability and literacy barriers that prevent uptake of data services.

Policy decisions on sector regulation, licensing, and taxation can all have a major impact on availability and affordability of digital services. A key approach is to enhance competition through market structure and regulation. Effective competition drives higher investment in networks and expands coverage that maximizes profits. Competition can be enhanced by licensing and regulatory rules that support competition, constrain anti-competitive behavior and serve to reduce costs for operators. Spectrum and operating licenses can also contain coverage obligations that provide an implicit subsidy when allocated through a competitive auction process.^{xxxv} With successive awards of spectrum over time, governments can create regulatory incentives for operators to expand coverage. This has proved an effective approach in many countries.

An appropriate tax treatment for telecom operators and targeted financial investment incentives are additional policy levers to promote digital inclusion. The tax regime imposed on telecoms operators has implications for profitability and the return on investments, including in marginal areas. Governments should consider the implications of the tax regime for operators' incentives to expand coverage and reduce prices. Specific financial incentives can also be applied to private operators in order to encourage them to invest in marginal areas, such as allowing them to offset their costs of network capital expenditures and operating costs that benefit targeted segments of the population (e.g. rural, low-income peri-urban populations) with cost free assignments of valuable radio spectrum rights of use. Another example is allocating amounts paid by private operators for spectrum rights of use for investment jointly with private operators in broadband services for targeted populations.

Public support can be channeled in different ways although governments need to ensure that any public subsidies are used in the most efficient way possible while focusing on promoting private sector investment.^{xxxvi} Public subsidies can also be used to increase take-up, mainly if they are targeted at vulnerable and disadvantaged groups. Recently, some developing countries have had promising results using public-private partnerships and a combination of well-calibrated demand and supply-side subsidies. In IDA FCV countries and frontier markets, governments can use other instruments such as risk guarantees and blended finance to improve the financial viability of network investments. To make broadband devices more affordable, risk-guarantees or other instruments can be used to support consumer credit markets.

Universal Service Funds are another mechanism that governments in about 90 countries have used with the objective of reducing broadband network coverage gaps, albeit with mixed results. In some cases, they have worked reasonably well, serving as financing and incentive mechanisms to extend network coverage into areas that would not otherwise have been covered. In other cases, they have not worked well – often being slow to implement and ending up tying up funds that could have been used more effectively in other ways. Successful Universal Service Funds have been characterized by a well-articulated policy and vision; transparency and accountability in resource assignment processes; autonomy from political interference and professional management for better planning and implementation, including the ability to respond to evolving priorities.^{xxxvii}

A critical complementary policy to achieve universal digital access is energy access. Closing the gap in access to electricity, in particular, is a prerequisite for enabling the deployment and usage of digital technologies, especially in Sub-Saharan Africa, where that gap affects more than half of the population. Thus, both policy agendas need to go hand in hand, including exploiting potential synergies such as by deploying fiber optic cables together with energy transmission lines and using renewable energy to power investments in digital infrastructure.

Digital Platforms

The second set of foundational policy priorities involves developing a conducive environment for public and private digital platforms to offer a growing array of products and services through digital means.^{xxxviii} Well-designed public platforms can boost government efficiency and transparency and promote the development of private digital businesses. Policy reforms are also needed to build thriving business ecosystems that support the growth of digital companies, including through platform business models.

Priority B1: transforming governments through public digital platforms

The pandemic illustrated the opportunities that the digital transformation of governments offers to improve service delivery for citizens and private firms. Digital public platforms can significantly enhance government operational and economic efficiency and boost service quality and accountability. They can also provide new channels for public engagement, make government services more citizen-centered, and catalyze private sector innovation. It requires building digital government systems as horizontal infrastructure that allows the public and private sectors to develop their applications on top. A holistic approach across the data life cycle – from creating or collecting information to processing, storing, sharing, using, archiving, and destroying data – will help ensure that systems and practices are consistent and interoperable and reduce risks related to leakages, loopholes, and liabilities.

To that end, an important priority is to increase the use of open standards, open interfaces, and interoperability-by-design. It requires developing "digital stacks" that link digital ID, trusted and secured data sharing, and digital payment systems as rails that enable cashless, paperless, and remote transactions. Social protection is a good example. The use of digital data for updating social registries and making digital payments has enabled adaptive social safety nets with more effective targeting, ultimately allowing for better use of limited resources for alleviating and preventing poverty (Box 6).

Although digital technologies and the increasing use of data provide many opportunities for improved government and service delivery, they also create new risks such as bias caused by AI in decision-making and privacy concerns arising from the use of biometric ID systems. There are growing concerns about risks that digital technologies could be used to amplify discrimination towards marginalized groups, lead to misinformation, and exacerbate fragility and violence. Openness and transparency in how such technologies are deployed, combined with a robust data protection regime, will be key to maintaining confidence and trust and mitigating risks.

Priority B2: developing digital businesses and platforms

Digitalization has the potential to boost firm productivity and job creation. Digital Platforms, in particular, leverage powerful network externalities, data, and disruptive technologies to enable market efficiencies, increase welfare for consumers, and boost productivity for businesses.^{xxxix} However, their growth in developing countries remains constrained by several barriers, including the availability of affordable quality digital connectivity, concerns with privacy and cybersecurity, absence of local venture capital and financial technologies, and a lack of a level playing field within the technology sector and with traditional businesses.

Several specific policy and regulatory reforms can help alleviate these barriers. Key areas of intervention^{xl} include regulations that facilitate the sharing and reuse of data through interoperability standards for data platforms and open-access rules – for example, enabling the public use of government data subject to the necessary safeguards. To boost local digital entrepreneurship, it is also essential to support the development of the venture capital industry (Box 7) and to consider matching private sector funding with

government funds. It is also vital to develop legislation for e-transactions intermediary liability and promote the expansion of cloud services.^{xii} Policies for digital technology adoption are essential to ensure enterprises, especially SMEs, informal firms, and farmers, benefit from productivity-enhancing digital solutions. Finally, to address competition and regulatory issues associated with digital platforms, countries need to strengthen their regulatory authorities, including anti-trust agencies.

Digital Enablers

Achieving a genuinely inclusive and transformational digital transformation requires supporting workers and businesses with two key *digital enablers*: digital financial services (DFS) and digital skills. DFS provide individuals with convenient and affordable channels to pay, save and borrow. Firms can leverage DFS to transact with customers and suppliers, build credit histories and seek financing more easily. Governments can use DFS to increase efficiency and accountability in various payment streams, including social transfers and tax payments.

Countries also need a digitally savvy workforce to build robust digital economies and competitive markets. Digital literacy is critical for workers to benefit from the new job opportunities created by the digital economy and the general population to use and benefit from digital products and services increasingly. Investments in digital skills are also vital in providing businesses with the skilled workers they need to remain competitive, from the basic skills now required in most jobs to the advanced digital skills required for developing local digital platforms and applications.

Priority C1: a conducive environment for the development of digital financial services

Responsibly enabling digital transformation in the financial sector requires efforts to facilitate market entry of new players and business models with appropriate Central Bank supervision. It also requires strengthening regulatory processes and ensuring open and fair access to critical financial infrastructure for all players. To further expand both the benefits and uptake of DFS, new emerging priorities include the digitalization of large-volume, recurring payment streams and the expansion of electronic retail payments, including for e-commerce (Box 8). These emerging areas further elevate the importance of ensuring adequate supervision by the Central Bank and other sectoral regulators, including safeguarding integrity and stability of the financial system, fostering competition, and protecting and supporting consumers, especially those in disadvantaged groups.^{xlii}

Other policy priorities to ensure social and gender inclusion in the development of DFS include adapting financial consumer protection frameworks to the specific needs of DFS and developing financial literacy programs covering digital skills relevant for the use of DFS. In addition, well-designed incentives to consumers, merchants, and financial service providers tend to increase the use of digital payments. Finally, it is imperative to improve data protection and privacy in the financial sector and ensure cyber security for providers and systems (see priority D1).

Priority C2: promoting digital literacy and advanced digital skills to leverage new job opportunities and help mitigate potential negative impacts on labor markets created by digital technologies

The demand for digital skills grows as economies become more focused on digital technologies. Basic digital skills are required even for occupations that are not primarily digital: in Vietnam, for example, that is the case for 68% of occupations. A recent IFC study came to a similar conclusion for Africa. It is estimated that over 230 million jobs in Sub-Saharan Africa will require digital skills by 2030, with a strong need for introductory and intermediate digital skills training. Higher-level, more advanced digital skills are critical for developing, adapting, and diffusing digital technologies, especially in the technology sector.

In addition to helping create new job opportunities and supporting the adoption of digital solutions, enhanced digital skills can help mitigate risks associated with potential negative impacts on labor markets created by technology and the growth of digital businesses. Digital technology disrupts many traditional markets, which negatively impacts some households through job replacement, casualization of labor in the gig-economy, and pressure on traditional retail business models.^{xliii} Governments are looking at a range of policy responses to mitigate some of the risks this imposes on households. These include tax incentives to support local businesses, labor-market regulations to protect gig-economy workers, retraining programs, and strengthening workers' digital skills.^{xliv}

The provision of basic and advanced digital skills should become a critical part of countries' educational policies (Box 9). To that end, interventions are needed at three levels: developing ICT in education policy frameworks, expanding digital skills programs, and increasing the digital connectivity of educational institutions.^{xlv} Public education and training programs can also be effectively complemented by programs offered by private sector service providers.^{xlvi}

Digital safeguards

Strong safeguards are needed to manage and mitigate some of the main risks associated with the digital economy's growth, including to foster trust in the utilization of digital services, and increase their uptake. Policy priorities include enhancing privacy protection in private and public systems and ensuring the security of critical information and infrastructure. Adequate data privacy and cybersecurity are prerequisites for trust and security in data systems, which is a crucial driver of the adoption of digital solutions.

Similarly, there is a risk that growth in the digital economy can further increase greenhouse gas (GHG) emissions and economies' vulnerability to environmental shocks affecting their digital infrastructure. Policy action is needed to mitigate such risks by increasing energy efficiency, the reliance of the sector on clean energy, and its resilience to climate shocks. Beyond taking such protective actions, countries can further leverage digital technologies to enhance climate change mitigation and adaptation.

Priority D1: policies to promote trust and security in data transactions by avoiding or limiting harm arising from the misuse of data, including infringements on data privacy and cybersecurity

As highlighted in the WDR 2021, appropriate government regulations are critical for promoting trust and security in the digital economy and thus increasing the effectiveness of other policy levers by making citizens and businesses more willing to adopt digital solutions. To that end, countries need to strengthen the legal and regulatory framework for data and adopt regulations to protect data users from various potential abuses, including privacy protection for personal and non-personal data.^{xlvii}

The transition to digital has also increased countries' exposure to cyberattacks, and the rapidly evolving cybersecurity landscape is escalating threats for governments, companies, and individuals alike. Both the private and the public sectors need to scale up their focus on scrutinizing and addressing cybersecurity risks. It requires a broad effort to develop institutions, systems, and human capacity. In practice, it means undertaking diagnostic analysis of cybersecurity capabilities, establishing Cyber Security Incident Response Teams (CSIRTs), and building cybersecurity into all aspects of decision making. In addition to adequate legal frameworks for data protection, it is vital to strengthen associated institutions – for example, data governance entities, data protection authorities, and cybersecurity agencies.

Priority D2: greening digital infrastructure and using digital technologies to support climate action

Ensuring that the digital transformation takes place in a way that is consistent with – and supportive of – the climate change agenda is another essential policy priority (Box 11). Current estimations of the ICT sector's relative shares of global CO2 emissions vary, but a reasonable estimate range from 2% to 4%. Rapidly rising production, usage, and disposal of ICT can significantly increase the sector's GHG emissions. Several interventions and investments are needed to alter that trend, including 'greening' existing infrastructure, minimizing emissions as new infrastructure is deployed, and improving the energy efficiency of existing and new infrastructure. Improvements in sustainable energy, battery storage, and data center design can significantly increase power usage effectiveness. Still, effective data management, notably the transition to the cloud, will be a game-changer.^{xlviii}

Beyond the challenge of limiting its emissions, digitalization also creates sizable opportunities for helping achieve climate change mitigation and adaptation goals.^{xlix} Digital technologies using satellites and terrestrial networks to monitor, analyze and map environmental conditions are already being deployed in climate change adaptation strategies. For low-lying coastal countries or those with river systems prone to flooding, digital networks are the basis of early warning systems that can save lives and livelihoods in the event of natural disasters. Similarly, digital payments systems are the most effective tools for getting emergency financial support to households in the aftermath of climate-related events.

Digital is also a key component of reducing GHG emissions across various sectors. For example, digitalization is a critical aspect of the shift to smart grids, small-scale distributed renewable generation, and real-time energy pricing in the energy sector. Digital technologies are also a key component of efforts to increase energy efficiency in hard-to-abate sectors such as manufacturing. They play an essential role in reducing losses in water utilities and are vital for efficiently integrating multiple transport modes, thus helping decelerate rapidly growing transport emissions. Moreover, digitally enabled precision agriculture is an important tool for making agricultural production more sustainable (see Box 4).^l

Cross-cutting areas

All aspects of the digital economy need to be inclusive, giving equal opportunity to all social groups and men and women. Similarly, it is in most developing countries' best interest to explore the synergies arising from regional and global collective action on various digital economy challenges.

Priority E1: ensuring that social and gender inclusion are mainstreamed across all policy areas

To maximize development impact, it is essential to design reforms and investments – across all policy areas – to connect all social groups to the opportunities generated by digitalization. This requires catering to the specific needs of vulnerable groups, people living with disabilities, and those living in more remote areas. Examples include government programs and regulations aimed at supporting the rollout – with the necessary safeguards – of digital services targeted at consumers that are currently offline. To that end, an important tool that needs to be deployed more broadly is Digital Identification (Box 10).

Cross-cutting efforts are also needed to leverage digital technologies for enhancing gender equity. For example, digital technology can help reduce gender gaps in access to markets, services, and information, boosting women's agency, self-reliance, and participation in economic activity. Digital solutions can also help address the mobility challenges women face in many developing countries, thus facilitating their access to markets, employment, and educational opportunities.

In FCV contexts, special attention is needed to leverage digitalization to contribute to positive social outcomes, including by helping address the drivers of fragility, conflict, and violence. This may entail using digital to improve the quality and accessibility of public services, supporting the rebuilding of institutions, and enhancing trust by helping bridge societal divides and sowing the seeds of mutual understanding among warring groups.^{li}

Priority E2: enabling regional and global cooperation to address common policy challenges

Many of the infrastructure barriers that limit the expansion of the digital economy cannot be fully resolved at the national level, particularly for small countries. International cooperation can help implement many of the policies needed to enable the digital economy in more efficient and effective ways (Box 12). For example, regional collaboration can play a valuable role in developing data infrastructure by providing scale efficiencies. While large data center operators are reluctant to deploy in smaller markets due to a lack of scale and returns, regional cloud hubs could enable these entrants.

Another example is the need for workable international rules on cross-border data flows, which are becoming an increasingly important factor in the growth of the digital economy and trade in data-enabled services.^{lii} Similarly, international cooperation is needed on issues such as competition policy decisions affecting global players^{liii}, the allocation and administration of international taxation rights^{liiv}, and law enforcement matters related to cybercrime.

III. The WBG's program on digitalization for development is tailored to country needs and priorities

The WBG stands ready to support client countries in implementing ambitious government-owned transformational digital development programs at the country and regional levels. The WBG approach leverages its comparative advantages by engaging through knowledge, finance, and convening power, working across the public and private sectors, and drawing on multi-sector global expertise across the proposed priority policy areas.

The support that the WBG offers to countries in the digital arena varies with country characteristics and priorities, building in all cases on the Cascade principles and working in partnership with global, regional, and local actors.^{liv} WBG engagements range from providing technical assistance or financing for public or private solutions in specific policy areas to programmatic support for comprehensive policy and investment programs.

Following the WDR 2016, the WB adjusted its approach to digital transformation, moving from a focus on ICT sector development to a comprehensive multi-sector framework involving close collaboration between the WB, IFC and MIGA. Digital Economy Diagnostics serve to identify priority policy reforms and investments needed to advance digital transformation. They inform policy dialogue and WBG strategy formulation. Multidisciplinary collaboration is essential to the success of digital transformation initiatives; therefore, Digital Economy Diagnostics involve strong collaboration across the World Bank Group – including multiple GPs – and across client government agencies.^{lvi} Depending on the types of country demands and on their consistency with WBG comparative advantage, the resulting policy dialogue may lead to WB financing operations or to IFC investments or MIGA operations. The WBG also undertakes programs of South-South learning on various digital development issues, linking countries undertaking reforms in the same areas.^{lvii}

WB, IFC and MIGA work together to complement their instruments and achieve a common goal through complementary interventions. This starts with defining a common approach at the country level,

collaborating in carrying out digital economy diagnostics, designing operations to address policy and regulatory bottlenecks, and exchanging information for better design of lending operations to support private capital mobilization. The choice of lending or guarantee instrument considers the specific priorities of the country or region. For example, major regulatory and institutional reforms are often supported through development policy operations, while support to implementation of regulatory frameworks and public investments generally calls for investment projects.

During recent years, the WBG has rapidly increased its operational programs on digital.^{lviii} The number of WB operations with significant digital components has grown from 6 projects approved in FY19, to 22 in FY20 and 29 in FY21 – with \$4.7 billion in commitments in the latter year. In FY21, IFC exceeded \$1 billion in commitments in the telecom sector for the first time in one fiscal year, with a strong focus on Africa. MIGA has also been active across a number of sub-sectors related to digitalization, by providing political risk insurance for operators' investments in critical infrastructure assets in the telecoms sector (e.g. telecom tower investments, fiber-optic cable infrastructure, mobile broadband and telephony assets, captive renewable energy generation to power telecom assets in off-grid locations).

The cascade approach is applied to facilitate private capital mobilization, starting with regulatory reforms, followed by de-risking mechanisms and public co-financing as needed, ensuring public investments crowd in private solutions. While many of the WB operations focused on supporting the digital transformation are led by the Digital Development GP – in collaboration with other GPs – several GPs are significantly increasing digital content in their operations. Examples include the Education, Macroeconomics, Trade and Investment, Governance, Transport, Finance, Competitiveness and Innovation, and Energy GPs.

In response to the growing demand for support on digitalization, the WBG has significantly enhanced its internal staff capacity over the past 2 years, with a focus on strengthening the cadre of specialized staff in high priority areas, and on increasingly decentralizing staff from the Digital Development GP. Other GPs have also recruited staff with a background in digital technologies to support their mainstreaming in sector operations, including in Agriculture, Education, Health, and Energy. Teams have increasingly complemented internal staff capacity in the digital area with specialized technical consultants required for specific assignments.

The WBG is actively supporting Digitalization across various income groups

The WBG supports both MIC and LIC client countries, recognizing that they generally face different digitalization challenges. Many middle-income countries have established relatively reliable and inclusive digital infrastructure and are now in the phase of fostering wider use of digital technologies and new digital business models. However, even in middle-income economies, digital inclusion remains a challenge as certain population groups (low-income population in urban areas, rural areas) and smaller businesses (informal, microenterprises) continue to have low levels of adoption of digital technologies.

The digital transformation of government also remains an ongoing challenge for many MICs. In particular, the realization of whole-of-government approaches (e.g., in data governance and shared platforms) continues to be difficult for many governments. The causes are not technological but rather about legacy legal frameworks and institutional arrangements, and limited coordination among actors. Another ongoing challenge is related to the fact that governments and businesses in MICs are still in the process of developing data protection and cybersecurity frameworks and building associated capacities.

On the private sector side, IFC supports MIC clients through investments in high quality digital infrastructure and in start-up ecosystems that can tailor digital technology development to the local

context. IFC also supports MIC clients across sectors to adopt digital technologies to enhance their productivity. In the case of LICs, IFC's focus is on investing in foundational broadband infrastructure to improve affordability and service availability; in fintech solutions to promote financial inclusion; and in digital skills education. Furthermore, IFC is working to ensure that the gender and digital divides do not compound each other through numerous initiatives to this end,^{lix} thus complementing WB initiatives also focused on addressing the gender digital divide.^{lx}

MIGA's focus has been on LICs and IDA/FCV countries such as Liberia and Sierra Leone, and also in other West African countries like Guinea, Guinea-Bissau and Mali. For example, MIGA is in advanced discussions to provide political risk insurance to a pan-African mobile money services provider, across twelve Sub-Saharan Africa countries, as well as for a project involving the construction and operation of a series of carrier-neutral data centers across seven Sub-Saharan African (mostly IDA/FCS) countries.

In IDA countries, the WBG has committed to achieving technology-related policy commitments in the Jobs and Economic Transformation (JET), the Gender and Development, and the Fragility, Conflict and Violence (FCV) Special Themes.^{lxi} To speed up digitalization, IDA20 will go beyond IDA19 to help integrate digital technologies into development solutions to build resilience and support long-term growth in IDA countries. IDA20 will address affordability, usage, and inclusion issues while ensuring personal data protection, addressing cyber risks and gender gaps, and supporting people living with disabilities.^{lxii}

IV. Conclusions and questions for discussion

The Covid pandemic has highlighted the digital economy's essential role in helping countries prepare for and respond to crisis. The opportunities brought about by digital technologies can accelerate economic growth, help lead the world economies out of the pandemic-related economic crisis and create new jobs. Digitalization not only contributes to development but helps to build greater social resilience. With appropriate policy interventions, it may also enhance social inclusion and contribute to greening the economy.

But if emerging markets cannot compete in the future global digital economy, they will be left behind. There is thus a robust case for developing countries to invest in their digital infrastructure and further develop digital solutions to build solid foundations for participating in the digital economy. Achieving that objective and harnessing the full potential of the digital transformation requires comprehensive whole-of-government approaches and strong partnerships with the private sector.

Private companies are best placed to deliver most of the investments and services required for a thriving digital economy. Under a good regulatory environment, competition between private operators and service providers on a level playing field is the best way to benefit consumers through access, affordability, and service availability. FDI can provide capital at scale, introducing best-in-class and proven technology and processes and leveraging existing Research and Development (R&D) and economies of scale.

However, for digitalization to generate inclusive development outcomes, public policies and funding must play a significant catalytic role. Decisive policy action is needed to reduce barriers to entry and promote competition in digital markets, support the rollout of broadband infrastructure in commercially unviable areas, and address demand-side barriers to the uptake of digital services. Furthermore, foundational local applications need to be developed. This requires developing digital skills and creating conducive policy environments to deploy digital financial services and expand public and private digital platforms.

Proactive government policies are also essential to create strong safeguards from various emerging risks associated with digitalization. Policy priorities include strengthening data protection in the areas of

privacy and cybersecurity. Also crucial is the need to limit possible negative environmental impacts associated with rapid growth in the digital economy while leveraging its potential to accelerate climate action.

The WBG stands ready to use all its knowledge and financial instruments to provide tailored support to client countries in this critical development agenda, working across the public and private sectors and leveraging its convening power and partnerships.

Questions for discussion:

- *Among the list of priorities to foster digitalization put forward in the paper, where does the Committee think that developing countries should place more focus?*
- *Does the Committee have suggestions of other digitalization priorities that the WBG should consider?*

Annex 1: Boxes

Box 1: Digital payments enabled governments to deliver social programs during the pandemic

Globally, about 60 developing countries leveraged digital payments for the delivery of social assistance programs. Most of the countries that expanded social assistance to new categories of beneficiaries used digital social registries, online applications, or other existing digital databases to assess beneficiary eligibility.^{lxiii}

The pandemic showed that countries with advanced government-to-person (G2P) payment ecosystems were better able to implement transfers quickly and effectively.^{lxiv} Countries that used digital ID and digital databases for delivery of these programs were able to cover 39% more beneficiaries than those that did not or were unable to.^{lxv}

An important lesson learned through the expansion of social protection programs during the crisis is that in order to help build preparedness and resilience against future crisis, it is important to develop solid policy and institutional frameworks – including on data protection – during normal times, as these are critical for safely expanding social programs once crisis hit. Morocco, for example, expanded its social protection system during the pandemic using effective interoperable technology and data platforms to determine eligibility for social assistance rapidly, efficiently, equitably, and at scale.^{lxvi}

Box 2: Remote education took off during Covid

Nearly every country offered remote learning opportunities to ensure some learning continuity. Indonesia, for example, developed an emergency curriculum and provided Internet credits to more than half of the student population, based on the time students spent learning. Turkey greatly expanded its e-learning platform to reach 18 million students and over 1 million teachers. Context-appropriate solutions were key to reach all populations. Sierra Leone, for example, with lower access to Internet and TV, prioritized delivering remote learning through printed material and radio. Brazil combined low-tech and high-tech modalities, using both TV lessons and a mobile application to encourage teacher-student interaction. Countries with long-established ICT-in-education masterplans and the continuous development of digital learning systems and resources – for example, the Republic of Korea, and Singapore – reported minimal or zero loss of learning hours.

Box 3: Digital applications in health and other government services during Covid

In health, the pandemic showed the important role that digital technologies can play for providing telemedicine services, delivering medical screening services, and implementing targeted public health campaigns.^{lxvii} In Côte d'Ivoire, for example, the government worked with mobile operators to develop a public health information resource that includes remote pre-screening, geolocation information regarding infections, and an automated alert system.

Beyond human development services, many governments established online platforms and mobile applications to deliver various other online services. Mongolia, for example, established a public service integrated portal (e-Mongolia) that provides access to a large number of government services through smartphones. Kenya's Revenue Authority launched an app for tax collection and processing for both businesses and individuals.

The pandemic also illustrated how Governments can utilize open-source products and services to avoid vendor lock-in while enhancing flexibility and cost efficiency, as well as promoting international cooperation and generating opportunities for local IT industries and workers.^{lxviii}

Box 4: Digital applications to boost inclusive agricultural development through "Smart Farming"

Rapid developments in Internet of Things (IoT) and cloud computing are driving the development of "smart farming." While precision agriculture takes in-field variability into account, smart farming goes farther, basing management tasks not only on location but also on data enhanced by contextual awareness and triggered by real-time events. The result should be increased production, lower costs, faster innovation, greater processing power, better monitoring of food quality, and reductions in waste through better market information and logistics (World Bank 2019).

Digitally enabled agricultural technologies are already addressing some of the key challenges facing agriculture in the developing world, including low productivity, lack of market linkages between farmers and buyers, farmers' limited access to financial services, and lack of data to support informed and real-time decision-making. There is already significant evidence of how digital technologies reduce information frictions in rural markets, helping farmers to secure better prices for their products, and base their production decisions on more accurate price information. See Allen (2014) and Jensen (2007).

Box 5: Selected examples of WBG activities in digital infrastructure

Examples of WB operations supporting the development of shared infrastructure include the Afghanistan Digital CASA Project (IXPs), and the West Africa Regional Communications Infrastructure Program (colocation data centers). Similarly, the WB is supporting 6 Pacific Island countries on improving regulation, encouraging private investment and extending broadband access to uncommercial areas. Projects in Niger and Nicaragua also exemplify WB support for countries to bring digital connectivity to remote and rural communities.^{lxix}

Almost 75% of recent IFC investments in the telecom sector have been in Africa. IFC's clients in Africa have connected during the last year alone an estimated 3.5 million users directly to mobile networks and another 165 million users indirectly. The IFC launched eight global Telecoms, Media, and Technology (TMT) Upstream Platforms, targeting investment opportunities in cutting edge market segments.^{lxx}

MIGA's support to the digital sector, through projects in the areas of mobile telephony and mobile broadband, as well as fiberoptic cable infrastructure, currently stands at \$586.3million, with a strong focus on IDA and FCV countries in the Sub-Saharan Africa and East Asia Pacific regions. In FY21, MIGA provided political risk insurance to two captive solar power projects in support of digital infrastructure in two Western African countries. MIGA is in advanced discussions with clients in the areas of mobile telephony and mobile broadband, data centers and mobile financial services, with particular focus on IDA and FCV countries in Sub Saharan Africa.

Box 6: Selected example of WBG activity on digitalizing government functions

In Pakistan, through its CRISP program, the WB will facilitate the gradual expansion of the Ehsaas social protection program to better reach informal workers through an innovative, hybrid approach that blends social assistance with promotion of increased savings that informal workers, particularly women, can depend on in the event of economic shocks. The program will provide a platform through which the government can rapidly respond to support the most affected households during an economic crisis. To that end, it will improve the capacity of the social registry to maintain up-to-date accurate household data and exchange data among social programs, while providing greater beneficiary choice in the biometric payment systems. Ehsaas will also contribute to fast track the adoption of digital solutions within government going beyond social protection.

Box 7: Example of IFC support for Digital Platforms

Beyond investment in infrastructure, IFC has \$1.6 billion of Venture Capital (VC) investment commitments to date across direct, VC Funds and VC co-investments. The VC portfolio size has grown 5.5x since 2014, driven by substantial net valuation increase in recent years and new disbursements. IFC's focus on supporting digital entrepreneurship and the emerging venture capital ecosystems across EM has strong performance for the IFC and strong impact on tech entrepreneurship in emerging markets.

Box 8: Emerging policy priorities in Digital Financial Services

Digitalization of large-volume, recurring payment streams: This would provide important use cases for transaction account holders. In this regard, two important use cases have emerged: digitalization of government payments in general, and government-to-person (G2P) payments in particular; and digitalization of remittances. Globally, social assistance payments are estimated to be approximately \$620-930 billion. Digitalization of these flows would bring in cost savings, reduce leakage and improve financial inclusion.^{lxxi}

Expansion of electronic retail payments (including for e-commerce): The value of cash payments made and accepted by micro, small and medium retailers are estimated at \$19 trillion in 2016 out of a total of \$34 trillion such payments.^{lxxii} Enabling widespread acceptance of digital payments by small, everyday merchants would improve the usage of transaction accounts.^{lxxiii} The World Bank is working with several governments, including in Egypt, Guyana, Morocco, Nepal, Pakistan and Tunisia, to implement an expansion of electronic payments acceptance.^{lxxiv}

Box 9: Selected examples of WBG activities on Digital Skills

Digital skills are a recurrent component in WB operations on digital. Examples include the Rwanda Digital Acceleration Project, which includes an umbrella basic digital literacy initiative, and the Mozambique Digital Governance and Economy Project, which targets the provision of the digital skills needed for strengthening the digital business ecosystem. Similarly, the Cambodia Digital Economy and Competitiveness Project aims to address supply-side and demand-side skills gaps, to improve the productive use of digital technology by the workforce. Digital skills pilots targeting women and girls are also ongoing in Nigeria, Rwanda and Uganda, in partnership with EQUALS and GSMA.

IFC is increasing investments in venture capital funds that can focus on ed-tech in skills and making direct investments in scalable platforms that focus on digital skills on the African continent. For example, IFC has provided upstream support for training and expansion support for Gebeya in Ethiopia, Andela in Rwanda, and Genius Plaza in Uganda, in addition to expanding software developer training activities across markets in Sub-Saharan Africa.

Box 10: The role of Digital ID and Government-to-Person (G2P) payments in enhancing inclusion

The COVID-19 pandemic showed that countries that had strong digital ID systems, digital databases, and digital payments pre-pandemic were able to leverage these tools to rollout social assistance at a higher scale and make payments more efficiently and safely through digital methods. Amid lockdowns, these countries could also maintain continuity of service delivery by being able to shift from physical to remote channels more easily and securely.

Digital ID systems are the foundation for building "digital stacks" and realizing the benefits of inclusive digitalization, including a range of development outcomes, such as effective access to social safety nets, universal healthcare coverage, and financial inclusion. For example, Estonia's digital ID enables more than 99% of government services to be completed end-to-end online, saving the average resident 5 days per year from reduced bureaucracy. India used its digital ID system to reduce costs and risks of financial account opening, which, combined with a shift to digital payments in social protection programs, contributed to increasing financial inclusion from 35% in 2011 to 80% in 2017, with the largest gains among women and the poor.

Despite all those benefits, the World Bank Group's Identification for Development (ID4D) initiative estimated in 2018 that one billion people lack any official ID. There can also be a substantial gender gap in coverage of existing ID systems, with the 2017 Global Findex Survey finding that 44% of women not having an ID in low-income economies, compared to 28% of men. Many more people may have an ID, but it may not be usable or secure enough for the digital age, such as because it is just a piece of paper or cannot be verified. These people are thus prevented from accessing the opportunities being created by the growth of digital economies. The ten Principles on Identification for Sustainable Development, which are endorsed by 30 organizations (including the World Bank Group) provide a guiding framework for how countries can design and implement inclusive and trusted digital ID systems across the pillars of access, design, and governance.

Box 11: Selected examples of WBG activities linking the digital and the green agendas

In West Africa, a WB-led Climate and Vulnerability Mapping initiative provides access to climate and conflict vulnerability profiles and data across 16 countries. Using Machine Learning techniques, vulnerability clusters were generated, drawing on 5 by 5 km grid cells, based on communities' exposure, sensitivity, and adaptive capacity to climate and conflict risks. An interactive digital tool maximizes the actionability of the vulnerability profiles and data for policymakers, researchers, and development practitioners to access the data directly. The tool will allow users to explore and compare the vulnerabilities of specific locations to climate change, with the goal of more effectively targeting development resources.

On the mitigation front, the World Bank works with Financial Intermediary Funds (FIFs) like the Climate Investment Fund (CIF) to co-finance investments that support clean technology investments. CIF's new Technical Assistance Facility, for instance, has approved five projects to expand clean energy markets, pioneer new business models, and support energy transition targets including an operation shaping next-generation digital utilities in Thailand.

IFC and green data centers: IFC invested in Teraco, the first carrier and vendor-neutral data center in Africa, operating in Cape Town, Johannesburg and Durban covering over 4,000 sq. mt. capacity. The IFC has also anticipated the trend of investment in sustainable data infrastructure through its support to Scala Data Centers, a leading hyperscaler data center operator located in Brazil with 35 MW of critical capacity, and the first data center in Latin America to fully operate on renewable energy.

In FY21, MIGA executed two captive solar power projects in support of digital infrastructure across Sierra Leone and Liberia, providing renewable power to the private sector client's existing and future cell phone towers. The projects support the expansion of the scope and quality of mobile telephony services and will have a significant impact on quality and first-time access to mobile coverage to consumers, while replacing reliance on diesel generators in favor of a renewable energy solution.

Box 12: Selected examples of WBG activities for enabling regional cooperation

The WB's Western Africa Regional Digital Integration Program is supporting Gambia, Guinea and Mauritania in developing a single digital market in the region. It will remove barriers to regional telecoms infrastructure, creating a single regional market for data and a single online market that will allow governments, firms, and individuals to access and deliver both public and private services online within the region. Another example is the WB regional project with the nine OECS countries, which is harmonizing the telecom regulatory frameworks as well as financing a submarine cable and supporting a PPP to create a government wide-area network in St. Lucia, Grenada and St. Vincent and the Grenadines.

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Endnotes:

ⁱ A growing volume of over 100 academic research papers provides increasingly robust evidence that digital connectivity contributes to a wide range of positive economic outcomes, including growth, employment, and poverty reduction. Rigorous research published in the *American Economic Review*, for example, suggests that the arrival of fast speed Internet cables in Africa – supported by the WBG in 20+ countries – has already had a significant impact on firm productivity, exports, and job creation, especially in higher skill occupations – see Hjort et al. (2019). This research also shows increased productivity among Ethiopian manufacturing firms, higher firm entry in South Africa, and larger exports in Ghana, Kenya, Nigeria, Senegal, and Tanzania. Global cross-country econometric studies confirm a positive causal relationship between digital infrastructure and economic growth, both for developed and developing countries. See, for example, Niebel (2018), Edquist et al. (2018), and Calderon and Cantu (2021). Similarly, a one percentage-point increase in adoption of digital technologies is associated with labor productivity increases of 1-2 percent in several African countries, on average, and as much as 4 percent for informal firms in Senegal (Cirera et al., 2021 a,b). Digital connectivity also contributes to equity through poverty reduction and increased household consumption. Across Africa, 3G coverage has been linked to a 10 percent reduction in extreme poverty in Senegal (Masaki et al., 2020), and a 4.3 percent reduction in extreme poverty in Nigeria (Bahia et al., 2020). Based on global data, mobile phone penetration has also been linked to increases in the human development index (Iqbal, 2019), and a 10 percentage-point expansion of 3G and 4G connections per capita has been found to reduce the Gini coefficient by 1.35 points (Calderon et al., 2020).

ⁱⁱ https://www.ifc.org/wps/wcm/connect/publications_ext_content/ifc_external_publication_site/publications_listing_page/ogle-economy. It is also worth noting that a large part of the population in LMICs that does not use digital services lives within range of a broadband signal, but is unable to make use of it, due to a variety of barriers that range from affordability, to digital literacy, to lack of relevant content.

ⁱⁱⁱ IFC analysis

^{iv} ITU (2021). <https://www.itu.int/en/mediacentre/Pages/PR-2021-11-29-FactsFigures.aspx>.

^v Telecommunication Union (ITU), (2021), Measuring digital development: Facts & Figures. <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf>

^{vi} Based on estimates from GSMA, UN, Xalam Analytics data, with broadband being defined as average download speeds of 10Mbps or greater. There is also evidence that poor quality is an additional binding constraint even for those that do have access. Recent research shows that in the majority of African countries surveyed before the pandemic, fixed Internet download speed was below the minimum performance threshold of 10mbps, while mobile Internet download speed was under 20mbps somewhat better but still relatively slow for applications like video-conferencing. See Comini (2020).

^{vii} <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf>

^{viii} <https://webfoundation.org/2020/03/the-gender-gap-in-Internet-access-using-a-women-centred-method/>

^{ix} New emerging evidence indicates that the impact of digital technology in mitigating crisis disruptions caused by pandemics depends on the extent to which governments and private firms had previously invested in expanding digital infrastructure and in adopting new digital technologies. See for example Apedo-Amah et al. (2020) and Katz et al. (2020). Data collected by the World Bank through Business Pulse Surveys in more than 60 developing countries show that firms that had already invested in digital technologies pre-pandemic were particularly well positioned to weather the storm. Those using digital technologies were less likely to close, experienced lower declines in sales and a lower likelihood of falling into arrears. Katz et al. (2020) show that SARS-afflicted countries with higher rates of fixed broadband penetration experienced significantly smaller negative economic effects in 2003, suggesting that Internet usage allowed them to keep their economies up and running. Data for the initial months of the COVID-19 pandemic show that countries with higher levels of digital infrastructure development experienced smaller downward adjustments in IMF GDP growth forecast after the onset of the pandemic.

^x <https://www.unicef.org/press-releases/learning-losses-covid-19-could-cost-generation-students-close-17-trillion-lifetime#:~:text=%E2%80%9CThe%20COVID%2D19%20pandemic%20shut,and%20exacerbated%20the%20gender%20divide.&text=More%20than%20200%20million%20learners,learning%20during%20emergency%20school%20closures.>

^{xi} <https://www.unicef.org/press-releases/covid-19-least-third-worlds-schoolchildren-unable-access-remote-learning-during>

^{xii} <https://www.unicef.org/media/88381/file/How-many-children-and-young-people-have-internet-access-at-home-2020.pdf>.

Three out of four students who could not be reached by remote learning programs live in rural areas; in lower-income countries the percentage is even higher. Interruptions in learning were most salient for children in lower-income countries, and within countries for children in lower-income households with lower-educated parents and in rural areas. Moreover, despite some successes, the evidence on the impacts of school closures reveals large and inequitable learning losses. It shows that in many countries children have missed out on most or all of the academic learning they would ordinarily have acquired in person, partly due to lack of digital access. See Azevedo et al. (2021).

^{xiii} See Budd et al. (2020) and Hale et al. (2021).

^{xiv} For example, operators improved affordability of digital connectivity by increasing data allowance at the same cost through expansion of network capacity; and deferred payment by business and residential customers to maintain access to the Internet.

^{xv} Go-Jek in Indonesia, for example, engaged in relief programs, including over 3 million free meals provided to partner drivers and over 250,000 free meals to health personnel engaged in Covid emergency relief efforts.

^{xvi} Cases in point are cloud-based solutions such as ‘Infrastructure as a Service’ (IaaS), ‘Platform as a Service’ (PaaS), and ‘Software as a service’ (SaaS).

^{xvii} Cloud solutions also facilitate better integration of value chains across emerging markets and advanced economies. Global spending on cloud services is expected to reach over \$482 billion in 2022, up from \$313 billion in 2020.

<https://www.gartner.com/en/newsroom/press-releases/2021-08-02-gartner-says-four-trends-are-shaping-the-future-of-public-cloud>

^{xviii} In Africa alone, on the international connectivity side, two large cable consortia will provide new high-capacity cables with multiple landing sites on the African continent. In addition, the Eastern part of Africa will be reached by new submarine cables planned to strengthen and diversify the connectivity routes from India to Europe crossing the Arabian Peninsula through the Red Sea. Other ventures address the North and East of Africa.

^{xix} Approximately half of the world’s DC capacity is located in the US, with Europe and Asia Pacific (developed) contributing another 40%, leaving approximately 10% of DC capacity in Emerging Markets. Africa accounts for less than 1% of global colocation DC supply, as late adoption has left a large DC supply gap in Africa. The continent as a whole needs up to 700 DC facilities to meet demand and bring capacity density up to par with that of South Africa, the continent’s DC leader with 50% of Africa’s DC.

^{xx} In Southeast Asia, e-commerce Gross Merchandise Value (GMV) grew by 62% between 2020 and 2021, from \$74b to \$120b. In Latin America, e-commerce represented around 10% of all retail sales in 2020, compared to 6% in 2019, and Brazilian e-commerce sales grew 41% in 2020. In Africa, Jumia, a local e-commerce platform, experienced a GMV growth of 30.4% YoY for the first six months of 2020 (as compared to 2019). In MENA, e-commerce grew by 52% from 2019 levels and reached an annual GMV of \$22b in 2020. Sources: https://services.google.com/fh/files/misc/e_economy_sea_2021_report.pdf; Beyond Borders 2021-2022 report commissioned by Brazilian fintech unicorn Ebanx; Webshoppers 43 report by Ebit|Nielsen; UN Economic Commission for Africa’s report; MIT’s Legatum Center for Development and Entrepreneurship.

^{xxi} For example, AI can provide instant language translation and accessibility features for illiterate people (for example, written to oral) and the disabled. Blockchain is another technology that can transform transparency and reliability of property registries across EMs.

^{xxii} <https://www.investindia.gov.in/indian-unicorn-landscape>; <https://tracxn.com/d/unicorn-corner/unicorns-list-china>; <https://labsnews.com/en/articles/business/latin-america-goes-from-2-to-34-unicorns-in-four-years-says-sling-hub/>; <https://endeavor.co.za/2021/06/elearning-platform-go1-becomes-south-africas-first-unicorn/>

^{xxiii} In just four years, the local Fintech *Wave* grew to become a leading provider of mobile money services in the country by leveraging a nimble business model and introducing a new, lower-cost pricing structure for sending money and paying bills through a mobile wallet. The success of this app-based innovator in fostering greater access and usage of mobile financial services has led incumbents in Senegal and other West African markets to adapt their pricing resulting in a significant decrease in the cost of mobile money transactions and withdrawals. Recent press: <https://qz.com/africa/2055856/how-did-wave-become-francophone-africas-first-unicorn/>; https://www.lemonde.fr/afrique/article/2021/11/09/wave-la-tornade-bleue-qui-s-impose-dans-le-paiement-mobile-en-afrique-de-l-ouest_6101539_3212.html; <https://www.theafricareport.com/97171/senegal-cote-divoire-wave-the-fintech-thats-shaking-up-the-mobile-money-industry/>; <https://techcrunch.com/2021/09/06/sequoia-heritage-stripe-and-others-invest-200m-in-african-fintech-wave-at-1-7b-valuation/>.

^{xxiv} In Sub-Saharan Africa, the share of adults using mobile money grew by 80% between 2014 and 2017, compared to 13% for bank accounts. Mobile money contributed to over 50% of the total increase in financial inclusion in the region. Findex 2018

^{xxv} Financial services allow the poor to seize opportunities through investments in their health, education, and businesses.

^{xxvi} Suri and Jack, ‘The Long-Term Poverty and Gender Impacts of Mobile Money’, 2016.

^{xxvii} Digital financial services have supported new business models for expanding access to clean energy, water, irrigation, sanitation and energy-efficient appliances and equipment. IMF-WB Bali Fintech Agenda (2018)

^{xxviii} Among a group of 136 developing economies, 132 have very concentrated mobile retail markets (Herfindahl-Hirschman index (HHI) higher than 2,500 based on number of subscribers) and 50 have extremely highly concentrated markets (HHI higher than 5,000, equivalent to having only two asymmetric operators), with SSA and EAP exhibiting the highest average level of concentration. World Bank 2022 a. Forthcoming. Promoting competition in digital infrastructure through antitrust enforcement. World Bank, Washington, DC. The HHI is calculated by summing up the squared value of market shares of all providers in a market. It is an indicator used by competition authorities and telecommunications regulators to screen for potential competition issues when analyzing market dynamics and effective competition. According to the US Merger Guidelines, a low

concentrated market has an HHI below 1,500, a moderately concentrated market has HHI between 1,500 and 2,500, a highly concentrated market has HHI above 2,500.

^{xxxix} A one standard deviation decrease in the national Hirschman-Herfindahl (HHI) concentration index for providers of mobile internet services is associated with 0.11 standard deviation increase in mobile internet uptake, based on 2018 data for 137 countries (World Bank 2022b forthcoming), even after controlling for GDP per capita as market size proxy. Other empirical research supports similar findings: a higher number of mobile service providers is associated with lower prices (Ofcom, 2016) and entry of new operators boosts competition among incumbents delivering gains to consumers due to increased product variety (Bourreau, Sun, and Verboven, 2021).

^{xxx} Among 54 countries in Africa, 35 have highly concentrated digital retail markets, 42 out of 52 countries have highly concentrated midstream markets, and 16 out of 19 have highly concentrated upstream markets. Retail markets include both fixed and mobile retail. Midstream markets include fiber networks for backbone and backhaul. Upstream markets include both international connectivity (submarine cables) and passive infrastructure (towers). High concentration is defined as HHI higher than 2,500. It is worth noting that the level of market concentration is usually used by competition authorities and telecom regulators to screen for potential competition issues, since it is a proxy for the existence of market structure characteristics that can impede effective competition. However, market dynamics, including outcomes in terms of prices and quality, need to be assessed in each market to determine the existence of effective competition. World Bank 2022b. Forthcoming. Technological Transformation for Jobs in Africa: How Digital Development Can Support Good Jobs for All.

^{xxxi} Another concern is the large level of vertical integration of dominant firms, which creates risks to competition along the value chain. In Africa, 21 operators with more than 40% market share – a common threshold for screening for market dominance based on EU case law – in mobile retail are integrated into two other segments or more. The same is true for 17 firms with more than 40% market share in fiber networks for backbone and backhaul. This highlights the importance of introducing regulation of bottleneck markets to enable competition along the value chain, including to prevent excessive market power in digital infrastructure from limiting competition in digital services or reducing their uptake given the high cost and low quality of the underlying internet services. World Bank 2022b.

^{xxxii} Based on IFC sector specialist estimates

^{xxxiii} Based on IFC analysis. Governments should develop integrated fiber development plans and blueprint maps of the fiber networks to maximize performance while avoiding inefficient and duplicative development of the backbone network. Broadband networks using alternative technologies such as low-earth orbit satellite constellations also have potential to deliver broadband to underserved areas. Competition between these and traditional mobile networks will benefit customers, particularly those living in rural and remote areas.

^{xxxiv} Many of the dominant firms in Africa's digital value chain are wholly or at least minority state owned (SOEs/SLEs). From a sample of 37 SOE/SLEs in twenty countries, 15 are monopolies in at least one segment (such as international gateways, fixed retail, and fiber backbone). World Bank 2022c.

^{xxxv} Colombia offers a good example of how providing incentives to mobile services operators to lower operating costs and de-risk investments led to the expansion of investments in unconnected areas of the country. The government implemented a scheme that allowed operators to swap high-cost spectrum fees paid to the government for build-out obligations in underserved areas. Similarly, in Peru the Government issued a tender announcement for the presentation of bids (due on February 21, 2022) for the award of spectrum to private operators with the objective of expanding the development of mobile broadband systems in the country at a national level, for technologies such as 4G, 5G, or higher. The AWS-3 and 2.3 GHz Bands will be granted in exchange for buildout obligations (i.e. capital investment commitments):

<https://www.investinperu.pe/es/app/DatosProyecto?idAPPProyecto=608>

^{xxxvi} There are many countries that have successfully taken such an approach. The Republic of Korea, for example, has historically funded 94% of its digital infrastructure with private investment and 6% with public investment.

<https://openknowledge.worldbank.org/handle/10986/2469>

^{xxxvii} There have also been modifications to the traditional USF structure through, for example, "Pay or play" policies, that give the option to fulfil roll out obligations or contribute to the fund, - are also being implemented as an alternative to finance universal service goals, together with specific co-financing facilities for increased coverage funded by general budget (World Bank, ITU, 2020).

^{xxxviii} Such platforms create significant benefits for consumers by enabling service providers and users to leverage very large returns to scale and network externalities. In other words, the value of the digital services offered through digital platforms increases with the number of users while the cost of the producing them does not increase proportionally. See, for example, Cremer et al (2019).

^{xxxix} It is worth noting that because of their powerful network externalities, digital platforms are prone to a high degree of market concentration at the global and national level and pose complex challenges for the application of anti-trust and ex-ante regulation.

^{xi} Reforms in these areas need to be completed with actions to ensure online safety through data protection laws and national cybersecurity strategies, as well as the availability of digitally skilled labor. Both issues are discussed in more detail below, under priorities D1 and C2. Similarly, as highlighted under priority B1, supporting the expansion of digital identity and other public digital platforms can also contribute to the development of digital businesses. Finally, for a rich ecosystem of technology companies to develop, it is also important to develop complementary national strategies to mainstream disruptive technologies such as in biotechnology, genomics and blockchain.

^{xii} This may involve leveraging local pension funds to create a local venture capital ecosystem, creating sand box regulatory environments for digital startups, aligning regulations of traditional businesses with that of technology companies, and broadening the scope of recognized healthcare and education service open for online delivery.

^{xiii} See World Bank, 2022. Forthcoming. *Incentives in Electronic Payments Acceptance*.

^{xiii} Technology has the potential to improve living standards, but its effects are not manifesting themselves equally across the globe. Workers in some sectors benefit handsomely from technological progress, whereas those in others are displaced and have to retool to survive. Workers involved in routine tasks that are “codifiable” are the most vulnerable. Although quantifying the impact of technological progress on job losses continues to challenge economists, estimates abound. For Bolivia, for example, job automation estimates range from 2 to 41 percent. In other words, anywhere from 100,000 to 2 million Bolivian jobs may be automated in 2018. The range is even wider for advanced economies. In Lithuania, from 5 to 56 percent of jobs are at risk of being automated. In Japan, from 6 to 55 percent of jobs are thought to be at risk. See WDR 2019.

^{xiv} Policy priorities for the specific challenges derived from the impact that digital technologies are having on the changing nature of work include investing in human capital – from cognitive and socio-behavioral skills to digital and other foundational skills; enhancing social protection; and creating fiscal space for public financing of human capital development and social protection. See WDR 2019.

^{xiv} ICT in education policy frameworks need to be led by Ministries of Education and Higher Education Quality digital skills programs can be offered by both education and training institutions, with special attention to ensuring strong linkages to the digital competencies in demand in labor markets. The expansion of digital connectivity of educational institutions needs to include efforts for building their capacity to choose, procure, maintain and deploy technology at scale.

^{xvi} IFC estimates that a \$130 billion opportunity exists to provide digital skills across Sub-Saharan Africa until 2030.

^{xvii} Protection of personal data, typically accomplished through user consent, poses particular challenges due to the increasing ease of inferring personal characteristics from non-personal data (such as mobile phone records) as well as machine AI/ML techniques.

^{xviii} This is because the cloud has three positive impacts on the reduction of the GHG emissions caused by increased data use. First, the cloud allows for shared access to infrastructure and resources, eliminating the need for “zombie servers”, servers in on premise data centers that are not actively used. Second, by moving to the cloud, the availability of data is “on-demand” and is continuously optimized, and companies can rely to cloud providers to retrieve data that are not immediately needed, improving the overall data management compared to local storage. Third, by allowing on demand storage of data, cloud providers can arbitrage between different locations, choosing those with more environmentally friendly options, and those locations that require less energy due to favorable climate.

^{xix} Mukhi, N. et al. World Bank Outlook 2050: Strategic Directions Note. Supporting Countries to Meet Long-term Goals of Decarbonization. World Bank, Washington, DC, 2020, p.76).

ⁱ An example is the use of digital technologies for mitigating methane emissions in paddy fields, by means of supporting mid-season drainage and intermittent irrigation – through GIS-based suitability maps, the use of sensors and cloud-based data systems to measure and adjust water levels in rice fields through smartphone application. Richards and Sander (2014). Islam et al. (2020). Chousary and Fock (2020).

ⁱⁱ Notable examples are the Info-Share platform in Sri Lanka and the Syria Tracker:

<https://www.comminit.com/health/content/infoshare-sri-lanka>

<https://www.humanitariantracker.org/syria-tracker>. It is also important to proactively manage the risk of digital technologies helping exacerbate fragility, conflict and violence, for example by promoting greater interconnectedness of criminal networks and allowing them to prey on disenfranchised and marginalized communities.

ⁱⁱⁱ One of the most rapidly growing areas of international trade, is trade in digitally enabled services. This is creating important economic opportunities for low and middle-income countries. For example, in the Philippines, the value of value of exports of data-enabled services now exceeds that of agriculture. The scope for such trade depends critically on the regulatory environment governing the cross-border flow of data. Around the world, a variety of contrasting regulatory regimes are in place, ranging from a fully liberalized “open transfers” regime to a “limited transfers” regime that requires government authorization of cross-border data movements as well as copies of all domestic data to first be stored locally. Creating a supportive environment for trade in data-enabled services entails balancing data protection measures to safeguard data that is exchanged across borders, while limiting the associated regulatory burden.

^{liii} Despite the considerable regulatory challenges posed by such online business models, there have been an increasing volume of competition cases brought against digital platforms, particularly in middle-income countries. Anti-trust agencies have been concerned to ensure that the considerable benefits associated with digital platforms do not come at the expense of consumer or wider social interests, and that new entrants from low and middle-income countries can compete fairly in these markets.

^{liv} Regarding taxation, while Value Added Tax on digital platform services unambiguously accrues to the country where the final sale is realized, the additional administrative complexity of collecting revenues from third party firms trading across such platforms from a wide variety of countries, often prevents this from happening. When it comes to Corporation Tax, the rules for allocating the profits of a multinational digital platform across the different markets where it is active remain unclear, although the recent G20 agreement to harmonize Corporation Tax rates globally at least dilutes incentives for shifting profits across borders.

^{lv} In low-income countries where Internet penetration is low, the priority is to remove barriers for expanding digital connectivity and Internet adoption. This may involve addressing high duties on ICT capital imports and helping improve the business climate for private investments. Promoting digital literacy and basic cognitive and socioemotional skills is also a common area of focus in such country conditions. In countries transitioning toward universal Internet use, the WBG concentrates on supporting the digital innovation ecosystem, creating an enabling environment for further growth in digital applications and driving reform of public service delivery through the use of digital technology.

^{lvi} Digital Economy Diagnostics have typically taken place as part of regional initiatives. The first was the Digital Economy for Africa initiative, which is covering almost 30 countries (<https://www.worldbank.org/en/programs/all-africa-digital-transformation/country-diagnostics>). In South Asia, a similar initiative has just concluded Diagnostics for all 8 SAR countries, using a methodology that was tailored to the region's situation and updated based on the experiences of the work in Africa. The next phase of the Digital Economy diagnostics initiative is currently being launched in East Asia and Pacific (DE4EAP). A significant amount of analytical work has already been conducted in several countries (e.g. Indonesia and Philippines) so the DE4EAP program will aim to fill gaps in what has already been done and cover new areas such as data infrastructure, data protection and cybersecurity. In LAC, country diagnostics are well under way for Colombia, El Salvador, Ecuador and Jamaica. More countries will be added in the next phase.

^{lvii} For example, the WBG has organized exchanges between Brazil, Tunisia, Moldova and North Macedonia on open government; between India, Moldova, Tajikistan and other Central Asian countries on various digital development issues; and between Peru, Côte d'Ivoire and Guinea focusing on the successful implementation of digital ID in Peru. Another example is the recently launched Agile Regulation program in Africa, which is focusing on capacity building for regulatory authorities in the digital sector with extensive exchange and learning between countries in the region.

^{lviii} The WBG's approach follows the directions proposed in the 2018 Development Committee paper on "Disruptive Technologies and the World Bank Group." WBG engagements on digital transformation build on the Cascade Principles and focus on creating the opportunities and mitigating the risks associated with digital technologies, by means of helping build the digital and physical infrastructure and regulatory foundations for sustainable, inclusive technology-enabled economies. The WBG also focuses on boosting local country capacities and leveraging partnerships.

^{lix} For example, Digital2Equal is an IFC-led initiative launched in 2018 in partnership with the European Commission that brought together 17 leading technology companies operating across the online marketplace to boost opportunities for women in emerging markets. Under the initiative, participating companies made measurable, time-bound commitments specific to each company's goals and participated in knowledge-exchange sessions on implementing gender innovations, including contributing to thought leadership on how the digital economy can increase women's access to jobs and assets.

^{lx} For example, the Digital Development GP launched two digital skill pilot initiatives to support closing the gender divide in FCV environments in Nigeria, Rwanda and Uganda. The initiatives target digital literacy as means to expand economic opportunities, create new digital jobs, enable the growth of digital businesses, and increase social inclusion as a form of violence prevention. The two pilots are also tackling limited access to infrastructure, affordability, and social and cultural gender norms.

^{lxi} In IDA19, the WBG committed to close the infrastructure gap by supporting 18 IDA countries to double broadband penetration, ensure at least 40 percent of IDA countries implement e-procurement systems, and conduct procurement data analytics, support at least 8 IDA countries to adopt universally accessible GovTech solutions, ensure that 50 percent of entrepreneurship and MSME projects incorporate digital financial services and/or digital entrepreneurship elements, and 58 percent of agriculture projects support adoption of modern technology, and support building capacity in 33 percent of IDA FCVs to use field-appropriate digital tools. In addition, all operations for digital development support women's increase access and usage of digital services, and at least 50 percent of financing operations for digital skills support women's access to higher productivity jobs, including online work.

^{lxii} IDA20 will support 20 countries' resilience by building adaptive social protection systems, including the use of technologies; ensure that at least 18 countries meet the needs of persons with disabilities through projects in education, health, social protection, water, urban, digital development and transport; ensure the support to at least 17 countries to increase inclusive,

secure, affordable access and usage of broadband connectivity – a big step towards closing the usage gap; support 15 IDA countries to strengthen private sector recovery and transformation and support the adoption of digital technologies; IFC will increase its digital infrastructure investment with special consideration of cybersecurity and its venture capital in IDA and FCV countries; at least 30 operations in digital development, financial inclusion, and agriculture will increase women’s access to and usage of digital technology to close the respective gender gaps; and at least 15 countries will adopt universally accessible GovTech policies, regulations and solutions to enable secure digital government services.

^{lxiii} See Gentilini et al. (2020).

^{lxiv} World Bank, 2020, Scaling up G2P Payments as part of COVID-19 response.

^{lxv} Thailand, for example, combined its national ID system, real-time payment system, and 20 existing databases to quickly implement an emergency cash transfers for 15 million informal workers and 8 million farmers, integrating online registration, relatively fast eligibility checks, and payments made directly into a financial account the beneficiary had linked to their national ID. In Chile, the national ID-linked basic account – Cuenta Rut – which covers most low-income people allowed for making payments directly into the bank accounts of more than 2 million vulnerable Chileans by April 2020.

^{lxvi} This was possible thanks to policy and institutional reforms that had been designed prior to the pandemic, with special attention to data privacy and the management of personally identifiable information. Morocco’s experience also showed the potential that dynamic social registries offer across the developing world, provided the right physical and soft infrastructures are in place.

^{lxvii} The pandemic also showed the potential of digital technology and data to supplement more traditional epidemiological surveillance systems, with future applications in public health but also in future global early warning systems for one health risks (related to the interconnexions between human, animal, and environmental health).

^{lxviii} India, Indonesia, Jamaica, Philippines, and Sri Lanka, for example, used the same open-source software but different implementation methods to develop their digital COVID-19 vaccination certificates for international travel. Similarly, Ethiopia, Guinea, Morocco, Philippines, Sri Lanka, and Togo are using the same open-source software as the core of their new digital ID programs.

^{lxix} In Niger, the WB is supporting a competitive bidding process for expanding mobile infrastructure in rural areas in a way that ensures that WB-financed subsidies are used efficiently to maximize private investment in rolling out the coverage. Another example of WB support for deploying broadband infrastructure in remote and rural communities in partnership with the private sector is the CARCIP Nicaragua project, which is funding subsidies for deploying broadband infrastructure in remote and rural communities. These areas are not commercially viable so the private sector would not serve them without financial support.

^{lxx} These segments include: Energy Service Companies (ESCO) for Telecom Anchor Clients, satellite, rural communications, cloud and data services, and IoT. IFC’s exposure to the DC sector has increased over the past two years, reflecting increased demand for DCs in EM. In FY20, IFC had three investments worth \$18 million invested in the DC sector in Asia and Eastern Europe. As of December 2021, IFC’s exposure to the DC sector had increased to seven investments worth \$233 million in Latin America, Africa, Asia and Eastern Europe with an additional four investments worth \$175m in the pipeline for IFC’s fiscal year ending in June 2022.

^{lxxi} Recent evidence shows digital remittances are considerably less expensive to send. On average, sending \$200 digitally costs \$9.98 while sending the same amount non-digitally costs \$13.54. This would imply a potential of up to \$8-9 billion in savings if all remittances to LMICs were sent digitally. These cost savings would directly add to the incomes of migrants and their families home and could have substantial effects on reducing poverty and boosting shared prosperity as remittance beneficiaries are traditionally in the disadvantaged groups. Remittance cost data from World Bank, Remittance Prices Worldwide database, Q3 2021, remittance flow data from World Bank, Migration and Development Brief No. 35.

^{lxxii} World Bank and WEF (2016).

^{lxxiii} This can help expand the usage of digital payments by customers as transaction accounts can become valuable for customers through the regularity and the frequency of purchases from everyday retailers and can create an anchor for them within the regulated financial sector.

^{lxxiv} The extension of this work on e-commerce payments can have additional effects on improving e-commerce and financial inclusion, as the e-commerce market is projected to expand significantly over the next 5 years, with almost half the adults in developing economies (except China) paying in cash on delivery. Global e-commerce purchases are estimated to be approximately \$4.9 trillion worldwide and is forecast to grow 50 percent over the next 5 years, reaching approximately \$7.4 trillion by 2025. For evidence on cash payments upon delivery in developing economies, please see the data from Global Findex in 2017: in developing economies, except China, 53 percent of adults who made purchases online paid cash on delivery.