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TECHNICAL GUIDANCE TO ALIGN IDB GROUP OPERATIONS WITH THE PARIS AGREEMENT

INFORMATION AND COMMUNICATION TECHNOLOGY FOR THE DEVELOPMENT OF THE DIGITAL ECONOMY

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In accordance with the IDB and IDB Invest Access to Information Policies, this document is being made publicly available simultaneously with its distribution to the Boards of Executive Directors for information.

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ABBREVIATIONS

CC	Climate Change
CCAP	IDB Group Climate Change Action Plan
CO_2^e	Carbon dioxide equivalent
COP	Conference of the Parties
DE	Digital Economy
EE	Energy Efficiency
ESPF	IDB Environmental and Social Policy Framework
ESSP	IDB Invest Environmental and Social Sustainability Policy
GHG	Greenhouse Gases
GIS	Social Infrastructure Group of the IDB Group
HVAC	Heating, Ventilation, and Air-conditioning
ICT	Information and Communication Technology
IDB	Inter-American Development Bank
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and the Caribbean
LTS	Long-Term Strategy for Climate Resilience and Decarbonization
MDB	Multilateral Development Banks
NAP	National Adaptation Plan
NDCs	Nationally Determined Contributions
PA	Paris Agreement
PAIA	Paris Alignment Implementation Approach
PBL	Policy-Based Loans
PUE	*Power Usage Effectiveness* for a Data Center
RE	Renewable Energies
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
UNFCCC	United Nations Framework Convention on Climate Change

I. INTRODUCTION

1.1 This document is a technical complement to the Paris Agreement Alignment Implementation Approach (PAIA). The PAIA has been developed by the IDB Group (IDB, IDB Invest and IDB Lab) as a methodological tool to pursue the objective of aligning to the Paris Agreement (PA) new operations and projects that have been reformulated. Both the PAIA and this technical guidance are based on the Joint Methodological Principles for the assessment of alignment with the Paris Agreement, developed by Multilateral Development Banks (MDB)[1].

1.2 The PAIA outlines IDB Group's strategy to assess the alignment of operations to the PA, with the objective of informing decisions on project activities to be financed and the ongoing dialogue with countries and private sector clients. It establishes a set of principles to guide the consistent and equitable interpretation of the Joint MDB framework when performing the assessment, and it lays out a series of methodical steps to be followed along the preparation cycle of projects.

1.3 The PAIA builds on IDB's Environmental and Social Policy Framework (ESPF) and IDB Invest's Environmental and Social Sustainability Policy (ESSP). All operations covered by the ESPF and ESSP must *comply* with these policies during project preparation, execution, and closure. In contrast, PA alignment assessment is meant to *inform* project design before approval, using the information and tools at the disposal of the IDB Group at the time it is made.

1.4 This document provides additional criteria to interpret the Joint MDB Framework, with specific considerations that are relevant to IDB Group operations and tools[2].

1.5 The objective of this guidance is to help IDB Group personnel design and assess operations aligned to the mitigation and adaptation goals of the PA, providing them with the necessary elements to determine, justify, and disclose the information related to this alignment at approval. In this regard, the PAIA clarifies that aligning an operation with the PA does not equate to achieving net-zero emissions at present, nor to completely eliminating the risks associated with the physical impacts of climate change. In its opening paragraphs (¶ 2.6 - ¶ 2.7) it explains that alignment with the **mitigation goal of the PA** involves ensuring that operations do not undermine the transition to net-zero emissions outlined in the PA; and that, if present, the risk of deviating from decarbonization pathways must be identified and managed consistently with national and global commitments. In turn, alignment with the **adaptation goal of the PA** involves ensuring that operations identify and address physical climate risks, considering ways to develop climate resilience, and avoiding inconsistencies with national/local priorities for climate adaptation. Additionally, in section II.C, the PAIA outlines a set of principles that guide towards a just transition.

1.6 **This document contains specific technical guidance for aligning operations with the PA when their activities encompass the information and communication technology sector for the development of the digital economy**. In this document, the Digital Economy (DE) is understood as the use of information and communication technology (ICT) and advanced digital technologies in the processes of production of

[1] It is emphasized that, in cases of discrepancy, the Joint Methodological Principles for analyzing alignment with the MDB PA prevail over the PAIA, except for the exceptions explicitly provided by the latter. Available at IDB 2023: "Alignment of financial flows with Paris Agreement targets" https://www.iadb.org/en/who-we-are/topics/climate-change/climate-change-finance/paris-alignment

[2] In case of discrepancies between this technical guide and the Joint MDB Framework, the latter prevails except in those cases explicitly justified by this technical guidance.

goods and provision of services, starting from the basis of the digital and data infrastructure that enables their commercialization and consumption. Therefore, this technical guidance encompasses: (i) infrastructure for processing, storing and securing digital data (**data centers**); (ii) infrastructure for connectivity (**networks**); (iii) digital devices (**devices**) and digital technology; and (iv) services based on digital technologies (**digital services**) that depend on the three previous elements for their provision; for example: telemedicine, distance education, citizen services, among others.

1.7 For those activities in operations that differ from the DE sector defined above, the corresponding technical guidance[3] will be applied simultaneously and complementarily, always adhering to the materiality principle. In the event that an application conflict arises due to the concurrent use of this technical guidance with other technical guidance(s), resolution will be handled on a case-by-case basis, ensuring proportionality to the risk and striving for the highest possible climate ambition.

1.8 **Scope of this document**. This guidance has the same scope as the IDB Group Paris Alignment Implementation Approach (GN-3142-1) as outlined in its paragraphs 2.10 and 2.11. It therefore covers IDB Group operations in the Digital Economy sector, including investment loans, investment grants for an approved amount greater than US$3 million and guarantees (i.e., operations involving capital expenditures referred to as "direct investments" in the MDB framework), as well as policy-based loans and guarantees. The guidance is also applicable to products involving financial intermediaries and corporate finance (including equity financing), which follow specific methodological approaches agreed upon with other MDB. In this regard, the analysis of alignment with the PA in the ICT sector covers direct financing to activities and companies in such sector, as well as policies and enabling actions by the public and private sectors for the development of the digital economy. For example: industry standards, technology transformation programs, labor certifications, etc. etc.

1.9 **Relation to other IDB Group documents**. In 2020, the IDB Group's Climate Change Action Plan (CCAP, GN-2848-9) was approved. The CCAP proposed to 'promote the consistency of financial flows with low-carbon and climate-resilient development,' and to this end established as an action to 'integrate alignment with the PA into the IDB and IDB Invest operations procedures.' This follows up on the Resolution of the Board of Governors (AG-7/22) that proposes to "enhance the IDB's climate, green finance and biodiversity ambitions" to strengthen the resilience and sustainability of the economic and social sectors in Latin America and the Caribbean (LAC). In 2023, the IDB Group adopted the new Climate Change Sector Framework Document (GN-2835-13) which recognizes how digitization can be part of the improvement of climate governance, particularly towards greater climate resilience of services. It recognizes that digitalization can help reduce emissions, but its carbon footprint must be managed, emphasizing the increasing energy consumption of *blockchain-based* technologies[4].

1.10 **Information and communication technology (ICTs) are relevant to all development sectors**. The importance of closing the digital divide in LAC is highlighted in all the IDB Group's sectoral frameworks due to the role of ICTs in: **Water and Sanitation** (GN-2781-13) to modernize infrastructure and thereby raise efficiency in service management and accessibility; **Agriculture** (GN-2709-10) to foster economic inclusion, increase productivity, manage risk transfer and promote climate resilience in the sector;

[3] The IDB Group has Technical Guidance for energy, water and sanitation, transportation, information and communication technology, manufacturing industry, buildings, agri-food sector and financial intermediation.

[4] See Gschossmann, Isabella, Anton van der Kraaj, Pierre-Loïc Benoit and Emmanuel Rocher. 2022. Mining the environment - is climate risk priced into crypto-assets? European Central Bank.

Environment and Biodiversity (GN-2827-8) to innovate in environmental management and monitoring mechanisms; **Trade and Integration** (GN-2715-11) to improve business services aimed at promoting exports and increasing investment, and to modernize customs and border management at border crossings; **Skills Development** (GN-3012-3) to expand access to training opportunities and raise the efficiency of skills management and administration systems; **Early Childhood Development** (GN-2966-2), to modernize staff training and mentoring programs, as well as strengthen systems for tracking individual children; **Decentralization and Subnational Governments** (GN-2813-8), to improve revenue management, service delivery, and accountability mechanisms; **Energy** (GN-2830-8) to distribute energy more efficiently, automate processes, and increase accessibility of service for users in remote areas; **Long-Term Financing** (GN-2768-12) to increase the efficiency, affordability, and inclusiveness of financial services; **Gender and Diversity** (GN-2800-13) to increase the participation and empowerment of women and diverse populations; **Fiscal Management** (GN-2831-13) to strengthen institutional capacities, increase revenue collection, and maximize efficiencies in public spending; **Extractive Industries** (GN-3028-2), to reduce risks and impacts on the environment and increase transparency and traceability in the various processes; **Innovation, Science and Technology** (GN-2791-13) to manage the effects of the digital transformation in all industries, maximizing its benefits to development; **Social Protection and Poverty** (GN-2784-12), to enhance actions for autonomy and social inclusion, including incentives for the digitization of transfers; **Health** (GN-2735-12) to expand coverage, improve health quality and optimize the management of health service delivery; **Citizen Security and Justice (GN-2771-12),** to improve access to justice and strengthen crime prevention and reduction actions; **Transport** (GN-2740-12) to optimize transfers, prevent accidents, provide traceability to goods and reduce logistics costs, enable shared transportation, among others; **Labor** (GN-2741-12) to increase productivity and employment, create inclusive, equitable and sustainable social security systems, and ensure that benefits are shared equitably; **Transparency and Integrity** (GN-2981-2) to optimize the identification of possible irregular acts, improve the effectiveness of control bodies and ensure greater access to information; **Tourism (GN-2779-12)** to boost the production of tourism intelligence and create new business opportunities; **Housing and Urban Development** (GN-2732-11) to increase productivity in the construction sector, enable smart cities and encourage citizen participation. **Appendix I** includes a sample of recent IDB Group publications that advance knowledge on opportunities to address digital economy gaps in the LAC region.

1.11 If necessary, this document will be revisited by Management one year after approval and updated to reflect lessons learned by the IDB Group and other institutions as they work to align operations and other financial flows with the goals of the PA. Updates will respond to possible adjustments in the Joint MDB Framework, as well as the need to incorporate the experience during implementation, and to consider technological and knowledge developments in the region, among others. Future revisions to this document will be agreed between IDB, IDB Invest and IDB Lab, and submitted for no objection to the IDB Operations Policy Committee and the IDB Invest Senior Management Committee.

II. THE DIGITAL ECONOMY SECTOR AND CLIMATE CHANGE

A. The digital economy and the sustainable development goals in LAC

2.1 **Digitalization is essential to accelerate sustainable development**. Productive and social systems are increasingly driven by Internet access and by the generation of data

that flows through countries' digital infrastructure. Thus, digital connectivity infrastructure has become decisive in advancing towards the achievement of the Sustainable Development Goals (SDGs),[5] becoming an essential resource to improve people's lives, increase efficiency in the provision of public services and increase regional integration (Zaballos, A. 2019). Closing development gaps in the LAC region imperatively requires accelerating high-impact initiatives in digital transformation (including the use of emerging technologies such as Artificial Intelligence), IT infrastructure, cybersecurity and, in general, expanding investment in telecommunications.

2.2 **There are wide digitalization gaps in LAC; closing them will be doubly beneficial under sustainability standards**. Compared to other regions, the adoption of digital technologies is very low in LAC, particularly in the government sector and in small and medium-sized enterprises (SMEs). This is of concern because technology gaps tend to be exacerbated as the sophistication of digital technologies expands (IDB, 2022). Businesses require the Digital Economy (DE) to remain competitive; narrowing Digital economy-related gaps will be even more beneficial for LAC if the technologies adopted promote sustainability standards and practices. Global value chains are increasingly turning to "green" suppliers whose production methods can be traceable and verifiable, which is leading suppliers to comply with green digital standards to participate in the global economy (Amoroso et.al. 2022, cited in Cathles, et. al. 2023). Furthermore, to be sustainable over time, these technologies also need to be resilient to the physical impacts of climate change. There are also digital skills gaps. Given the above, the IDB Group has developed and is implementing the Digital Talent Survey in several countries in the region. The results show that companies have greater difficulties in finding people with the required digital skills than in finding people with other types of skills (Rosas and Novella, 2022).

2.3 **The IDB supports and finances a variety of ICT and digitalization projects due to their cross-cutting importance for development** (see ¶1.10). In the public sector, the IDB provides direct financing for the digital transformation processes of social and public services, through policy support and activities associated with digital devices and solutions, expansion and modernization of connectivity networks, acquisition and renovation of data centers, servers, and other physical assets, as well as activities associated with the deployment and use of cloud computing infrastructure, systems and processes that promote cybersecurity, and tools that enable the use of emerging technologies such as Artificial Intelligence; which together favor productive uses and the continuity of public and social services. Likewise, through specific investments and operations with financial intermediaries, it assists MSMEs with the digital transformation process, the adoption of next-generation technologies (Industry 4.0), innovation, and digital entrepreneurship, and promotes training programs in advanced digital skills to generate the digital talent needed by the productive sectors. In addition, through policy-based lending (PBL), it supports the digital transformation strategies of public administration and the rethinking of the design, development, and delivery of social services, and promotes legislative reforms with a high impact potential on the adoption of ICT standards.

2.4 **IDB Invest promotes the DE to increase the competitiveness of the private sector in LAC**. In the private sector, IDB Invest provides financing for the acquisition of mobile devices, network expansion and modernization, construction of new physical infrastructure such as data centers, towers and working capital financing for operators.

[5] According to UNDP, those countries that are more digitally developed have made up to 40% greater progress in achieving the SDGs, which denotes a correlation between the two and some degree of causality.

The adoption of digital solutions in all sectors of the real economy that IDB Invest finances has also resulted in an increase in financing operations to digital-based companies.

2.5 **IDB Lab finances innovative solutions in five key areas: education, health, agriculture and natural capital, essential infrastructure, and financial inclusion.** In education, it supports Edtech platforms, retraining, *upskilling* and WorkerTech solutions. In health, it funds telemedicine, digital technologies for health systems, long-term preventive care models, skills upgrading for health workers, and preventive medicine for vulnerable segments. In agriculture, it supports technological solutions such as AgTech, access to finance models for farmers, technologies for biodiversity conservation and regenerative agricultural models. In infrastructure, it invests in technologies that improve water efficiency, affordable electric mobility and decentralized clean energy. In financial inclusion, it supports *fintech* solutions (technofinance), digital transformation of financial intermediaries focused on MSMEs, and disruptive models to expand access to financial services. IDB Lab also finances digital skills development and data economy programs for SMEs, fostering digital talent and productivity. Through special programs, it supports the responsible development of data-driven technologies and Artificial Intelligence (fAIr LAC) and *blockchain* and web3-based applications for inclusion (LACChain).

B. The digital economy (DE) sector and the mitigation goal of the PA

2.6 **The DE has an important role to play in the alignment with the mitigation goal of the PA.** In the IDB Group's dialogue and programming process with governments and private sector clients, it is important to bear in mind that, for Latin America and the Caribbean, alignment with the PA in this regard implies investing in a DE model that moves towards the decarbonization of information and communication technology, under a social inclusion approach.

This section focuses specifically on the role of ICTs in gradually moving towards net zero greenhouse gas (GHG) emissions by mid-century.[6] Bearing in mind that to achieve this it is necessary to transcend a focus on GHG emissions reductions, and move towards decoupling economic development from: (1) the use of fossil fuels; (2) the loss of carbon sinks; and (3) the dependence on economic activities tied to models/technologies associated with high GHG generation.

2.7 **The DE enables GHG emission reductions in other sectors**. Evidence suggests that digital technologies have the potential to reduce CO_2 emissions globally by 15% by 2030 (ITU, CISCO, Gartner IDC 2019) due to their ability to decarbonize other sectors of the economy and generate efficiencies in business models and life habits (e.g., reduced travel, although it is necessary to consider the "rebound effects" of such efficiencies[7]). For example, by increasing the energy efficiency of buildings, reducing transportation congestion, and facilitating the integration of clean energy, all of which contribute to "smart" cities and energy grids. Furthermore, according to the International Telecommunication Union (ITU), this potential will grow through the adoption of frontier technologies such as Artificial Intelligence (AI) and Internet of Things (IoT) solutions, big *data* and 5G technology (ITU, 2020).

2.8 **The DE generates its own GHG emissions; in absolute terms, these emissions have increased rapidly in recent years**. Although efficiency by intensity of use has led to reduced "per capita" emissions attributable to the DE, the total GHG emissions have

[6] According to the IPCC in its special report on global warming of 1.5°C indicates the need to achieve global anthropogenic net CO2 emissions of zero around 2050 (interquartile range 2045-2055).
[7] See: Bergmark, P. 2022 "Unpacking the multifaceted climate impact of ICT: Rebound and other effects".

increased (Malmodin & Lövehagen, 2023) and energy consumption per dollar invested in digital technologies has grown by 37% compared to 2010 levels (The Shift Project, 2019). In part, this is due to the "rebound effects" of efficiencies; but, first and foremost, to the natural growth in the use of technologies: the digital economy is growing exponentially - global data traffic doubles every four years (Pearce, F. 2018). As a result, there is an increasing number of connectivity networks and data centers, as well as proliferation of digital devices. In total, the share of ICT in global GHG emissions increased from 2.5% in 2013 to 3.7% in 2018 (The Shift Project, 2019).

Table 1: Energy consumption trends and DE waste

ICT has become one of the sectors with the highest rates of energy consumption: a growth of 9% per year during the period 2015 to 2020. Globally, currently 3.6% of electricity is directly[8] consumed by these technologies, accounting for 1.4% of global GHG emissions (ITU, 2020). By 2030, that consumption is projected to reach 8% of total electricity, resulting in 4% of total GHG emissions (Jones, N. 2018). By 2040, direct GHG emissions from the sector could represent up to 7% globally. This is in addition to the nearly 50 million tons in e-waste (e.g., ceramics, glass, plastics, and minerals) generated annually (Baldé, C.P., et al. 2017), which is also increasing.

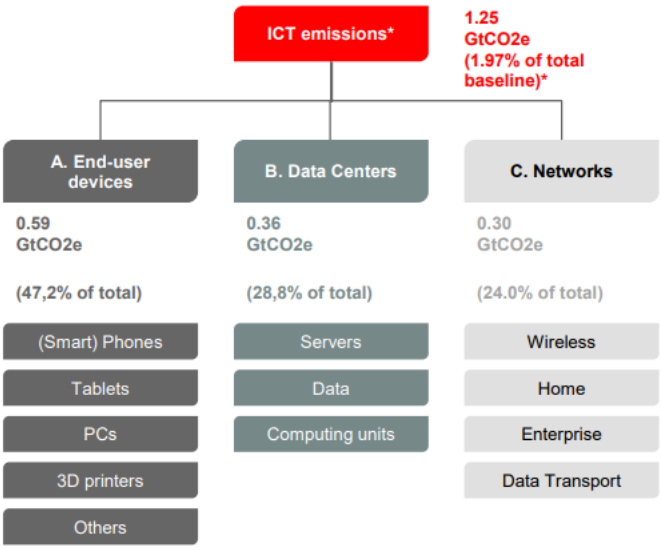
The use of *blockchain*, cryptocurrencies, data mining and generative Artificial Intelligence contributes significantly to these trends. Bitcoin currently uses 110 Terawatt hours per year, equivalent to the entire energy consumption of Sweden or Malaysia (see: Cambridge Centre for Alternative Finance - CCAF).

1. Decarbonization opportunities

2.9 **Main sources of emissions for the sector in general**. A disaggregated analysis of total GHG emissions by activity in the DE (which covered the three scopes of emissions, as feasible: direct -scope 1, indirect -scope 2 by electricity use- and in the value chain -scope 3), estimates that 47% of total emissions correspond to end-user devices (phones, tablets, computers, others, covering their life-cycle emissions); 29% correspond to data centers (in particular those used to mine cryptocurrencies, which consumed 0.3% of the global electricity in 2019 according to UNEP and connectivity networks); and the remaining 28% corresponds to networks (wireless, fixed and data transport) according to the analysis in Global e-Sustainability Initiative, 2015. The volume of emissions varies according to the degree of digital development of each country, where the production and consumption patterns of digital technologies and energy sources differ according to the degree of development.

[8] The major information and communication technology ecosystem consumes 8% of global electricity.

Figure 1. Carbon footprint by type of element in ICTs to 2030



Source: Accenture analysis.

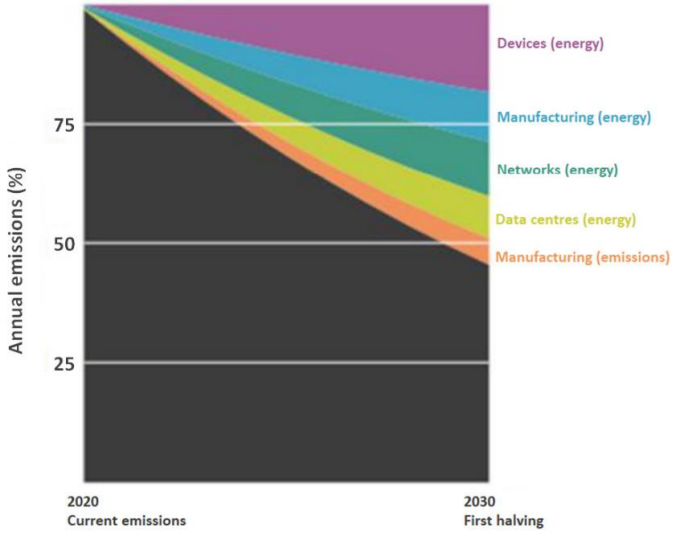
2.10 **GHG emissions by scope.** The average composition of emissions by scope depends on the type of telecommunications technology: mobile network operators, fixed network operators, or data center operators. In the case of mobile network operators, information collected by GSMA members indicates that: (i) scope 1 emissions account for approximately 3% of a typical operator's total emissions, mainly related to fuel for self-generation of electricity (at base stations and offices mostly), as well as for consumption in vehicle fleets; (ii) scope 2 emissions amount to an average of 25% of the total, linked to electricity use in networks, offices and stores; and (iii) Scope 3 emissions represent the most significant part of an operator's emissions inventory (around 72% of the total), related to travel, third-party fleets, use of materials, production and disposal of telephones and other electronic equipment, and employee travel. Scope 1 emissions from data center operators are generally minimal, while 31-61% of emissions are Scope 2 (which can vary widely, particularly if the energy source is renewable), and Scope 3 emissions can account for 38-69% of the total carbon footprint.[9]

2.11 **The importance of Scope 3 emissions**. The magnitude of emissions in the DE value chain represents a unique challenge in that, to set and achieve ambitious decarbonization targets for companies operating in the sector, addressing and mitigating Scope 3 will be the most significant strategy, requiring the development of pathways and action plans that consider the upstream (suppliers) and downstream (equipment and waste) impacts of scaling up supply chains.

2.12 **Greater opportunities for decarbonization**. The following are identified as the main areas of opportunity: the promotion of the circular economy to save device production phases; reduction of energy consumption and GHG emissions in new device manufacturing processes; optimization of energy consumption and deployment of renewable energies in network and data center operations.

[9] Bunger, R. & Lin, P. (2023): Quantifying Data Center Scope 3 GHG Emissions to Prioritize Reduction Efforts. Whitepaper. Datacenter Dynamics. https://www.datacenterdynamics.com/en/whitepapers/quantifying-ghg-emissions/

Figure 2. Projection to halve global GHG emissions by 2030 - by source of ICT emissions



Source: Bergmark, Pernilla. 'Halving Global Emissions by 2030 through Exponential Climate Action and Digital Technologies.' International Telecommunication Union (ITU), 13 May 2019. Available online.

2.13 **Low-emission measures and strategies**. In this regard, the intensification of the digital economy (e.g., through migration to LTE and 5G networks) is accompanied by an exponential growth in energy use, which makes it essential for both governments and network operators to consider low-emission and energy efficiency measures and strategies. It is therefore important to explore solutions such as: (i) incentives for energy-efficient equipment following international or equivalent standards, as well as penalties for equipment that is not efficient; (ii) models that facilitate infrastructure sharing; and (iii) the use of renewable energy, especially in the case of data infrastructure. Something similar would apply in the case of access devices that may eventually be financed, where it would be important to take into account aspects such as: (i) acquiring devices that comply with energy efficiency and durability standards or labeling (thus combating programmed obsolescence); (ii) including measures to repair, reuse and recycle devices and including adequate management of electronic waste; and (iii) exploring renewable energy options for charging devices.

2.14 **A major challenge for the DE is to increase the volume of data transmission, mobile network traffic and connectivity, without proportionally increasing non-renewable energy consumption and waste**. Instead of increasing energy consumption by 9% per year as is the case today, digital sobriety scenarios can control such growth in consumption to 1.5% per year (The Shift Project, 2019). For energy consumption that cannot be avoided, there is the metric of renewable energy adoption as set out in the "Industry Climate Action Pathway" developed by the United Nations Framework Convention Secretariat (UNFCCC, 2021). Many leading companies in the sector[10] are targeting 100% use of renewables. Therefore, the UNFCCC Secretariat estimates it is feasible that by 2030 between 70-80% of the electricity consumed by the sector will come from renewable energies, which would imply a 60% reduction in emissions from energy consumption.

2.15 **Specific goals exist for data centers, but without unified standards.** Data infrastructure (data centers) provides basic services for processing, storing, and protecting

[10] Sixteen of the largest global companies will be net zero by 2030. See ITU & WBA: 2022: "Greening digital companies: Monitoring emissions and climate commitments". https://www.itu.int/hub/publication/d-str-digital-03-2022/

digital data, encompassing both physical elements (storage systems, network devices, ventilation and cooling systems based on hydrofluorocarbons (HFCs) for the proper functioning of servers) and non-physical elements (the software itself). These elements represent one of the most significant energy uses for the sector - according to the International Energy Agency, between 1 and 1.5% of the total electricity used in 2020, equivalent to 0.6% of total global GHG emissions.[11] According to the Science Based Targets Initiative (Science Based Targets: Information and Communication Technology 2020), data center operators will have to reduce emissions by 53% between 2020 and 2030 to meet the PA mitigation goal. However, there is no single internationally agreed standard for low-emission data centers. Some key indicators for data centers are measures known as PUE - energy use efficiency - and WUE - water use efficiency[12]. In addition, there are initiatives to establish minimum energy efficiency requirements for data center design and operation (e.g., ANSI/ASHRAE/LEED). Also, there are already some emissions accounting tools[13] and green building certifications that specifically cover data centers such as LEED BD+C: Data Centers, LEED O+M (for operational data centers), EDGE Building (applied to data centers), BREEAM (applied to data centers) and Energy Star (data centers). Furthermore, the operations that follow best practice guidelines (e.g., the EU Code of Conduct on Data Center Energy Efficiency) for greener data centers can be taken as a reference or best practice.

2.16 **Measures for data centers**. Key measures to address decarbonization opportunities associated with data center construction, operation and maintenance include: (i) data center site selection and green building design to house them; (ii) energy efficient equipment and management practices, including the concept of "digital sobriety"; (iii) extending the life cycle of ICT equipment; (iv) applying low-carbon refrigeration practices and technologies, including those to minimize the use of global warming potential (GWP) refrigerants such as HFCs, opting for lower GWP blends[14] ; (v) use of renewable energy for power or backup; and (vi) reuse of waste heat or wastewater.

2.17 **The role of the public sector encompasses, among others:** (i) setting standards to ensure efficiency and requirements that minimize energy waste and raise the proportion of energy supply of digital companies and data centers from renewables (either through incentives for self-generation, or through policies and/or regulations that incentivize change in the electricity matrix, such as programs to purchase clean energy from third parties[15]); (ii) promote public procurement that migrates to contracting models that use power purchase agreements (PPAs) to ensure that energy comes from renewables or that purchase renewable energy certificates in regulated markets; (iii) remove barriers to the decommissioning of obsolete infrastructure; (iv) encourage circular economy goals and procurement policies that give preference to refurbished devices; (v) combat planned obsolescence; (vi) combat irregular disposal of e-waste; and (vii) promote public policies

[11] However, it is worth recognizing that the Power Usage Effectiveness (PUE) of data centers has improved greatly in recent years, which provides a hopeful outlook for the control of their environmental externalities.

[12] Power Usage Effectiveness (PUE) is a standard measure of facility infrastructure efficiency in the digital economy sector industry. It is equal to the total energy consumption of a data center (considering all fuels) divided by the energy consumption used for IT equipment. In other words, PUE = Total energy consumption of the facility / Total energy consumption of IT equipment. For more details see https://www.energystar.gov/sites/default/files/tools/DataCenterFAQs.pdf. WUE is the ratio that measures the amount of water used by data centers for cooling, temperature, humidity control, and electricity generation, to measure carbon and water efficiency during data center operations, respectively.

[13] Schenider Electric Science Center Data Center Life Cycle Emissions Calculator available at: https://www.se.com/ww/en/work/solutions/system/s1/data-center-and-network-systems/trade-off-tools/data-center-lifecycle-co2e-calculator/

[14] Substances harmful to the ozone layer subject to international phase-out are included in the ESPF and ESSP exclusion lists.

[15] The technology service providers can contribute to the grid transition in certain contexts through the adoption of renewable portfolio standards and/or participation in clean electricity selection programs of local power companies. For more information, see https://www.epa.gov/green-power-markets/contributions-policies-and-consumer-choice-drivers.

to identify the skills needed to carry out digital and PA-consistent activities, close skills gaps, and support people with the right skills to find jobs in companies where their skills are in demand.

2.18 **Role of the private sector**. Globally, 89% of organizations recycle less than 10% of their technological hardware (Capgemini, 2021). Therefore, the main areas of opportunity for companies include: (i) circular economy strategies that reduce raw material extraction; (ii) value chain strategies; (iii) innovation to decouple data transfer from energy consumption; and (iv) standardized platforms to reduce GHG emissions.

2.19 **Role of innovation in the private sector**. Among the key aspects for decarbonization are: (i) the development of technologies and practices that increase energy efficiency and encourage the use of renewable energy sources in their operations and data centers; (ii) the adoption of renewable power purchase agreements (PPAs) and investment in renewable energy as part of their energy supply strategy; (iii) investment in the responsible modernization and decommissioning of obsolete infrastructure; (iv) promotion of the circular economy and preference for refurbished electronic devices in its operations; (v) combating planned obsolescence, promoting product durability; and (vi) combating irregular disposal of electronic waste, promoting recycling practices and responsible e-waste management.

2.20 **Additional contributions of the DE to the decarbonization agenda**. Towards the future, digital technologies contribute to the traceability of low GHG emissions pathways and zero-deforestation of goods and services. An example of this is the deployment of *big data*, *blockchain*, smart sensors, satellite technology and Artificial Intelligence (among others) in the food industry traceability systems. These applications are elevating the monitoring capabilities of value chains, thereby contributing to logistical efficiencies, improvements in food quality and safety, reductions in waste (Hassoun, A. et.al. 2023) and the implementation of zero-deforestation emission commitments (Bager S. & Lambin E., 2022). These approaches are promising for advancing transparency and accountability in the face of the pledges and the decarbonization plans of different industries.

C. The digital economy sector and the adaptation goal of the PA

2.21 **In the IDB Group's dialogue and programming process with governments and private sector clients it is important to keep in mind that LAC is vulnerable to the geophysical and hydrometeorological hazards that climate change exacerbates, and this has implications for the alignment of investments in the DE sector with the adaptation goal of the PA.** These hazards affect the continuity of basic services that depend on telecommunications such as education and health services. At the same time, the telecommunications sector can be crucial in supporting national, regional, and local climate change adaptation actions by facilitating communication, coordination, event monitoring and information distribution during emergencies, including the possibility of restoring basic service delivery through telemedicine and remote education during emergencies. Therefore, the resilience of the sector's telecommunications infrastructure is critical.

2.22 **The infrastructure on which the DE operates can be severely affected by climate change due to extreme temperature and precipitation, floods, droughts, desertification, sea level rise, etc.** For example, hurricanes and cyclones can damage network connectivity infrastructure, and flooding and sea level rise could flood server rooms or data centers. In addition, power outages due to extreme weather events could impede network connectivity and disrupt services. Moreover, the semiconductor industry,

as well as the cooling of critical equipment in data centers, are water intensive; therefore, water stress must be considered in addition to energy supply and infrastructure robustness. For these reasons, it is necessary to undertake a risk assessment of climate hazards and their potential impact on digital infrastructure operations. Such an assessment is highly location dependent. Exposure to relevant climate hazards should be assessed under different scenarios over defined time periods, and according to the nature and lifetime of the activities and assets being financed by the project.

2.23 **Closing digital gaps is more challenging in areas that are vulnerable to the impacts of climate change**. Internet adoption in LAC is low compared to the average of the Organization for Economic Cooperation and Development (OECD) countries; increasing its adoption while building resilience is a challenge due to the size and distribution of the population and the need for connectivity in remote and isolated places, areas that require granular information on hazards which is often lacking. Likewise, capacity development to act on these risks since the planning and the operation must be articulated with the operators and developers of the infrastructure for digital connectivity.

2.24 **The potential sector vulnerabilities depend on the physical location of the assets**. The telecommunications sector is, directly and indirectly, sensitive to hydrometeorological hazards, mostly related to hydrological and wind events, such as high-speed winds, hurricanes, heavy rains, atmospheric electrical discharges, and flood hazards that damage towers, antennas, data centers and other supporting infrastructure. In addition, these events can prevent the maintenance and restoration of services in an agile manner, resulting in low quality or total loss of service and/or drastically increase network traffic. On the other hand, heat wave-related hazards create an additional burden to keep equipment operating at optimal temperatures, particularly in data centers, resulting in higher energy consumption, and potentially increased operating temperatures that increase the likelihood of failures and/or reduced service life. Indirectly, increased energy demand during heat waves can lead to power outages, affecting service delivery and increasing the cost of power supply. In addition, sea level rise and hurricanes intensify the risk of salt corrosion, erosion or flooding of coastal and underground infrastructure related to telecommunication towers, data centers and other supporting buildings.

2.25 **There are solutions and best practices to improve the sector's adaptation and resilience to climate change**. These include the use of predictive models for infrastructure placement, the use of self-generated renewable energy for power supply, diversification of services, advanced e-waste management, data hosting in the cloud, the establishment of energy and information *backup* centers, and the design and implementation of specific emergency plans for each data center or digital system facility, among other context-specific measures. In the case of data centers, the European Union's Best Practice Guidelines: Code of Conduct on Data Center Energy Efficiency 2023 recommends modular and dynamic load responsive designs, among others.[16]

2.26 **The DE can contribute significantly to building long-term climate resilience.** As discussed in Chapter 5 of the review by, the capabilities that digital technologies provide for sharing information and knowledge in real time are key to climate change adaptation. Potential applications include: (i) early warning systems for managing natural disasters exacerbated by climate change; (ii) information to manage agriculture and contribute to food security, for example to take action in the face of prolonged droughts; (iii) monitoring for the prevention of ocean pollution, protection of marine species and habitats, detection of fishing practices, (iv) rapid deployment of humanitarian aid following climate

[16] Note that the Code of Conduct is usually updated annually.

catastrophes; and (v) continuity of health and education services during emergencies. These are opportunities that both the public and private sectors will need to promote and scale to achieve the long-term climate resilience that the PA calls for. In addition, digitalization can foster resource and energy efficiency, reducing carbon emissions, and it can also promote the use of digital platforms to implement climate change adaptation strategies and drive sustainable production practices.

III. ASSESSMENT OF OPERATIONS: ALIGNMENT WITH THE PA MITIGATION GOAL (BB1)

3.1 The joint MDB methodology serves as the basis for determining the alignment of operations with the PA. The application of the guide will result in two possible scenarios: "aligned", or "not aligned". In this context, an operation is "aligned" if it does not go against the mitigation (BB1) and adaptation and resilience (BB2) goals of the PA. **This section presents and describes the procedure to determine the alignment with the mitigation goal.**

3.2 The alignment of ICT and digitalization projects with PA mitigation goal implies ensuring consistency with a decarbonization pathway towards net-zero emissions by mid-century, in the country where the project is located; it implies not hindering or harming the transition to a decarbonized economy, both at the country and global levels.

3.3 **In operations with targeted use of proceeds**[17], the MDB use an assessment approach, the first step is to identify whether the types of investments are considered "universally aligned" or "universally non-aligned" with the PA mitigation goal. In a second step, projects that do not belong to either category require a detailed analysis considering the country's Nationally Determined Contribution (NDC) and Long-Term Strategy (LTS), the global decarbonization pathways for the sector, a *carbon lock-in* analysis and a transition risk analysis. This procedure is described in detail in sections A-C below in this document.

3.4 **For financing without targeted use of proceeds** comprised by budget support (PBL), operations with financial intermediaries, working capital, capital investment or other use of corporate funds, the general principles and technical reference of sections A- C below in this document will be taken as reference, but applying the MDB approach already adapted for each case: Policy-based operations, Financial intermediaries (in conjunction with the *IDB Group Technical Guidance for Operations with Financial Intermediaries* GN-3142-2), and General Corporate Purpose Finance (GCPF).

3.5 The key principles in IDB Group's PAIA (section II.C) outline that these criteria must be applied to the ICT sector in analysis that is based on the best information available, commensurate to climate risk in the operation, and that promotes continuous learning. The IDB, IDB Invest and IDB Lab will individually determine the implementation arrangements for each type of case**.**

A. Activities universally aligned with the PA mitigation goal

3.6 According to the MDB List of Universally Aligned and Universally Non-aligned Activities, some activities can be considered to be consistent with the PA's decarbonization goal across countries and under all circumstances. Table 1 captures the ICT/DE activities considered universally aligned by the MDB as long as (i) their economic feasibility does not depend on external fossil fuel exploitation, processing, and/or transport activities; (ii)

[17] In the case of the IDB, the "targeted use of proceeds" category includes Global of Multiple Works Operations (GOM), although the details of the entire list of works are not known in advance. In these cases, alignment with the PA is evaluated using the same sample of projects that is studied for the application of the ESPF.

their economic feasibility does not depend on fossil fuel subsidies; and (iii) the operation does not depend significantly on the direct use of fossil fuels. Otherwise, they require a specific assessment to determine their alignment (section B).

3.7 Furthermore, the Joint MDB Methodological Principles for the assessment of alignment with the Paris Agreement suggests that the design of operations should reinforce the preservation of areas of high biodiversity value and high carbon stocks (HCS)[18] , an aspect that should be reviewed in conjunction with the IDB's Environmental and Social Policy Framework (ESPF) and the IDB Invest's Environmental and Social Sustainability Policy (ESSP), as applicable.

3.8 **Universally aligned activities in the IDB Group**. The following activities financed by the IDB Group in the context of the DE sector can already be considered universally aligned by the MDB (see Table 1).

Table 1. ICT and Digital Technologies sector activities considered universally aligned to the mitigation goal of the Paris Agreement

Sector	Typology considered universally aligned	Conditions and orientation
Information and Communication Technology (ICT) and Digital Technologies	Information and communication: acquisition/renewal of user devices; construction, expansion, or modernization of connectivity networks; and services based on digital technologies (e.g. telemedicine, distance education, citizen services, among others; programs to support the adoption and innovation of digital technology in the public sector, and companies and enterprises, and training of digital talent). Data centers are excluded.	

Source: Group of Multilateral Development Banks (2023): List of activities considered universally aligned with Paris Agreement mitigation objective. Available here.

3.9 It should be clarified that an operation can only be considered "universally aligned" when all of its financed activities are classified under the universally aligned categories.

3.10 Whenever possible, including in universally aligned transactions, the IDB Group will seek to incentivize the decarbonization of information and communication technology, as well as the maximization of climate finance to achieve this.

3.11 In this context, for the IDB Group, any DE activity that is framed under efforts that promote connectivity (including infrastructure such as equipment, networks, and all the passive and active physical digital infrastructure assets that enable user connectivity to telecommunications networks) and support for the adoption of digital technologies and training of digital talent, will be considered universally aligned with the PA mitigation objective as long as it is not related to any of the activities provided for in paragraph 3.13, and subject to meeting the MDB's criteria of non-dependency on fossil fuels.

3.12 Data centers are excluded from MDB list of universally aligned activities. In addition to data centers, the IDB Group considers that there are some activities within the "information and communication technology" category listed in Table 1 that should validate their alignment with the mitigation objective, such as *fintechs* and *blockchain* applications, data mining and generative Artificial Intelligence (see ¶ 3.13).

[18] Under this approach, it is recognized that secondary forests offer essential carbon storage services and forest products to local communities that are often not considered to be of conservation value and therefore are not protected.

B. Activities that must validate their alignment with the mitigation goal of the PA

3.13 Based on the projects omitted from the list of universally aligned activities and the active portfolio of the IDB Group, the following types of investment (including through bidding and/or contracting of services provided by a third party) and associated policies **will require a specific assessment of alignment with the CC mitigation goal of the PA.** Please note this list is not exhaustive and may be supplemented over time:

a. Financing to *fintechs* or e-commerce in support of particular industries: this category of activity requires consideration of the specific activities and the particular market or actual sector in which the *fintech* or e-commerce operates[19] (for example, if it is a *fintech* that facilitates access to automotive credit, the IDB Group's Technical Guidance for Transport should be considered; or if it is a loan for agropastoral solutions, the IDB Group's Technical Guidance for the Agri-Food Sector should be applied).

b. New data centers (*Greenfield*): the development of new capacity to process, store and/or protect information through data centers (including on-site, in the cloud, or any other modalities), presents a decarbonization opportunity due to their high-power demand, particularly if the energy source is fossil fuel. This is even more important because data centers require: (i) a constant supply of power during both day and night (which renewables struggle to supply without storage); (ii) robust backup systems that often rely on diesel to handle grid outages; and (iii) reliable HVAC systems, which often account for most of the power demand within the facility. HVAC systems, if inefficient, can increase the facility's energy demand unnecessarily and lead to additional climate considerations related to the prolonged use of refrigerants (such as hydrochlorofluorocarbons- HFCs) that, depending on the system configuration, can lead to ozone depletion and/or increased global warming. Aspects related to the construction of the building housing the data center will need to consider the IDB Group's Technical Guidance for the Building Sector, unless the data center meets the criteria for a green certification that also covers the building housing the data center (see footnote 23).

c. Data mining solutions, *blockchain* and regenerative Artificial Intelligence. When IDB Group operations promote secure transactions through blockchain (for cryptocurrencies, notarial contracts, among others) using the *proof of work* (POW) mechanism[20], and/or regenerative Artificial Intelligence solutions, this will implicitly be interpreted as an expansion of the use of data centers. In general, computing solutions that require data mining rely on energy-intensive equipment such as ASICs (Application-Specific Integrated Circuit) and GPUs (Graphics Processing Units). Several factors must be considered to assess whether the *blockchain* energy consumption causes CO_2 emissions to exceed or not the efficiencies generated (Sedlmeir, J. et. al. 2020) which is why a specific assessment is important to ensure the inclusion of sustainable criteria in this type of solutions, including financing energy equipment that follows the IDB Group's Technical Guidance for Energy.

[19] "E-commerce or electronic commerce is the distribution, sale, purchase, marketing and provision of product or service information over the Internet." (Visa)

[20] When the testing mechanism is a *proof of stake* (PoS), and given that this mechanism eliminates the need to dedicate computational capacity to solve cryptographic puzzles that are the source of the high energy intensity of *proof of work*, it will be considered that no specific assessment is required as the carbon footprint of PoS is estimated to be between 0.001% and 0.01% of a PoW application (CCRI, 2023).

d. Data center renovations (*brownfield*): the specific assessment must follow the considerations applicable to new data centers.

e. Construction of other buildings to support operations, other than data centers: relevant considerations are addressed in the *Technical Guidance to Align IDB Group operations with the PA for the Building sector.*

f. It should be noted that, consistent with the Energy Technical Guidance, when financing information and communication technology involves support for fossil fuel-based equipment (e.g., diesel-powered backup power system), alignment with the mitigation goal of the PA of the financed activity should be reviewed with a specific assessment in accordance with the Energy Technical Guidance.

C. Criteria for the specific assessment

3.14 For activities that cannot be considered included in the universally aligned list, there are five specific criteria to be analyzed, as noted in **Table 2**. In order to consider those types of operations as aligned with the mitigation goal of the PA, the answer to ALL the questions from the specific assessment must be "No". Please note that limitations in information availability will not lead to a non-alignment decision, but rather, the assessment will rely on other specific criteria for which information is available.

3.15 This section describes how each one of these general MDB questions by MDB should be interpreted in the context of DE projects at the IDB Group.

Table 2. Specific criteria of the Joint MDB Principles for PA alignment – direct investment

Specific Criteria (SC)
SC1: Is it inconsistent with the Nationally Determined Contribution of the country? *The NDC of the country should not explicitly or implicitly phase-out this type of activity*.
SC2: Is it inconsistent with the Long Term Strategy of the country? *The LTS (or similar long-term low GHG strategies for the whole national economy, sectoral or regional) of the country should not explicitly or implicitly phase-out this type of activity in its lifetime.*
SC3: Is it inconsistent with global sector-specific decarbonization pathways in line with the PA, considering countries' common but differentiated responsibilities and respective capabilities? *The operation/activity should be checked against widely accepted data and findings in the global literature to inform the analysis, given the local context and the principle of equity.*
SC4: Does it prevent the transition to PA-aligned activities, or does it primarily support or directly depend on non-aligned activities? *The type of operation/activity should be compared to lower-carbon alternatives and consider the risk of (i) carbon lock-in (ii) preventing future deployment of Paris-aligned activities.* *When the risk of "carbon lock-in" is estimated to be considerable, the application of this criterion implies an analysis of alternatives preferably validated by a third party.*
SC5: Do transition risks or stranded assets make it economically unviable? *Once CC considerations are included in the economic and/or financial analysis of the operation, it should meet the IDB Group's thresholds for viability.*

Note: As stated in the PAIA (GN-3142-1), a positive response to at least one of the above questions will result in the operation being considered incompatible with the PA mitigation target. Limitations in the availability of information will not result in a

decision of non-alignment, but rather the assessment will be based on the specific criteria for which information is available. It is considered possible to assess CE4 in all cases.
Source: Own elaboration based on the Joint MDB Methodological Framework for Assessment of Paris Agreement Alignment of Direct Investment Operations.

3.16 **SC1 - SC2: Review of the Nationally Determined Contribution (NDC) and Long-Term Strategy (LTS):** the project and its activities must not contravene the NDC, LTS and other support plans linked to national CC commitments, including sub-national plans. This criterion entails analyzing these instruments and ensuring that the investment is not excluded or subject to phase-out in such plans or policies, preferably contributing to their achievement whenever possible. It is worth noting that, to date, no NDCs or Long-Term Strategies have been identified in LAC that establish specific goals or actions to decarbonize the digital economy. Therefore, it is recommended that national targets for energy efficiency, clean energy and circular economy be reviewed as benchmarks to promote operations that are clearly compatible with national climate change plans.

3.17 **SC3: Review of sectoral low carbon pathways (LCPs):** the project should not be incompatible with sectoral LCPs such as those contained in paragraph 2.15 of this document, in the context of the operation. This will be assessed alongside considerations related to equity and national circumstances, particularly considering the feasibility analysis under SC4. The latter may consider, for example, the information gaps that still prevail in many LAC contexts on the feasibility of reducing the CO_2 footprint of digital technologies, versus the urgency of upgrading technologically obsolete facilities that imply high costs for companies and the public administration.

3.18 **SC4: No obstruction of the transition ("carbon lock-in"):** Does the project involve financing facilities with significant CO_2^e emissions, which will continue to operate even if there are economically viable lower-carbon options available to replace them during their lifetime? To meet this criterion, it is necessary to conduct an analysis of alternatives that considers locked-in GHG emissions associated to the investment. When the carbon lock-in risk is deemed to be considerable, the application of this criterion implies a robust analysis of alternatives (preferably validated by a third party).

3.19 **SC5: Economic viability given the transition risks.** This criterion implies analyzing climate transition risks (i.e., those associated with a future scenario that keeps the temperature increase well below 2°C), and monetizing, to the extent possible, the associated costs and benefits. An operation will be considered "non-aligned" if, once the quantitative or qualitative implications of CC have been incorporated into the analysis, the project does not meet the thresholds of economic and financial viability required by the IDB Group.

3.20 **Specific considerations for SC4 and SC5 by type of activity.** For the activities that require a specific assessment, the revision of SC4 and SC5 should consider the following in the acquisition/bidding criteria as applicable to the project:

a. **Financing to *fintechs* or e-commerce in particular industries:**

1. In general, a counterparty assessment approach is required to assess alignment (as if it were a financial institution under the MDB methodology for intermediated financing); this involves verifying that the company is not directly supporting universally non-aligned activities (coal or peat energy generation), nor those that have a high risk of misalignment (e.g. because of their potential for deforestation), as well as verifying that its suppliers are not involved with or directly dependent on such activities.

2. When the operation has a targeted and limited use of proceeds and it is associated with activities that are exclusively included in the list of universally aligned activities, the operation can be considered automatically aligned with the mitigation goal. However, it is advisable to check against the sector-specific guidance relevant to the pertaining *fintech* or e-commerce to ensure alignment with the specific guidelines applicable to the sector.

3. In the case of financing without targeted use of proceeds the methodology for financial institutions with unknown use of proceeds (incorporated in the MDB methodology and the corresponding IDB Group guidance) applies.

b. **New data centers (*greenfield*):** Data from the 2020 "Global Data Center Survey" developed by the Uptime Institute was taken into consideration to provide the following qualitative alignment guidelines to consider the development of new capacity to process, store, and/or protect information through data centers (including on-site, in the cloud, or any other modalities) as not obstructing the transition and minimizing the carbon lock-in risk (CE4), as well as economically feasible considering transition risks (CE5). A project can answer "No" to CE4, and CE5 when the project satisfies at least one of the following conditions, and in the understanding that: i. option n.1 regarding PUE is optimal and therefore should be given preference if it is feasible in the local context; and ii. if possible, more than one condition can be met:

1. The new data center has been designed and built in such a way that it will have and operate with a PUE equal to or less than 1.5.[21] In this regard, it is relevant to consider the PUE comparison between an *on-premises* solution versus a cloud solution (which in many cases can be more energy efficient) and other comparable processing, storage, and data protection solutions. A list of actions that collectively can ensure better PUE levels in data centers can be found in Appendix II.

2. The data center will be managed in accordance with the European Union Code of Conduct for Energy Efficiency in Data Centers[22]. This implies observing all the minimally expected measures according to the type of operator or supplier (per the Code of Conduct). In the case of new data centers, these mainly include: (i) consideration of the embodied environmental impact of installed devices; (ii) selection of equipment that does not require additional cooling; (iii) adoption of an environmental management plan coherent with ISO 14001 and ISO 20001, which measures and manages air quality and informs the selection of filters; (iv) adoption of methodologies such as ISO 55000 for effective energy management; v) presenting information on the participation of renewable sources in the provision of the total power for the data center operation; vi) ensuring that accurate and high quality operation and maintenance manuals are developed, with assigned responsibilities for the efficient operation of the

[21] According to the Uptime Institute's 2020 Global Data Center Survey, a survey of a sample of 36 LAC data centers yielded an average PUE of 1.77, above the world average of 1.59. Data centers in the best-performing regions average 1.46 (European Union) and 1.53 (U.S. and Canada). Therefore, achieving a benchmark of 1.5 or lower should be achievable for developing countries in LAC, also considering that the benchmark data is already 3 years old at the time of developing this guide. It should be noted that the PUE calculates the efficiency of the DC considering computer equipment and complementary equipment of the entire infrastructure, so the PUE is considered a global efficiency of the entire system that encourages not only the acquisition of efficient computer equipment but also equipment such as efficient lighting and HVAC to minimize the PUE.

[22] https://e3p.jrc.ec.europa.eu/sites/default/files/documents/publications/jrc132576_jrc132576_jrc_2023_best_practice_guidelines_v14.1.0final_gt1.pdf

data center; and vii) training and development of staff to reduce energy use by removing silos and efficiently managing the data center.

3. The data center has been designed and built in a manner that will meet the criteria of an internationally recognized[23] or nationally recognized sustainability certification, and in accordance with the provisions of the **Technical Guidance to Align IDB Group operations with the PA for the Building Sector** for cases where the data center involves construction.

4. At least 51%[24] of the total energy consumed by the data center is provided by RE. To meet this criterion, it is acceptable:[25] (a) renewable energy self-generation, (b) entering into a renewable energy power purchase agreement (PPA) with a term of at least 5 years and with the possibility of renewal, or (c) in the case of countries with a regulated market, the acquisition of renewable energy certificates that demonstrate the referred percentage of renewable energy consumption.

Note: As a reference, it is recommended to review the CO_2^e calculator for data centers from Schneider Electric's Science Center available at: https://www.se.com/ww/en/work/solutions/system/s1/data-center-and-network-systems/trade-off-tools/data-center-lifecycle-co2e-calculator/.

c. **Data center renovations (*brownfield*):** To consider the maintenance and upgrade of existing capacity to process, store and protect information through data centers (on-site, cloud, or other modalities) as not obstructing the transition and minimizing the carbon lock-in risk (SC4), as well as economically viable given the transition risks (SC5), a project can answer "No" to SC4 and SC5 when the project satisfies at least one of the following conditions:

1. All eligible new equipment must have an internationally recognized energy efficiency label (e.g., Energy Star). This applies to servers, computer units and HVAC systems.

2. All eligible new equipment must have a national energy efficiency label[26] similar in scope to the international labels. This applies to servers, computer units and HVAC systems.

3. If energy labeling is not available, all new equipment must demonstrate that it reduces energy consumption, resource consumption or GHG emissions by at least 40%[27] compared to an appropriate baseline[28] .

4. The total annual GHG emissions of the data center after project

[23] Some relevant schemes for data centers include "LEED BD+C: Data Centers", "EDGE Building" (applied to data center), "BREEAM" (applied to data center), and Energy Star (data centers with a score of at least 75 on the Energy Star scale).
[24] Threshold based on the MDB Joint Methodology for Tracking Climate Finance, 2020. While the methodology requires "majority of energy to be renewable", at the IDB Group we interpret majority as (50 +1).
[25] A high percentage of renewables in the national electricity matrix will not be accepted as a justification.
[26] Compatibility between national and international label requirements will be determined on an ad-hoc basis when the project-specific assessment is carried out.
[27] In a benchmark study entitled "A global comparison of building decarbonization scenarios for 2050 towards 1.5-2 °C targets" (Camarasa et.al, 2022), regional scenarios were developed to project the required reductions in energy consumption and GHG emissions from the buildings sector. For South America, reference sources showed that in a scenario of increased energy efficiency and electrification of building technologies, final energy and electricity consumption would need to decrease by 5% and 42%, respectively, by 2050, to achieve alignment with the PA GHG pathway.
[28] The baseline for energy use, resource use, or GHG emissions is defined as the average available among equivalent equipment available in the local market (or, in the absence of local market data, in a different market that can be considered representative of the local market).

implementation will be at least 40%[29] lower than the total annual GHG emissions of the data center prior to project implementation.

5. Whether the *brownfield* data center, after project implementation, will comply with any of the considerations applicable to new data centers (see 3.20.b.1-4).[30]

In all cases it is advisable to encourage the replacement of fossil fuel-dependent equipment as part of the renovation of data centers.

d. **Blockchain and data mining applications:** ensure that the comparison of alternatives assesses efficiencies in the solution design, paying particular attention to the technical specifications regarding: (i) the *proof of work (*PoW) mechanism; (ii) the redundancy index; (iii) data mining devices (CPU, GPU, FPGA, ASIC, etc.); and (iv) power supply. Regarding this last point, it is advisable to explore the possibility of on-site power supply from renewable sources as a priority; as a second priority, seek connection to an electrical grid whose energy comes mainly from renewable sources.

3.21 Both the public and private branches of the IDB Group have begun to monitor climate transition risks based on internationally recognized approaches. The main framework is that established by the Task Force on Climate-Related Financial Disclosures (TCFD)31, which broadly covers three areas of change: a) changes in policies and regulations associated with the transition; b) technological improvements and innovations; c) possible changes in supply (e.g., investor decisions) and/or consumer behavior, i.e., market changes.

3.22 Therefore, to meet this criterion, it is necessary to determine whether there are material risks for the transition in the operation's subsector and, if so, to incorporate such risks into the financial sensitivity analysis, estimating their impact on the project's feasibility, when necessary. It is worth noting that leading companies in global value chains are increasingly relying on green suppliers whose production methods can be traceable and verifiable, leading suppliers to comply with green digital standards in order to participate in the global economy (Amoroso et.al. 2022, cited in Cathles, et. al. 2023).

IV. ASSESSMENT OF OPERATIONS: ALIGNMENT WITH THE PA ADAPTATION GOAL (BB2)

4.1 The effects of climate change and the disasters caused by natural hazards[32] are a major challenge for sustainable development in the LAC region.

4.2 The evaluation of alignment with the PA adaptation goal (BB2) focuses on establishing whether the long-term achievement of the operation’s development objectives is vulnerable to climate change effects, and whether the activities are consistent with the climate resilience pathways, and specific to the context defined by national or subnational stakeholders.

[29] See footnote 13.
[30] It should be noted that LEED O+M certification is available for existing data centers that have been in operation and occupied for at least one year. The project can be for improvement works or with little or no construction and must also include the total gross floor area of the building.
[31] See: "Recommendations of the Task Force on Climate-Related Financial Disclosures" (2017).
[32] Consult the IDB's Disaster and Climate Change Risk Assessment Methodology for Projects (DCCRA), which defines disaster and climate change risk in terms of hazard, exposure and vulnerability.

4.3 In operations **with targeted use of proceeds**[33]**,** the Joint MDB assessment framework focuses on the application of the three criteria indicated below. In the case of the **IDB and IDB Lab**, criteria 1 and 2 are already covered in the operations in which the IDB's Environmental and Social Policy Framework (ESPF) is applicable**.** In these cases, the "Disaster Risk and Climate Change Assessment Methodology for IDB Projects" (DCCRA) will determine those instances where greater considerations of the physical impacts of climate change are necessary to ensure the alignment of DE projects. All projects that comply with the application of the DCCRA methodology will be considered aligned with the adaptation goal of the PA under the first two alignment criterion established by the MDB. The third criterion will be additionally applied during project formulation as explained in the PAIA document. In the case of **IDB Invest**, the alignment in terms of the first two criteria will be done in accordance with the provisions of the Environmental and Social Sustainability Policy (ESSP) and the Climate Risk Assessment (CRA) methodology of IDB Invest:

a. **Criterion 1-Climate risk and vulnerability context.** Determine if the operation is vulnerable to CC, by identifying and evaluating its exposure to physical climate impacts. Depending on the type of operation, these may be impacts on assets, on the services it plans to provide, on human and natural systems, and/or on its beneficiaries. If the operation is considered to be at risk, it continues with Criterion 2. Operations with low or immaterial climate risk can skip Criterion 2 and go directly to Criterion 3.

b. **Criterion 2-Definition of climate resilience measures**: Have climate adaptation and resilience measures been identified and incorporated into the operation to manage physical climate risks and/or to contribute to climate resilience?

c. **Criterion 3-Does not contravene plans for climate resilience.** Depending on relevance and availability, consider policies, strategies and plans at the territorial, local, national, or regional levels, as well as community or private sector priorities. The operation should not be inconsistent with them.

4.4 **In financing without targeted use of proceeds**, when the flows constitute budget support (PBL), sub-loans through financial intermediaries, working capital, capital investment or other corporate fund usage, the general principles and technical guidance of the three criteria mentioned above will be taken as reference (¶. 4.3), but applying the MDB approach already adapted for each case: Policy-based lending Operations, Financial intermediaries, (in conjunction with the IDB Group Technical Guidance for Operations with Financial Intermediaries GN-3142-2), and General Corporate Purpose Financing (GCPF)."

4.5 Specifically, in the case of transactions involving **General Corporate Purpose Finance** (GCPF), a counterparty-based approach assessment will be followed, considering:

a. **Loan term**: A short-term transaction (equal to or less than 390 days) is considered aligned, while a long-term transaction requires detailed analysis according to the three criteria detailed above.

[33] This term refers to loan operations and global credit operations with clear eligibility criteria on the use of funds. In the case of the IDB, the "use of funds defined" category includes GOM operations even if the detail of the entire list of works is not known in advance. In these cases, alignment with the PA is assessed using the same sample of projects studied for the MPAS application.

b. **Level and materiality of physical climate risk**: Counterparties whose climate risk exposure is considered low or immaterial, for example, based on sector sensitivity or geographic location, are considered aligned.

c. **Counterparty capacity to manage material physical climate risks**: When the IDB Group considers the climate risk to be material or when the exposure of such risk cannot be determined, the counterparty must demonstrate and document progress in identifying and assessing climate risks, in the identification of adaptation measures and in the implementation of appropriate processes to execute and monitor the effectiveness of said adaptation measures to material climate risks.

A. Considerations for the assessment of alignment with the adaptation goal of the PA in the digital economy sector

4.6 **To ensure long-term alignment with the adaptation goal of the PA, the Joint MDB assessment framework advises on the importance of avoiding maladaptation.**[34] When climate variability and change factors are incorrectly considered in project design the investment outcomes are diminished or rendered ineffective due to external impacts that could have been estimated and mitigated. The climate risk of an infrastructure system depends on the characteristics of its components and the severity of the hazards exposure.

B. Opportunities to help transition towards climate-resilient pathways

4.7 **Additional opportunities to strengthen climate resilience**. In addition to strengthening the alignment with the PA in the operation where this methodology is implemented, its application allows for the identification of additional opportunities for support and dialogue with countries and clients. These are opportunities that contribute to the achievement of PA goals and whose implementation may require non-reimbursable resources. For example, for developing robust, inclusive, and ambitious private climate resilience plans, as well as to initiate dialogue and engagement on relevant critical issues.

4.8 Regarding actions in the public sector, it is recommended that the following are explored as part of this agenda:

4.9 **Solution 1**. Strengthen the collection and processing of information in open data format on geo-referenced energy and water generation and consumption, environmental indicators, hydrological indicators, etc., at an appropriate scale for decision making.

4.10 **Solution 2**. Collect and disseminate data on energy use and other environmental indicators associated with digital solutions deployed by governments.

4.11 **Solution 3**. Promote the establishment of e-waste recycling centers (public and/or private).

4.12 **Solution 4**. Promote the establishment of temporary collection centers for electronic waste (at least one per municipality) and establish the logistics for its periodic transfer to recycling centers (a modest sum of money per kilogram of waste delivered could be

[34] Maladaptation refers to climate adaptation actions that increase current or future climate vulnerabilities within the boundaries of an operation, shift vulnerabilities from within the boundaries of an operation to an external or surrounding system (causing adverse effects on social, environmental, economic or physical aspects of the system) or undermine sustainable development. Maladaptation occurs when an adaptation action undermines the coping capacities of existing systems, diminishes the capacities of future generations to respond to climate vulnerabilities, or imposes a disproportionate burden for climate action on current or future external stakeholders.

considered to encourage an ant "industry", such as the one that collects aluminum cans or PET containers).

4.13 **Solution 5**. Promote that operators and marketers of end-user devices (phones, *tablets*, computers) are obliged to give the user a small rebate if they turn in their old device when they buy a new device and ensure that the collected devices are sent to recycling centers.

4.14 **Solution 6**. Promote/mandate that all IoT devices on public roads must be powered by solar photovoltaic energy.

4.15 **Solution 7.** Promote the sustainable management of refrigerant gases in HVAC systems, throughout their selection, leakage control and final disposal.

4.16 **Solution 8.** Promote that manufacturers and marketers of ICT equipment (routers, base stations, servers, etc.) are obliged to give users a small rebate if they turn in their old equipment when they purchase a new device and ensure that the collected equipment is sent to recycling centers.

4.17 **Solution 9.** Promote that institutions at all levels of government host their digital services in shared/common public/private data centers, thereby eliminating their micro data centers/servers.

4.18 **Solution 10**. That all bank's operations related to the DE sector include a component of awareness campaigns to raise awareness among the public on the correct disposal of electronic waste.

4.19 **Solution 11.** Establishment of information backup centers to provide backup in the event of possible loss of data due to inclement weather.

4.20 **Solution 12.** Establishment of energy backup systems, to eventually supply the infrastructure that may have been de-energized due to inclement weather**.**

4.21 **Solution 13.** Design and implementation of emergency plans (specific to each data center or digital system facility) that consider reliable sources for predicting adverse weather events.

4.22 **Solution 14**. Continue to advance the dialogue with the countries to include this type of resilience solutions in relevant national planning instruments such as the NAP, as well as in local instruments.

APPENDIX I. RELEVANT IDB GROUP PUBLICATIONS

The Impact of Digital Infrastructure on the Sustainable Development Goals: a Study for Selected Latin American and Caribbean Countries.[35] This publication measures the impact of digital infrastructure development on progress towards the Sustainable Development Goals (SDGs) and quantifies the investment needed in digital infrastructure to (i) achieve the SDG targets and (ii) close the gap between LAC and the OECD.

Broadband Development Index Annual Report: Digital Divide in Latin America and the Caribbean.[36] This report describes and presents the results of the Broadband Development Index (BDI) to measure the digital divide between LAC and the OECD, helping to focus both public policy reforms and the financial support needed by the sector in LAC.

Broadband policies for Latin America and the Caribbean: A Digital Economy Toolkit.[37] This joint IDB/OECD Handbook to Foster the Expansion of Broadband Networks and Services in LAC describes the main public policy objectives of the sector and provides a guide to their measurement and a compilation of good practices in: (i) digital strategies, (ii) regulatory frameworks, (iii) spectrum management, (iv) competition and poor infrastructure, (v) broadband access, (vi) affordability, (vii) sector taxation, (viii) digital inclusion, (ix) convergence, (x) regional integration, (xi) education, (xii) skills, (xiii) business adoption, and (xiv) local content, healthcare, digital government, consumer policy, digital security and privacy.

Digital Economy in Latin America and the Caribbean: Current Situation and Recommendations.[38] This study examines the readiness of LAC and the OECD to develop the digital economy through the Application Ecosystem Development Index (IDEA) and analyzes the digitization potential of each sector, so that LAC countries can identify key areas of action to maximize the benefits associated with new digital technologies.

The 360 on Digital Transformation in Firms in Latin America and the Caribbean.[39] This publication provides a 360-degree assessment of the adoption of technologies ranging from Artificial Intelligence, *big data*, and the Internet of Things to "core" tools such as cloud computing and basic digital technologies. It also assesses the enabling conditions for digital technology adoption and current trends in the digital economy. *Living with the coronavirus How to take advantage of the inertia to digitize SMEs in the region?*[40] In the wake of the pandemic, this publication sought to understand what the new digitization opportunities for MSMEs are to survive; the different measures that governments in the region were taking to support them in this process and the lessons learned from these interventions.

Digital business transformation: How to level the playing field?[41] This study presents the gaps in business digital adoption in the region, the obstacles that limit adoption and public policy proposals to support productive digital transformation processes.

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[35] García Zaballos, Antonio; Iglesias Rodriguez, Enrique; Adamowicz, Alejandro. 2019. https://publications.iadb.org/publications/spanish/document/El_impacto_de_la_infraestructura_digital_en_los_Objetivos_de_Desarrollo_Sostenible_un_estudio_para_pa%C3%ADses_de_Am%C3%A9rica_Latina_y_el_Caribe_es_es.pdf

[36] García Zaballos, Antonio; Iglesias Rodriguez, Enrique; Puig Gabarró, Pau; Dalio, Maribel. 2023. http://dx.doi.org/10.18235/0004960

[37] OECD, IDB. 2016. https://publications.iadb.org/es/politicas-de-banda-ancha-para-america-latina-y-el-caribe-un-manual-para-la-economia-digital

[38] García Zaballos, Antonio; Iglesias Rodriguez, Enrique. 2017. https://publications.iadb.org/es/economia-digital-en-america-latina-y-el-caribe-situacion-actual-y-recomendaciones

[39] Cathles, A.; Suaznabar, C.; Vargas, F. 2022. https://publications.iadb.org/en/360-digital-transformation-firms-latin-america-and-caribbean. https://publications.iadb.org/en/360-digital-transformation-firms-latin-america-and-caribbean

[40] Suaznabar, C.; Herrera, D.; Cathles, A. 2022. https://interactive-publications.iadb.org/convivir-con-el-coronavirus/como-aprovechar-la-inercia-para-digitalizar-a-las-pymes https://interactive-publications.iadb.org/convivir-con-el-coronavirus/como-aprovechar-la-inercia-para-digitalizar-a-las-pymes

[41] Suaznabar, C.; Henriquez, P. 2020. https://publications.iadb.org/es/transformacion-digital-empresarial-como-nivelar-la-cancha

Social Protection and Health Division's approach to digital transformation: Guidelines and recommendations.[42] This document describes the Social Protection and Health Division's (SPH) approach to digital transformation and lists the guidelines we will follow as part of our technical and financial support to countries in the region. By using the Principles for Digital Development as a framework, SPH provides a systematic approach to investments in digital transformation in health and social protection. Although the content of this version focuses on the health sector, all practices are applicable to social protection.

The golden opportunity of digital health in Latin America and the Caribbean.[43] This document addresses every aspect of the digital transformation process, shares evidence, practices, and concrete recommendations, identifies the set of actors that can and should participate, and outlines the practical elements necessary for each country to build this crucial path.

Digital Transformation Strategy for the Infrastructure and Energy Sector 2021-2025. It presents the challenges facing the sector for its digital transformation; it is organized according to its four main actors: companies, public sector, consumers, and digital ecosystem. On this basis, it summarizes the requirements for the digital transformation of the sector with its main enablers: governance and institutions, regulatory framework, digital talent, and digital infrastructure and tools.

Driving the digital transformation of transportation in Latin America and the Caribbean. Quantifies the status of the digital transformation of transportation in Latin American and Caribbean countries and analyzes the benefits and challenges. Based on best practices of leading countries worldwide, it identifies public policy lines of action to establish an institutional architecture and policy framework that encourages digital transformation while minimizing its risks.

[42] Nelson J.; Tejerina, L.;2019 https://publications.iadb.org/es/enfoque-de-la-division-social-y-salud-para-la-transformacion-digital-directrices-y-recomendaciones

[43] Bagolle, A.; Casco, M.; Nelson, J.: Orefice, P.; Tejerina, L. 2022 https://publications.iadb.org/es/la-gran-oportunidad-de-la-salud-digital-en-america-latina-y-el-caribe https://publications.iadb.org/es/la-gran-oportunidad-de-la-salud-digital-en-america-latina-y-el-caribe

APPENDIX II. TECHNICAL STRATEGIES FOR DECARBONIZING DATA CENTERS

*Several of these measures, taken together, can help ensure acceptable levels of PUE.

Source: World Bank. 2023. Green Digital Transformation: How to Sustainably Close the Digital Divide and Harness Digital Tools for Climate Action. Climate Change and Development Series. Washington, DC: World Bank. http://hdl.handle.net/10986/40653 License: CC BY 3.0 IGO.

Another reference of comprehensive measures to obtain an optimal PUE result is available here: https://www.mitsubishicritical.com/resources/improve-power-usage-effectiveness/.

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