



Digital Inclusion Benchmark

Draft Methodology

Report for Public Consultation
January 2020

From 27 January to 29 February 2020, the World Benchmarking Alliance (WBA) is holding a public consultation on the draft methodology for its Digital Inclusion Benchmark. All interested stakeholders are invited to review and share their feedback with us on this draft by using the following [link](#). This consultation is part of WBA's continuous stakeholder engagement.

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Executive Summary

Digital technology can be a powerful enabler of the United Nations' Sustainable Development Goals (SDGs). However, divides around access to technology, digital skills, inclusive technology development and exposure to online risks and harms persist around the world, slowing the potential to achieve the SDGs. Companies, while varied in their approach and levels of commitment, are evolving rapidly in how they view information and communications technologies (ICTs) as a tool for sustainable development. Acting as a global accountability mechanism, publicly available benchmarks are a vital first step towards shedding light on the reality of corporate impact in this area.

Although progress is being made, those on low incomes, the disabled, ethnic minorities, people in developing countries, rural communities and other marginalised groups are on an unequal footing when it comes to digital inclusion. Almost half of the world's population is offline, and billions do not own a mobile phone (ITU, 2018). The vast majority of the ICT ecosystem is centred in two countries, the United States and China, with developing countries, other than China, particularly excluded (Gai, 2017). Adoption of new technologies such as 5G, the internet of things and artificial intelligence is occurring much faster in developed versus developing countries.

During global consultations leading to the establishment of the [World Benchmarking Alliance \(WBA\)](#), companies in the digital system were highlighted as among the most influential for achieving the SDGs. The Digital Inclusion Benchmark (DIB) is part of WBA's wider effort to measure and rank the 2,000 most influential keystone companies on how they contribute to the SDGs across seven critical systems transformations. This report sets out the draft DIB methodology for feedback. It outlines a set of proposed indicators to examine and assess around 100 companies' policies, processes, performance and disclosure across the breadth of the digital system, from hardware to software and telecommunications. Critical digital inclusion themes covered by the benchmark include access, use, skills and innovation.

The UN's 2030 Agenda for Sustainable Development, which presents the 17 SDGs and their 169 associated targets, was adopted by 193 countries in September 2015 to serve as a comprehensive blueprint for global societal transformation. In addition to governments and civil society, the 2030 Agenda envisions a significant role for business. Consequently, a number of platforms and mechanisms have been established to facilitate the private sector's engagement in the SDGs (Abshagen, Cavazzini, Graen, & Obenland, 2018). At the same time, thousands of companies have pledged their support to the 2030 Agenda by way of concrete projects – many of them in the digital system. However, a systematic approach to track companies' efforts to drive achievement of the SDGs via digital inclusion is missing. WBA seeks to address this gap by building on a wide range of existing standards and frameworks.

By the end of March 2020, the final DIB methodology will be publicly available and free for all to use. In this way, companies not in scope will also be able to assess their own performance levels. Likewise, external stakeholders may do so, either in partnership with the companies they assess or independently. Towards the end of 2020, the first DIB results and ranking will be published. These will highlight best practices among the digital systems' 100 most influential companies to inspire wider adoption. This kind of peer-to-peer learning opportunity has the potential to fast track digital inclusion efforts across the industry. The benchmark will also highlight where companies can do more or partner with others. Additionally, the DIB will act as a roadmap for the industry, guiding new and more nuanced dialogues to generate more systemic accountability and pioneer change within the ICT sector. Finally, the DIB will empower stakeholders including those beyond the digital sphere such as investors and policymakers, with the necessary data and insight to take action and encourage sustainable business practices more broadly.

The DIB methodology, in its current draft form, will continue to evolve over the coming quarter as feedback from a diverse set of stakeholders is collected and incorporated. Therefore, you are kindly invited to share your reflections, feedback and suggestions regarding this draft methodology.

Why a Digital Inclusion Benchmark (DIB)?

The challenge

Achieving broad-based digital inclusion has tremendous potential to benefit our global society. The United Nations General Assembly, in its 2015 review of the outcomes of the World Summit on the Information Society, highlighted the cross-cutting contribution of ICTs to the SDGs as well as poverty eradication more generally (United Nations General Assembly, 2016).

However, much work remains to be done. Approximately 3.7 billion people – out of a global population of around [7.6 billion](#) – are not yet online and almost 2 billion do not own a mobile phone (International Telecommunication Union [ITU], 2018). Among those who are online, there are substantial disparities in the quality of access. Internet users in developed countries have, on average, 13 times more bandwidth at their disposal, compared to users in least developed countries (ITU, 2017). A skills gap is also evident among those who already access and use ICTs, compared to those who do not. In developing countries, 46% of the general population was reported to have basic skills, such as transferring digital files and sending email attachments, compared to almost 69% in developed countries. This figure is less than 25% for least developed countries (International Telecommunication Union [ITU], 2018).

These gaps are, in part, driven by the broader digital system norms which prioritise disruption, scale and technology advancement over inclusive growth. However, by adopting best practices that address constraints to and leverage opportunities for digital inclusion across their business lines, companies can use these very norms to close rather than widen the gaps. And companies should do so not just because it is the right thing to do but because it is the smart thing to do. After all, digital inclusion is the key to bringing the next billion users online and growing markets for ICT companies.

Leading companies are increasingly acknowledging their role in, and the business imperative linked to, digital inclusion. These companies are taking proactive steps to conduct research to understand how they can better spread the benefits of digital technologies (Lee Kuan Yew School of Public Policy & Microsoft, 2015). For instance, telecommunications companies could venture into new verticals such as e-health, chip makers could repurpose older model chips to offer low-cost hardware options and software companies could embark on new connectivity products.

WBA conducted extensive desk research of existing benchmarks to gather best practices as well as identify relevant concepts, methods and gaps. Each of the nine benchmarks reviewed (see Appendix 1 for a summary) either tracks an issue area related to one or several dimensions of digital inclusion or is a broader benchmark with an ICT component. This review revealed three major gaps in the current ICT benchmarking landscape, building a compelling case for the need for the DIB:

- a) Stakeholders do not understand exactly what companies can do to drive achievement of the SDGs through their core products and services as opposed to purely philanthropic initiatives.
- b) None of the existing benchmarks goes beyond material access to track corporate contributions to the four wider dimensions of access, skills, use and innovation.
- c) None of the existing benchmarks includes both a multi-system scope of companies and is independent from the industry.

As such, WBA seeks to address these unmet needs by building on existing standards and reporting frameworks (see the 'What the DIB Measures' section for specific areas of alignment between our benchmark and existing efforts by iGOs and civil society) to create a digital inclusion benchmark that is fully transparent, comprehensive across the core themes, freely and publicly available, and aligned with stakeholder expectations.

WBA recognises the challenges implicit in this endeavour, both in terms of building consensus across such a broad set of stakeholders as well as in terms of companies' ability to meet stakeholder expectations. That said, clarifying what global best practices regarding digital inclusion look like can inspire action and encourage more equitable business practices. These practices will help to close digital divides, bring marginalised groups online and ensure that ICTs promote and contribute to sustainable development.

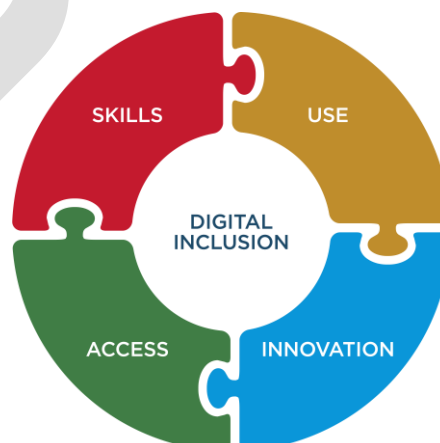
Key concept in the DIB

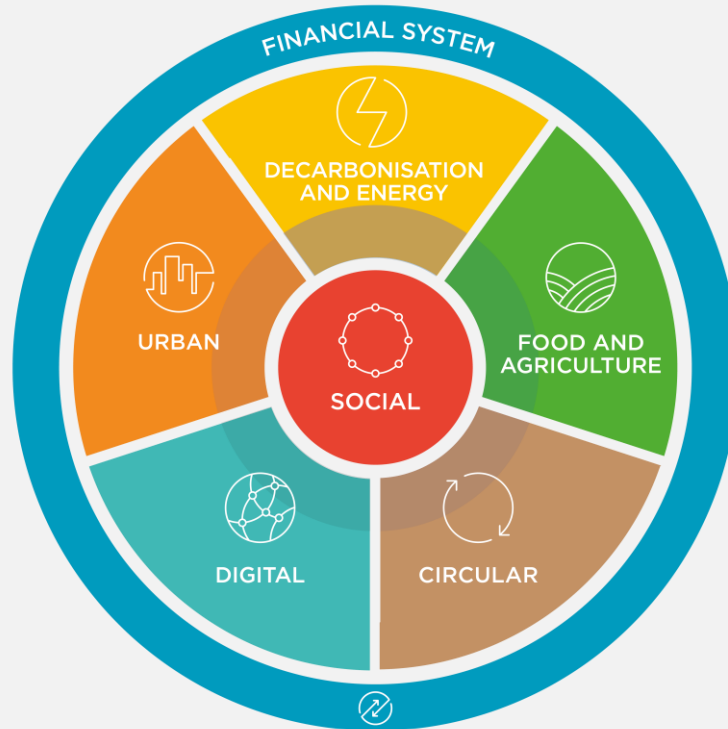
Digital inclusion is more than just access

When digital inclusion first appeared in public policy discourse at the start of the internet in the late 1990s, the focus was on closing a narrowly defined digital divide – a gap between those who did and did not have material access to a computer or the internet (van Dijk, 2005). It was feared that those who did not have access to these technologies would be unable to reap their benefits and would be left behind by a fast-changing information society, thereby widening existing gaps in opportunity, education, income and wealth. Initially, digital inclusion was viewed largely as a technological problem with an equally streamlined technological solution. A high-profile example of this thinking was One Laptop per Child, a project that aimed to distribute low-cost computers to children in developing countries. The project was supported by several ICT firms, including chip manufacturers and content platforms. While the project succeeded in putting computer literacy on many public agendas, its actual reach was limited (Robertson, 2018). Other initiatives that took a similar simplified technological approach floundered when faced with regulatory and political obstacles (Fitchard, 2013).

The DIB will highlight best practices, build consensus from a wide range of stakeholders and serve as a framework for companies to follow in aligning their activities with the SDGs. The benchmark will track how companies contribute to closing the gaps across four dimensions of digital inclusion: access, skills, use and innovation.

- **Access:** Examines how closely companies' business practices are geared towards making digital technologies broadly available, affordable and of similarly high quality across socio-economic groups and developed/developing countries.
- **Skills:** Emphasises contributions to digital skills as a means to broaden diverse users' abilities to safely use digital technologies. The DIB will examine not only how companies upskill their own employees but also their users, communities and beyond, in a wide range of digital skills.
- **Use:** Tracks the steps companies are taking to mitigate barriers to use, such as privacy, security and the lack of appropriate content and design (especially for illiterate and disabled people and children).
- **Innovation:** Focuses on how companies behave in ways that foster innovation in the wider digital ecosystem (e.g. external developers, smaller firms, new entrants), and to what extent they consciously create innovation meant to both bridge digital divides and address the SDGs.





The [World Benchmarking Alliance \(WBA\)](#) is generating a movement to increase the private sector's contribution towards a sustainable future for all. WBA is working to incentivise and accelerate companies' efforts to achieve the SDGs by assessing corporate performance and business impact in alignment with the goals. By providing this information to all stakeholders, WBA aims to build a movement where civil society, companies, financial institutions and governments can exert their full influence and ultimately help the private sector play its role in delivering the SDGs. Working in the spirit of SDG 17 (Partnerships for the Goals) is central to WBA's approach.

WBA is an independent organisation backed by an alliance of over 115 institutions. These provide WBA with the necessary support and credibility to be a successful driver of change. To date, WBA has developed two effective benchmarks, the Seafood Stewardship Index and the Climate and Energy Benchmark, and it has plans to launch five benchmarks during the course of next year, including the DIB.

WBA will serve as a public good offering free, publicly available benchmarks of around 2,000 companies by 2023. These keystone companies will be identified across seven systems transformations, each having relevant industries and specific companies within them. At the heart of all these systems is social transformation. Without respect for human rights, equality and empowerment, none of the SDGs can be fully achieved. Accordingly, WBA has committed to assessing all 2,000 companies on a social dimension. One of the ways that WBA will do so is through spotlight benchmarks that examine specific social issues across various sectors.

Introduction to the DIB

The DIB is part of WBA's wider work to measure and incentivise companies' efforts to achieve the SDGs. WBA aspires to better equip companies, financial institutions, governments, civil society and individuals with the information they need to assess and compare the private sector's contribution to digital inclusion as a cross-cutting SDG enabler. This work:

- Is grounded in key international principles and normative standards (e.g. digital inclusion recommendations from the OECD, UN bodies, the World Bank and relevant civil society organisations);
- Builds on and aligns with existing initiatives, particularly those focused on companies' contributions to digital rights online (e.g. Ranking Digital Rights);
- Includes a robust set of indicators that look beyond corporate policies to assess their performance outcomes;
- Takes a sub-industry-specific approach while also capturing digital inclusion issues that exist in all companies regardless of their place in the digital ecosystem.

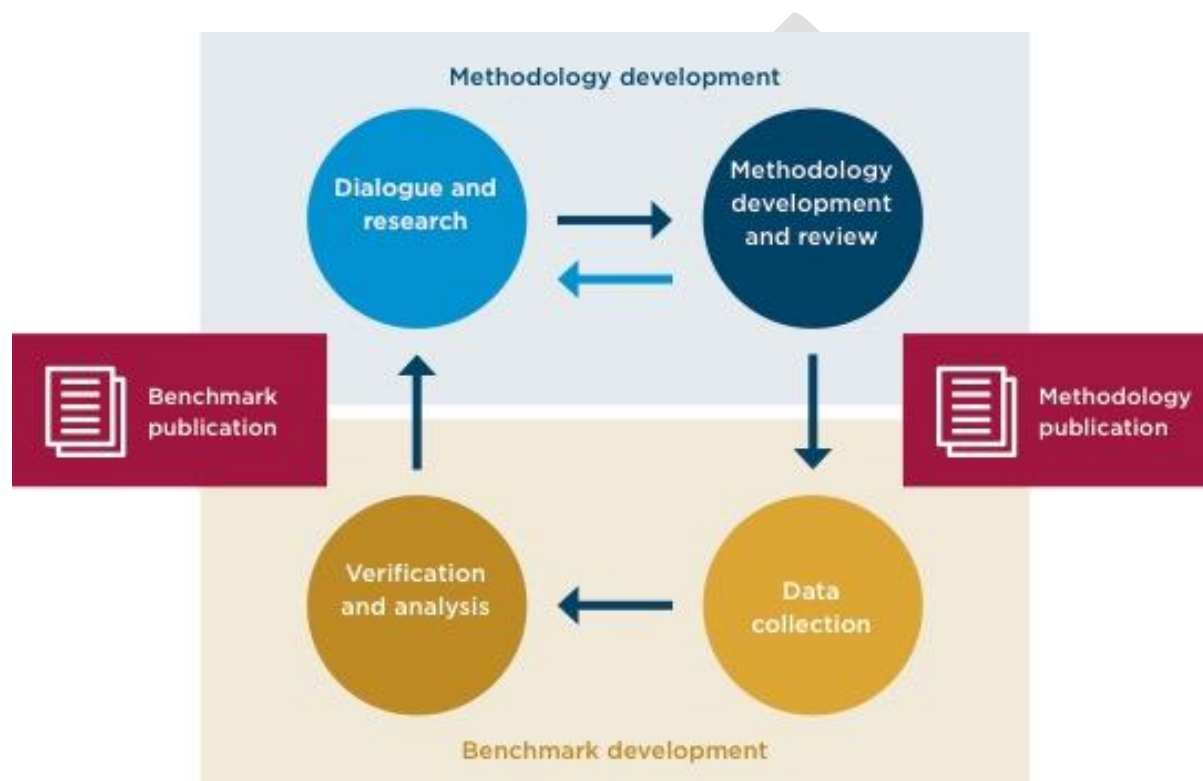
Once published, the DIB results will be freely and publicly available. These results will identify companies who perform strongly as well as those lagging behind, holding them to account. By highlighting best practices, the DIB will build a better understanding of the larger role that companies could play in driving digital inclusion through their core products, related business activities and corporate social responsibility efforts. Alongside the DIB, WBA will also publish benchmarks related to the circular economy, social inclusion and the existing Corporate Human Rights Benchmark. Some DIB companies will be included in these WBA initiatives. However, only issues specific to digital inclusion will be measured by the DIB while other sustainability issues, such as companies' success in reducing greenhouse gas emissions, will be evaluated by the relevant WBA benchmark.

Development of the DIB Methodology

Benchmark development cycle

The DIB is being developed according to a robust and structured process, outlined in Figure 1. The development process follows WBA's 'Guiding Principles'.

Figure 1. The WBA benchmark development cycle



Dialogue and research

Dialogue and research are crucial parts of the benchmark development cycle, as they ensure the DIB and its methodology address the right themes and reflect stakeholders' expectations for the benchmark. This process began during a series of global and regional consultations with key stakeholders where WBA explored potential new corporate benchmarks, both industry- and SDG-centred. Among others, many stakeholders expressed the need for a corporate benchmark that focuses specifically on the role of companies in promoting digital inclusion. This led to an [initial scoping report](#), published in March 2019, for which desk-based research and expert interviews were conducted on existing digital inclusion initiatives, current gaps in the field, and themes and industries to be included in the benchmark.

Since the development of the initial scoping report, continuous consultation and dialogue with stakeholders have taken place to gather input for the methodology and create awareness around the DIB. This included a stakeholder [roundtable](#) that was held in Mumbai, India in March 2019 (see Appendix 3) to discuss and prioritise the primary industry that the DIB should target, and to begin to identify the benchmark's key measurement areas. A series of interviews were also conducted with digital experts in the field to assist in shaping the benchmark.

Methodology development and review

To inform the methodology development process, a second roundtable was held in Silicon Valley, United States in November 2019, which brought together multiple stakeholders (see Appendix 3) to further refine the benchmark's indicators. This input was paired with extensive desk-based research into the many relevant principles and normative standards, reporting frameworks and sector-, product- and issue-specific initiatives that already exist that the DIB could align with and draw from. These resources were all mapped in detail to the key themes and sub-themes that emerged from the dialogue and research. Collectively, these inputs led to the development of draft indicators for each of the four measurement areas of digital inclusion (access, skills, use and innovation). Figure 2 illustrates the types of sources used for methodology and indicator development.

Figure 2. Types of sources for the DIB Methodology development



The methodology development process is being supervised by the DIB Expert Review Committee (ERC), which consists of independent external experts who advise on the benchmark's structure, scope, methodology and analysis. The preliminary draft indicators were reviewed in detail at an in-person meeting held over a full day with the ERC in Berlin, Germany in November 2019. The feedback from the ERC has been incorporated into the current draft indicators. A full list of ERC members can be found in Appendix 3.

The DIB draft methodology will be available online for public comment between 27 January and 29 February 2020. Feedback collected during this public consultation phase, as well as from a final review by the ERC, will be incorporated into the final methodology, which is due to be published by the end of March 2020.

Data collection

Once the final methodology is published, the data collection process will begin. The information to measure the performance of the companies in scope will initially be collected from public sources, followed by company-provided evidence. Companies that choose not to participate in the data collection process will be scored based on publicly available information only.

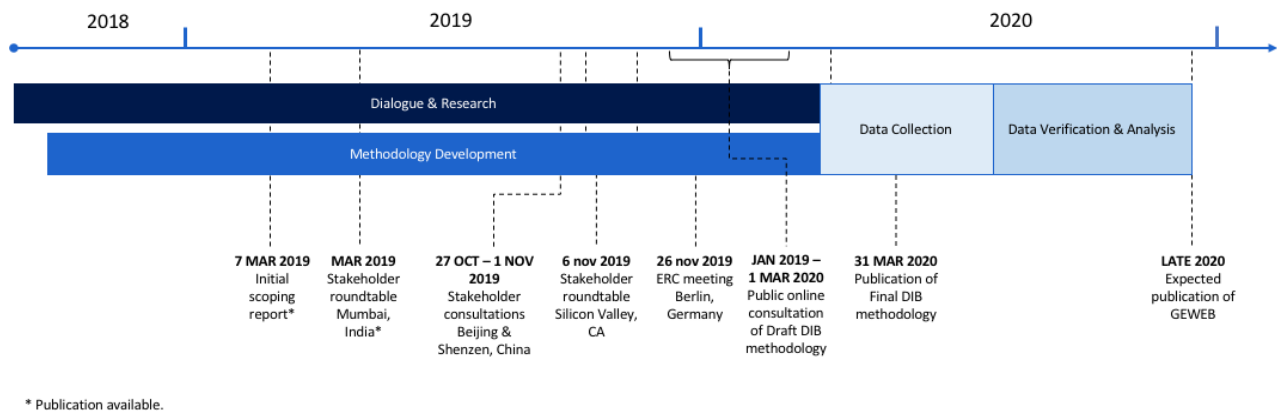
Verification and analysis

Following the data collection phase, the information provided by the companies will be checked and analysed. A review cycle will also be conducted in which we may seek clarification from companies on information that is unclear or incomplete. The companies will then be scored and ranked.

After publication, the DIB's findings and results, including company scorecards, will be publicly distributed. This will involve media communications, engagement with individual companies and industry organisations and outreach to specific stakeholders such as investors, banks, NGOs and policymakers. Feedback will be captured and incorporated in the methodology review process for the DIB'S next iteration.

Timeline of the benchmark development process

Figure 3. Benchmark development timeline



Scope of the DIB

Industry scope

The DIB aims to assess the world's leading ICT companies, all of which have varied approaches and levels of commitment to digital inclusion. The companies represent a significant share of the global ICT market and often shape norms for other actors in the sector.

The ICT sector can be visualised as consisting of three layers: layer one is the networked elements, layer two is the network providers and layer three is content, platforms and applications. The DIB uses a layering analogy, borrowed from network engineering, to help organise the ICT sector and thus understand how different industries interact and co-evolve with each other, as well as determine key players with significant impact on digital inclusion. These three layers should not be viewed as fixed but rather as fluid boundaries that shift with changes in technology and business models. There are also companies that straddle multiple layers. For example, Alphabet is a major player in all three layers as an operating system provider (Android), content delivery network (Google Cloud CDN) and search engine provider (Google Search).

- 1. Networked elements:** Mobile devices, fixed devices, servers, telecom switches and equipment, semiconductors, drones, supercomputers.

Hardware forms the base of the ICT sector and consists of networked element providers that produce the physical equipment users interact with to gain access to information, as well as components and inputs to equipment. For example, In the initial benchmark, the DIB will pay particular attention to mobile devices as these carry 48% of web traffic by data volume (Ericsson, 2019), with the share of internet use by users and data volume increasing exponentially since widespread adoption of the technology began in the 2010s. Relative to desktop use, mobile traffic by data volume is concentrated in the developing world. The amount of traffic on mobile has also increased by more than 20 times since 2014 and is forecast to continue increasing with the introduction of 5G (Ericsson, 2019). Along with mobile phones and the largest fixed-device makers, the DIB emphasises the network components and production ecosystem elements needed to operate an integrated mobile network. These include servers, telecom switches, integrated mobile base stations as well as telecommunications equipment and semiconductors used in internet operations. We have also included drones because of their tremendous potential to drive SDG achievement, as well as high-performance computing, or supercomputers, for their contribution to machine learning and other frontier technologies.

2. Network providers: Backbones, content delivery networks, fiber and mobile data providers, satellite telecommunications.

Layer two provides the connectivity interface for the digital ecosystem. Diversified network providers form the core of this layer. These include vertically integrated telecommunications companies that supply mobile and fixed connectivity, cable and broadband providers. This layer also includes wholesale providers of global internet connectivity, such as Tier 1 backbones. The DIB also makes special allowances for telecommunications companies that are less vertically integrated but serve key geographies, particularly developing countries. As part of our scoping process, we researched the top mobile providers in the world's ten most populous developing countries and ensured that these were included on our list. As a further effort to represent the developing world, the DIB includes companies such as Bharti Airtel and MTN, which are particularly active in providing connectivity in least developed countries. Finally, the DIB includes satellite companies. As around 90% of internet traffic is carried by terrestrial infrastructure, this final group constitutes a minority share of layer two.

3. Content, platforms and applications: Business software, search engines, platforms, social media, platform-enabled services, e-content.

Layer three captures code-based, non-physical elements that provide digital user interface structures. Since online platforms, such as Amazon, Grab and Airbnb, and platform-enabled services are not satisfactorily captured by the Organisation for Economic Cooperation and Development/United Nations Industrial Classification System classifications, the International Monetary Fund (IMF) suggests defining the digital sector as 'producers at the core of digitalisation: online platforms, platform-enabled services and suppliers of ICT goods and services' (IMF, 2018). This means that platform-enabled services, such as peer-to-peer rentals, peer-to-peer labour, peer-to-peer lending and gig economy platforms, fall under the IMF's digital sector. Thus far, the IMF definition is the most current and comprehensive to delineate the ICT sector and is used by the DIB. In scoping the companies to include in each sub-industry, the DIB considered the level of consolidation within the industry as well as the industry's relative global total revenue, number of users and time use of users.

Conglomerates

Many DIB companies operate in multiple layers. The company's ICT business line with the greatest share of revenue relevant to the benchmark was chosen when deciding in which layer to include such companies.

Company scope

The WBA approach for identifying keystone companies

WBA identified seven systems transformations that are needed to put society and our economy on a sustainable path: agriculture and food, circular, decarbonisation and energy, digital, financial, urban and a social transformation that underpins them all. These systems transformations offer a strategic framework for WBA to develop corporate benchmarks, helping identify the industries and specific companies that are most impactful within each. These 'keystone companies' build on the theory of 'keystone actors' originally coined by the Stockholm Resilience Centre (Österblom, et al., 2015), which refers to organisations with disproportionate influence on the structure and function of the systems within which they operate. These keystone companies, including both publicly listed as well as privately held and state-owned enterprises, will be catalysts for change and their actions will be vital for a wider, systemic transformation. The WBA principles for keystone companies are outlined in Figure 4.

Figure 4. The WBA principles for keystone companies



DIB company selection criteria

The DIB aims to assess the world's leading ICT companies on their varied approaches and levels of commitment to digital inclusion. The companies represent a significant share of the global ICT industry and often set the norms for other actors in the industry due to their size, influence and reach. Companies in the scope of the DIB were determined based on the WBA principles for keystone companies shown above, which were applied to the digital system as outlined below. The full list of companies to be included in the DIB can be accessed online through this [link](#).

Keystone criteria for the digital system

1. Companies that dominate global production or service revenues and volumes within a particular sector.

The amount of capital a company has raised (for pre-IPO companies) and growth in customers along with revenue were considered. However, company relevance in the digital economy is often based on much more than revenue, thus a nuanced set of criteria was used to assess a company's dominance in its respective industry.

Moreover, volumes in the digital sector are much broader than simply number of units sold. Using social media as an example, volumes would include not just the number of subscribers but also the growth of subscribers and their level of activity on the social media platform. We scoped industry publications such as CrunchBase, quantitative measures of connectivity, such as autonomous systems rank from CAIDA, and a list of the top 100 telecommunications firms by brand value as telecom importance is often not fully captured by revenue. The following criteria were used to assess company influence:

- Layer one: Market share (both revenue and units shipped), number of internet users by device category, share of total global installed supercomputer capacity by processing power.
- Layer two: Autonomous systems cone size from CAIDA (a measure of internet traffic), subscriber base for telecommunications companies, relative length of fibre optic network, countries connected, size and coverage of satellite constellation.
- Layer three: Market share, number of users in absolute terms, market share in developing countries, and consumer and business spending by sub-industry.

The top companies in each sector based on the above criteria were shortlisted. For example, telecommunications companies were shortlisted based on a combination of revenue and number of subscribers. The companies ultimately selected for the DIB include public, private and state-owned enterprises.

2. Companies that control globally relevant segments of production and/or service provision.

Parts of the technology ecosystem and supply chain most relevant to digital system transformation were identified. Consideration was also given to the importance and role of particular sub-industries, business activities and segments of production/service provision in the digital sector. Extensive desk research and stakeholder consultations were conducted on what types of companies are necessary for safe, inclusive access in each layer. As an example, this process led to the inclusion of hardware manufacturers that contribute critical components and engineering know-how to the production of mobile phones and laptops. Also included were companies that make central processing units (both design and fabrication firms), memories and screens and the device companies themselves such as Apple.

3. Companies that connect (eco)systems globally through subsidiaries and supply chains.

For network providers, metrics such as the number of observed direct and indirect customer links using the Border Gateway Protocol were considered. Companies operating at multiple layers of the ICT ecosystem were prioritised as these companies' vertically integrated business models, through which several stages of the supply chain are controlled, create greater sector influence. The software and hardware production process, including the most relevant supply chain players who do not directly supply ICTs to end users, was also taken into account. For example, this led to the inclusion of cloud computing providers as these are important for facilitating internet use but do not interact with users directly.

4. Companies that influence global governance processes and institutions.

Companies' global reach, influence, reputation and public policy involvement were considered. Specifically, participation in standards-making bodies and industry organisations (e.g. IEEE, ITU, GSMA, IETF) as well as a company's type of membership (e.g. founding member versus observer) were assessed.

5. Companies that have a global footprint, particularly significant in developing countries.

Companies were selected to ensure a globally representative sample, with particular attention paid to their impact through supply chains, operations and sales in developing countries. Specific focus was given to influential companies headquartered in emerging, frontier and developing markets. In addition, some companies were excluded due to overrepresentation or included due to underrepresentation of some regions and/or countries in the sample. For example, we included the top telecommunications companies by mobile internet market share in the world's ten most populous countries, eight of which are classified as developing countries. Mobile internet is the preferred method of access for low-income, women and other marginalised groups in these geographies.

Companies included in the DIB for 2020

Table 1: Layer one companies: Hardware

Trading name	Annual revenue (USD millions, most recent fiscal year available)	Headquarters	Estimated number of direct employees
AMD	6,475	USA	10,100
Apple	260,174	USA	137,000
BBK Electronics	5,407	China	40,000
Broadcom	20,848	USA	15,000
Cisco	51,900	USA	75,900
Dell	90,621	USA	157,000
Digital Realty Trust	3,046	USA	1,530
DJI	2,830	China	14,000
Equinix	5,072	USA	7,903
Ericsson	22,134	Sweden	95,359
Foxconn	173,663	Taiwan	863,000
GLOBALFOUNDRIES	6,000	USA	16,000
Hauwei	105,191	China	194,000
HP inc.	37,661	USA	55,000
Horizon Robotics	150	China	240
IBM	79,591	USA	350,000
Intel	70,848	USA	107,400
Lenovo	51,038	China	66,000
Nokia	24,851	Finland	101,000
Nvidia	11,716	USA	13,277
Qualcomm	242,773	USA	37,000
Samsung	221,568	S. Korea	309,630
SK Group (SK Hynix + SK Telecom)	45,650	S. Korea	33,000
TCL Communication	2,200	China	12,000
Texas Instruments	15,784	USA	30,000
Transsion	3,216	China	14,000
TSMC	33,838	Taiwan	48,919
Western Digital	20,647	USA	71,600
Xiaomi	24,840	China	17,965
ZTE	12,143	China	68,240

Table 2. Layer two companies: Telecoms

Trading name	Annual revenue (USD millions, most recent fiscal year available)	Headquarters	Estimated number of direct employees
Akamai	2,714	USA	7,579
América Móvil	52,747	Mexico	189,448
AT&T	170,756	USA	268,220
au by KDDI	46,383	Japan	41,996
Axiata	5,714	Malaysia	12,059
Bharti Airtel	11,310	India	14,818
China Mobile	104,893	China	451,000
China Telecommunications Corporation	53,625	China	280,474
China Unicom	41,306	China	260,964
China Sattelite Corporation	370	China	500
Cloudflare CDN	192	USA	1,191
Comcast	94,507	USA	184,000
Deutsche Telekom	83,336	Germany	215,675
EchoStar	2,091	USA	1,400
Etisalat	14,270	UAE	39,508
GTT Communications	1,491	Hong Kong	3,200
Inmarsat	1,465	UK	1,800
Jio	16,084	India	17,500
Level 3 (CenturyLink)	23,443	USA	13,500
Millicom	4,074	Luxembourg	21,403
Mobil'nye Telesistemy PAO (MTS)	7,463	Russia	65,000
MTN	9,170	S. Africa	18,835
NTT	108,459	Japan	303,351
Ooredoo	8,221	Qatar	16,489
Orange SA	45,582	France	150,711
PCCW Global	4,962	Hong Kong	23,600
Singtel	12,735	Singapore	24,071
SoftBank	34,200	Japan	17,100
SpaceX	2,500	USA	6,500
Tata Communications	823	India	10,752
Telecom Italia	21,219	Italy	57,901
Telefonica	53,941	Spain	120
Telenor	110,362	Norway	20,832
Telia	8,372	Sweden	20,439
Telkom Indonesia	9,095	Indonesia	24,071
Telstra	28,841	Australia	29,800

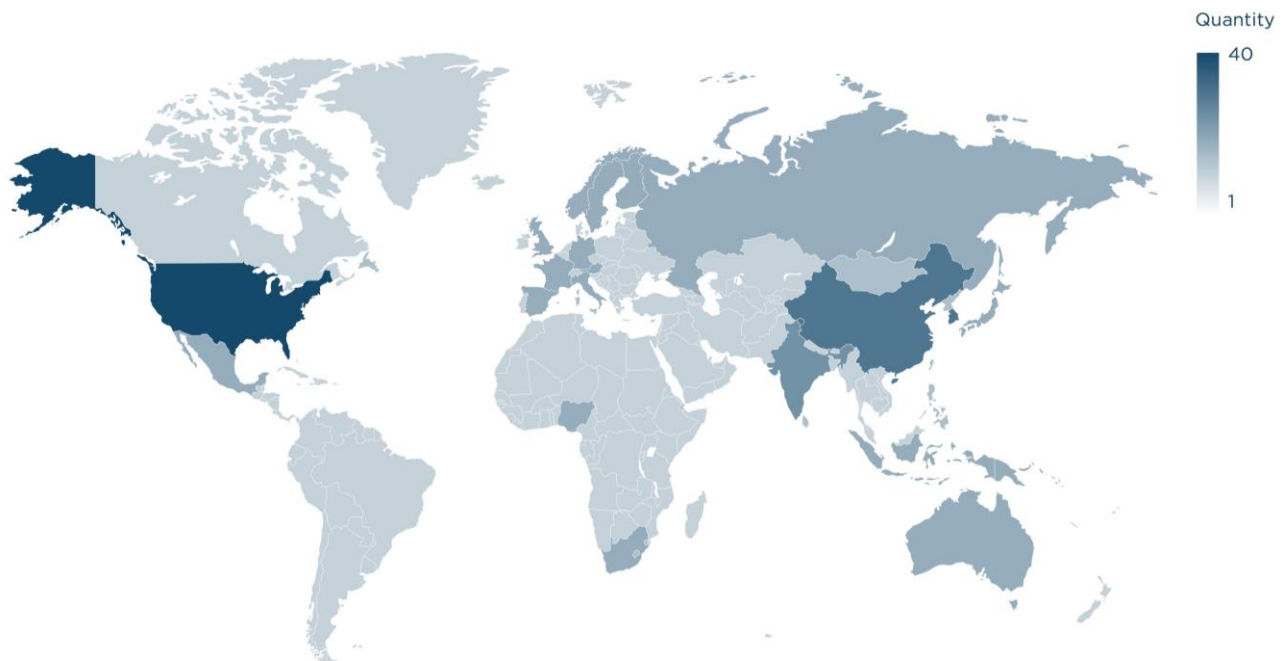
Veon	9,086	Netherlands	46,132
Verizon	130,863	USA	144,500
Vodafone Group	48,990	UK	92,000

Table 3. Layer three companies: Platforms/applications

Trading name	Annual revenue (USD millions, most recent fiscal year available)	Headquarters	Estimated number of direct employees
Adobe	9,030	USA	21,357
Airbnb	2,600	USA	6,000
Alibaba Group	56,152	China	101,958
Alphabet	136,800	USA	98,771
Amazon	232,887	USA	647,500
Baidu	14,876	China	42,267
Booking Holdings	14,527	USA	24,500
ByteDance	7,200	China	50,000
Citrix	2,973	USA	8,200
Didi Chuxing	10,667	China	90,000
Facebook	55,838	USA	35,587
Grab	1,000	Singapore	6,000
HCL Technologies	9,224	India	147,000
Infosys	12,860	India	236,486
jd.com	67,198	USA	178,927
Jumia	149	Nigeria	5,128
Lyft	2,200	USA	4,600
Meituan-Dianping	8,331	China	58,390
Microsoft	125,843	USA	144,000
NetEase	67,156	China	22,726
Netflix	15,794	USA	7,100
Ola	334	India	6,000
Oracle	39,506	USA	136,000
PayPal	15,451	USA	21,800
Salesforce	10,480	USA	29,000
SAP	27,211	Germany	96,498
Snapchat	1,200	USA	2,884
Spotify	6,044	Sweden	4,041
Tencent	44,410	China	56,310
Twitter	3,042	USA	3,900
Uber	11,300	USA	22,000

Details of the DIB 100 for 2020

Figure 5. Number of DIB companies by country

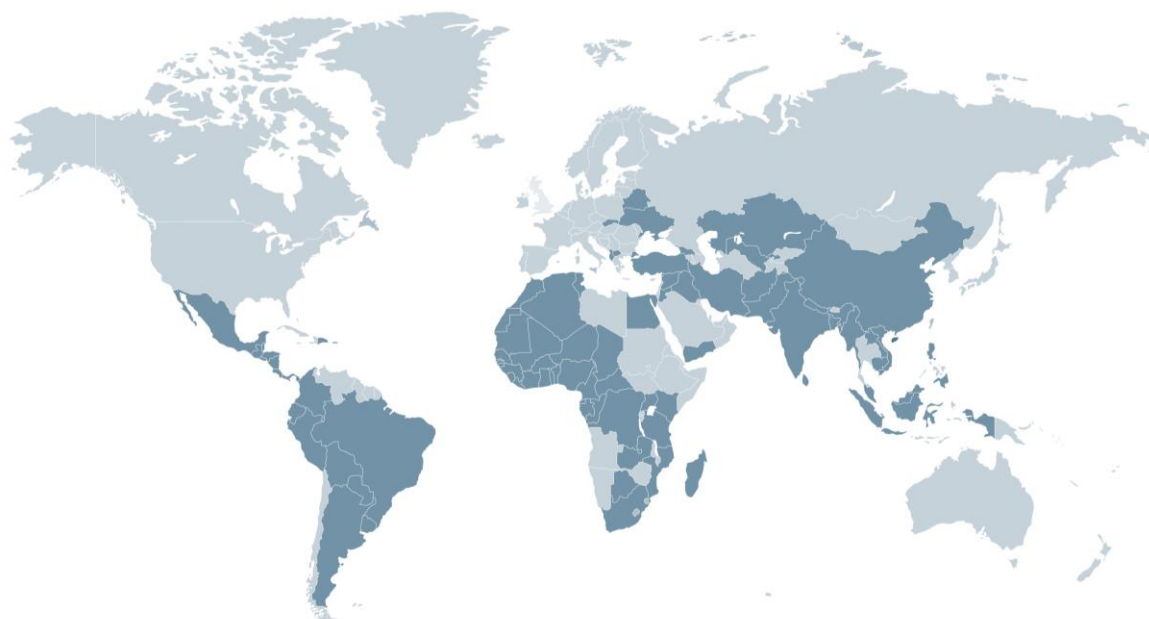


- Retail telecoms providers in the DIB serve countries with a combined population of roughly 6.62 billion people.
- Telecoms companies in the DIB reported around 5.5 billion telecoms connections. It should be noted that this may double count individual users and is not the same as the number of connections.

Geography and developing countries

The DIB strived to include companies that were relevant to developing countries while considering the other four keystone criteria. Special consideration was given to companies that are either based in developing countries or have a significant presence in those countries. 29g DIB companies are headquartered in developing countries, or 29% of the benchmark list. Further, retail telecoms companies in the DIB provide mobile internet in around 90 developing countries and 125 countries overall (see Figure 6). In addition, the retail telecoms providers on our list serve mobile and fixed internet customers in countries with a combined population of around 6.62 billion people.

Figure 6. Developing countries with mobile internet coverage provided by DIB companies



SDG scope

Digital inclusion can be viewed as both a means to a desired end and a desirable end in itself. As a mechanism, digital inclusion helps to ensure that individuals have an equal opportunity to employ digital technology for personal and social betterment. As for the end in itself, it is only right that everyone is able to enjoy this technology and participate fully in the information society.

Moreover, digital technologies are recognised for their cross-cutting contribution to the SDGs. The UN General Assembly, in its 2015 review of the outcomes of the World Summit on the Information Society, noted that access to ICTs has become ‘a development indicator and aspiration in and of itself’ (United Nations General Assembly, 2016). A variety of applications, such as the internet of things for better environmental monitoring, e-health and telemedicine for rural areas, smart sustainable cities, smart grids for more energy efficiency and e-government for better transparency, all have potential to accelerate the delivery of the SDGs.

The 2030 Agenda, therefore, focuses on ICTs as an enabling tool to advance the SDGs. While there is not an SDG specifically focused on digital inclusion, there are SDG targets that explicitly reference ICTs. Indeed, digital technologies intersect with all 17 SDGs to varying degrees, and the 2030 Agenda as a whole implies a role for digital technologies. For example, target 1.4 under SDG 1 (No Poverty) states, ‘By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services [...], appropriate new technology and financial services, including microfinance.’ Target 8.2 under SDG 8 (Decent Work and Economic Growth) aims to achieve ‘higher levels of economic productivity through diversification, technological upgrading and innovation’. Additionally, the globally agreed statistical framework to monitor SDG landmarks has seven ICT-related indicators. These include the proportion of schools with access to computers and the internet (SDG 4: Quality Education), the proportion of individuals with ICT skills (SDG 4: Quality Education), the proportion of individuals who own a mobile phone by sex (SDG 5: Gender Equality), the percentage of the population covered by a mobile network (SDG 9: Industry, Innovation and Infrastructure), fixed broadband subscriptions by speed and the proportion of individuals using the internet (SDG 17: Partnerships for the Goals) (UN, 2015).

Structure and Approach of the DIB

Measurement areas

The DIB will evaluate company performance across four measurement areas – access, use, skills and innovation – that are inspired by the SDGs and defined by extensive research and stakeholder engagement. These measurement areas are relevant to the entire ICT experience for a range of users, particularly those from marginalised groups, and reflect both the most critical constraints to digital inclusion as well as where stakeholders expect corporate action and where there is potential for companies to have the most impact.

Modularity

The DIB will take a modular approach. Some indicators require that different layers, or different sub-industries within layers, require different scoring criteria. In other words, one scoring method for a given indicator may be relevant to one layer but not another. For a given indicator, various layers may perform different activities that contribute to the same indicator goal. The DIB reserves the right to differentially score sub-industries or an entire layer within the same indicator as appropriate and will publish more detailed information on this approach in the final methodology.

Indicators

The basis for the DIB draft indicators – 13 in total – was drawn from seven sources:

1. Stakeholders' expectations;
2. Best available science;
3. Principles and normative standards;
4. Corporate reporting frameworks;
5. Sector-, product- and issue-specific initiatives;
6. Current industry best practices;
7. Existing benchmarks.

A thorough assessment was completed to determine the best and most relevant scientific research. Relevant principles and normative standards, corporate reporting frameworks and sector-, product- and issue-specific initiatives were then identified to ensure that the DIB indicators build upon the most widely accepted existing instruments. Inspiration was drawn from existing benchmarks, and the DIB draft methodology has sought to align with existing indicators where possible. The initiatives that a specific indicator aligns with are provided at the indicator level in the section 'What the DIB Measures'.

In order to accurately assess companies' progress towards digital inclusion, the DIB indicators have been formulated to go beyond measuring corporate policies and processes to also examine corporate performance and outcomes. The DIB, therefore, considers the extent to which companies put their commitments, policies and strategies into practice. However, WBA openly acknowledges the challenges that arise from taking a performance-focused approach and invites feedback specifically regarding the extent to which the right balance between commitment and performance has been achieved in the DIB draft methodology.

Approach to scoring and ranking

Each DIB indicator will be scored against a set of predefined criteria. These criteria are based on stakeholder consultations, guidance from the ERC and extensive research on existing initiatives and current practices. The DIB will use a standardised process to collect and analyse information about and provided by companies included in the benchmark in order to score the indicators. Each indicator will carry the same weight and a company will receive one of three scores based on the criteria.

Data collection, analysis and scoring

The DIB data collection, analysis and scoring process will consist of the following steps:

1. Development of a questionnaire and an online platform

Company data will be collected via a questionnaire sent to companies, containing one or more questions for each indicator. These questions will gather information to assess and score companies based on the indicators. General questions about the company's structure and other characteristics will also be included. The questionnaire will be built into an online platform that can only be accessed by those companies in scope and the DIB project team. Companies will also be able to review a blank version of the questionnaire to prepare their responses in advance.

2. Public domain research

Company information will be collected from a range of public sources to pre-populate the questionnaire. Information will be sourced from the company's website(s) and other disclosure sources. Third-party reports and publicly available data sets may be used to cross-check company information.

3. Company reporting

The pre-populated questionnaire will be shared with each company individually via the online platform. Companies will be requested to review the collected data and provide additional information to complete the questionnaire within a fixed time period. For certain indicators, companies will be able to provide unpublished information – including confidential information under a non-disclosure agreement – to ensure a more accurate assessment of their performance. The DIB project team will be available to support companies as needed during this time, guiding them through the process and answering any queries that may arise. Companies that choose not to complete the questionnaire within the allotted timeframe will be scored based solely on publicly available information and will not be able to influence or appeal their final scores.

4. Data analysis and verification

The DIB project team will review and analyse the submitted questionnaires and contact companies to clarify or verify information, as necessary.

5. Finalisation of scoring guidelines

Each indicator will be assessed against a set of scoring guidelines. These guidelines will be calibrated to the disclosed data and the information provided by the company, after which they will be finalised. This step allows for a more accurate reflection of companies' leading and lagging practices. The finalised scoring guidelines will be published together with the DIB report.

6. Company scoring

The final set of scoring guidelines for each indicator will be used to score company performance. Each set of scoring guidelines will have a fixed scale, such as 0 to 2, where companies can receive a minimum and maximum number of points for each indicator. Company scores will be cross-checked by multiple analysts on the DIB project team to ensure that the scoring process is fair and consistent. Spot checks will also be performed to ensure quality control and consistency across the scoring approaches. The best practices listed in the following section serve as guidelines, and the DIB explicitly reserves the right to make changes.

7. Company scorecards

The company scores and general profile information will be used to develop individual company scorecards, which will be made publicly available. The scorecards will outline how companies perform on the benchmark, provide key insights and highlight best practices. Prior to publication, the company scorecards will be shared with participating companies to inform them of their performance and ranking.

8. Publication

Along with the individual company scorecards, which will include company scores by measurement area and indicator, the DIB report will include companies' overall ranking, key (industry-wide) findings and the finalised scoring guidelines.

Types of evidence

Companies included in the DIB can provide different sources of information as evidence to support their data submission, such as company policies, statements, annual reports, sustainability reports, codes of conduct and guidelines. External sources of information, such as external assessments, audit reports, press articles and reports written for other purposes, can also be used as evidence if these sources contain credible information that is relevant and applicable to the DIB indicators.

Evidence to support the commitment-focused indicators can be sourced from company policies where the commitments are set and where the company explains its approach to implementing these commitments. The DIB will look for commitments that are supported by a clear approach and defined boundaries, including specific information regarding how the commitment will be implemented (e.g. goals, objectives, targets, timelines).

The performance-focused indicators should be backed by evidence that demonstrates actual practices, programmes and activities that the company has already implemented, how it manages the impact of its operations and whether practices apply to the full scope of company operations. Examples of information that could be considered as appropriate evidence for scoring will be included in the questionnaire.

For several indicators, the questionnaire will also request additional information about the scope of a company's operations to determine whether the company's practices, programmes and activities apply to all its operations and across its supply chains or only to a limited part.

As the DIB seeks to promote increased transparency for global stakeholders, it will, where possible, use evidence that is publicly available and in a format that will be widely understood by all stakeholders. For this reason, it is our strong preference to assess companies based on sources that are published and provided in the English language. However, the DIB project team will aim to translate select documents that may offer significant evidence, if companies indicate their relevance during the assessment process.

What the DIB Measures

In the details that follow for the four measurement areas, each DIB draft indicator is listed, together with relevant details and context, as follows:

Indicator topic: A short-hand reference for the indicator that uses a numbering schema. For example, 'A.C.1 Availability of ICTs' means 'A' = Access, 'C' = Commitment, '1' = chronological number in the relevant section, 'Availability of ICTs' = the specific topic addressed.

- **Indicator:** Company data point being measured.
- **Rationale:** Reasoning behind why the indicator is important and relevant to a company's performance on digital inclusion, in line with international normative standards, recent scholarly research and industry activities.
- **Best practices:** Examples that illustrate company efforts towards and role in closing digital inclusion gaps for this indicator.

Access (A)

This measurement area looks at how closely a company's business practices are geared towards making digital technologies widely and equally available and affordable. The first iteration of the benchmark will measure the quality of company commitments to improving access to digital technologies with a view to tracking how these commitments translate into core business practices in subsequent benchmarking rounds.

This measurement area includes the following indicators:

A.C.1

- **Indicator:** The company commits to provide and facilitate access to digital technologies for populations without prior access, e.g. individuals and/or informal and micro-enterprises. [C]
- **Rationale:** Access to both basic and frontier digital technologies is highly uneven, exacerbating existing economic inequalities and hindering achievement of the SDGs. Only half of the global population has access to the internet (International Telecommunication Union [ITU], 2018). The gap is even wider when it comes to access to frontier technologies, e.g. digital data and its associated applications. For example, under 5% of colocation data centres are located in Africa and Latin America (UNCTAD, 2019). With their capital and know-how, companies are well-positioned to ensure that their investment and business practices facilitate broad access to digital technologies.
- **Best practices:** Company best practices involve ambitious yet specific and measurable commitments to align core business activities with the goal of ensuring that populations without prior access, including informal or micro-enterprises, can easily access digital technologies. Specific commitments may vary depending on which layer the company operates in (see the 'Industry scope' section). For example, hardware companies (layer one) could commit to production and distribution practices that lead to affordable access for low-income populations and informal enterprises, while content and platform companies (layer three) could apply similar commitments to their paid products. Network companies (layer two) could commit to increase public peering in and support for developing country internet exchange points. The preceding examples are only for illustration, and companies may find a wider range of ways to align their business activities in support of this indicator.

A.C.2

- **Indicator:** The company commits to provide equal access to digital technologies for women. [C]
- **Rationale:** Globally, the proportion of women who use the internet is 12% lower than men, with the figure widening to 32% in least developed countries (Chakravorti, 2017). When women do use ICTs, they experience unique challenges. For example, in the United States, around 43% more women report online harassment than men (Women's Media Centre, n.d.). Companies have a unique role to play in making ICTs not just accessible to but inclusive for women – meaning they respect women's unique needs. By including more women in the digital economy, companies promote digital inclusion as well as increase their market opportunities.

- **Best practices:** This indicator tracks the quality of a company's commitment to ensuring their core business align with women empowerment, e.g. approach to product design and engineering; hiring and leadership in product design, research and engineering; public pledges to initiatives for closing gender gaps in access, etc. Leading companies commit to high-impact but time-bound targets and measure and evaluate their progress. The indicator applies similarly across the three layers.

A.C.3

- **Indicator:** The company commits to provide products and services with relevant features for diverse users. [C]
- **Rationale:** Digital products lack features tailored specifically to marginalised groups. Half of all web content is in English, yet only 20% of the world speaks the language (Charlton, 2018), and women lack

features to protect them online (Privacy International, 2019). Developing products and services relevant to these groups will not only be beneficial for them but also for the companies, as significant economic value can be unlocked by bringing the next billion users online (GSMA, 2014). Without equal access to digital technologies, marginalised communities and individuals will continue to fall behind.

Best practices: This indicator is designed to capture the needs of marginalised groups in terms of product features. It has been found that product features are a significant constraint to digital adoption, with most products engineered for dominant economic groups – i.e. English-speaking adult men (GSMA, 2017). Leading companies commit to understand the needs of marginalised groups and develop core product(s) with features that provide equal functional experience in any environment. Actions and policies may vary across layers. Companies in layer one may commit to provide users in developing countries with products that operate in low-power functionality and are resistant to harsh climate conditions. Companies in layer two and three may commit to apply inclusive user interfaces and language functionality for disabled users (Nganji & Nggada, 2011).

Skills (S)

The level of digital skills varies greatly both within and between countries as well as by gender, age, location and other social circumstances (International Telecommunication Union [ITU], 2018). A range of skills is required to benefit from ICT use. Given that ICTs are evolving rapidly, acquiring the right set of skills is a moving target. These skills are supported by general learning, critical thinking, problem-solving and creative abilities that are also useful in analogue domains. Companies, with their highly trained staff, are unique repositories of digital skills and have a key role to play in broadening the skills base within the company, among current and potential users of company products and for the general population in the communities where they operate.

The measurement area includes the following indicators:

S.P.1

- **Indicator:** The company ensures that underserved populations are equipped with digital skills. [P]
- **Rationale:** Women, less educated and rural populations are less likely to have basic digital skills. Women are 10% less likely to find, download, install and configure software than men (International Telecommunication Union [ITU], 2018). Such disparities are compounded at the corporate level with only 6% of CEO positions at the top 100 global technology groups held by women (Castle, 2017). Without proper skills, diverse groups are not able to use ICTs, billions are excluded from the digital

economy and the digital divide is widened. Thus, it is in companies' interest to create programmes that advance the skills of marginalised groups (Asian Development Bank Institute, 2019).

- **Best practices:** This indicator aims to capture the need for digital skills programmes targeting marginalised groups, as these are the most disadvantaged when it comes to participation in the digital system. Leading companies not only provide skills on core products to potential users but also promote upskilling for direct company employees, supply chain workers, product users, potential product users and non-users, especially marginalised groups. Leading companies also allocate significant budget relative to revenue to upskilling activities. The indicator applies similarly across the three layers, with special consideration given to the difference between B2B and B2C business models. For example, B2B companies may focus on baseline skills relating to product use among informal, micro, small and medium-sized enterprises as well as new market entrants.

S.T.2

- **Indicator:** The company measures and discloses the outcomes of its digital skills programmes. [T]
- **Rationale:** The DIB stakeholder consultations revealed that companies often fail to disclose the existence and effectiveness of their digital skills programmes. Further, there is a gap between providing inputs and measuring outputs. An existing initiative on corporate citizenship identified that three out of four companies fail to reach their community impact aspirations because they do not measure long-term impacts (Corporate Citizenship, 2016). Companies should provide better learning opportunities for digital skills because doing so will help upskill users and company employees (Asian Development Bank Institute, 2019).
- **Best practices:** This indicator captures the importance and effectiveness of digital skills programmes and institutional learning. Digital skills training is an evolving art, and more collaboration is needed to understand the most effective methods. Best practices may involve the disclosure of not only inputs to digital skills programmes, such as the number of participants, but also immediate and long-term outcomes, such as the number of participants who find a job after and due to the programme. Best practices may also involve consistent and comprehensive partnership with research institutions or other partnership that adds rigour to the company's approach to digital skills development. The indicator applies similarly across the three layers.

S.P.3

- **Indicator:** The company develops technical expertise in developing countries, for example engineering talent, technical design and entrepreneurial competence. [P]
- **Rationale:** According to GitHub data, no developing country is in the top 25 of software developers per capita (Frederickson, 2018). Artificial intelligence as well as other technical expertise is concentrated in a handful of countries (Foraus, 2019). This divide in the world's technical expertise stifles innovation and leads to greater global inequality (Diop, 2017). More needs to be done to improve the technical skills of those in developing countries in order to stimulate sustainable digital development and close inequality gaps. These gaps can be bridged with more investment, although some ICT companies are leading the way by establishing technical development centres in sub-Saharan African countries.
- **Best practices:** This indicator aims to address the ICT engineering and other technological skills gap between developing and developed countries. Leading companies support ICT skills development in developing countries, emphasising training and promoting local engineers, project managers and other technical staff. Best practices may consist of partnership with organisations that teach digital skills, local educational institutions and technology hubs, or training at R&D centres that are company supported or owned. Supporting high-level technical skills, such as developing engineering talent in blockchain (Porru, Pinna, Marchesi, & Tonelli, 2017) or other frontier software engineering fields, is what differentiates leading companies from the rest. Leading companies provide sustained support to

developing countries, particularly least developed countries. The indicator applies similarly across the three layers.

Use (U)

Material access and digital skills are necessary foundations for digital inclusion, but they do not guarantee beneficial use of ICTs. Concerns over data sales as well as the misgivings surrounding privacy and security can discourage use of ICTs. A safe, secure internet built on revenue models that respect the fundamental human right to privacy [UN3] the DIB sought to capture these constraints and the corresponding opportunities to overcome them in the indicators below.

U.P.1

- **Indicator:** The company assigns senior-level oversight and accountability for cybersecurity. [P]
- **Rationale:** On average, an internet of things device is attacked within five minutes of being plugged into the internet (NETSCOUT SYSTEMS INC, 2010). In the first half of 2019, more than 4 billion records were exposed due to 3,800+ data breaches (Risk Based Security, 2019). Cybersecurity threats discourage internet use as they give rise to legitimate user fears about online safety. Senior oversight ensures the appropriate provision of accountability, managerial capacity and company resources dedicated to prevention, mitigation and resolution of these issues (Roisman, 2019) (Rothrock, Kaplan, & Oord, 2017). Companies can align with existing standards and stimulate digital technology use through improvements in cybersecurity (IGF, 2017) (Ranking Digital Rights , 2019).
- **Best practices:** The indicator intends to address the risk for companies and society arising from cybersecurity threats. Leading companies not only assign but also empower senior leadership to take steps to ensure cybersecurity. These steps may include ensuring adequate time is spent on the topic in board meetings, allocating sufficient resources, including staff and engaging external consultants when appropriate and collaborating with other companies as well as government agencies. The presence of an empowered chief security officer may be another example of best practice. The indicator applies similarly across the three layers.

U.C.2

- **Indicator:** The company commits to limit third-party access to personal data. [C]
- **Rationale:** Research has shown that nine in ten internet users do not want their data to be sold (Muhammad, 2019). Without realising it, online users can agree to share their data with up to 400 third-party advertisers (Utz, Degeling, Fahl, & Holz, 2019). Neither do users always understand what information is being collected, what it is used for and who controls the data as it is packaged and sold. Leading companies strive to create an ICT ecosystem that respects users' right to data privacy.
- **Best practices:** Personal data refers to information that can be used to identify individuals or groups of individuals with a high emphasis on marginalised groups, especially children (ICO, n.d.). The indicator is designed to capture the gap between status quo 'informed consent' practice and the preference of users to retain their privacy in their online activities. Leading companies not only have policies in place to better inform users but also orient their business model away from data sales. For example, layer two and three companies have a role to play in refraining from collecting personal data, such as location data and identifying information collected as part of product registration or use. Leading layer one companies examine the scope for their products to be used as data collection and data service instruments.

U.P.3

- **Indicator:** The company assesses its cybersecurity risk and has a plan in place to prevent and remedy cybersecurity incidents. [P]
- **Rationale:** Globally, cybersecurity incidents are projected to cost USD 5.2 trillion over the next five years (Accenture Security, 2019). In 2018, the average time to identify a data breach for an American company was 196 days (Symantec, 2018). Ranking Digital Rights recommends companies have a plan in place to prevent and quickly remedy cybersecurity incidents (Ranking Digital Rights, 2019). If companies are proactive regarding cybersecurity, digital inclusion will improve as users feel safer while using digital technologies.
- **Best practices:** The indicator aims to address the gap between cybersecurity best practices and implementation. Leading companies continuously evaluate their risk and update plans as well as develop concrete steps to prevent incidents accordingly. Best practices around remedy may involve providing fixes and selectively disclosing risks to users so that fixes may be implemented. Assessment means identifying the scope of cybersecurity risks across company's business lines. B2B companies, particularly hardware producers, may be more concerned with protecting hardware vulnerabilities from being discovered, while an online consumer platform may put more focus on data breaches.

U.T.4

- **Indicator:** The company systematically informs vulnerable users of known risks and harms arising from the use of the company's products and services. [T]
- **Rationale:** Vulnerable users are not sufficiently informed about online risks and harms, and terms of service are often too long and complex for the average user to fully understand (Nowicki, 2019). In the United States, 40% of users have experienced online harassment (Duggan, 2014). Changing digital technology and more time spent online by diverse users means new risks constantly emerge, particularly for vulnerable users. Informing users of issues relevant to their online safety creates confidence and encourages greater ICT use.
- **Best practices:** This indicator intends to address the fact that most users of ICT products and services are not aware of all the risks and harms arising from this use, even though they have been notified through terms and conditions. Leading companies assess the scope of risks and harms from their products and services and make this information easily accessible and understandable for every stakeholder, especially marginalised groups. Actions and policies may vary across layers. Leading companies in layer one may highlight physical harms due to ergonomic product structure or screen use, whereas B2B hardware providers, such as chipmakers, may take more of an advocacy role versus direct harm mitigation. Leading companies in layer two and three may focus more on harms from internet use such as cyberbullying, online addiction and negative impacts on children.

Innovation (I)

From a business standpoint, innovation refers to an improvement in the organisation, process, and products and services that create more wealth for the company. These innovations can involve cost-reduction, value-creation or the development of entirely new business models that do both. Innovation is a critical enabling mechanism for use and access as companies can build new technologies or processes that aid both. Further, innovation is an important broad-based enabler of the SDGs as new digital technologies have the potential to stimulate advances across the board, from health to agriculture.

I.P.1

- **Indicator:** The company develops and promotes open standards. [P]

- **Rationale:** Improving existing standards and creating, implementing and developing new standards is necessary to ensure ongoing innovation (IETF, n.d.). Open standards drive global innovation and advancement (Open Stand, n.d.) but adoption only works if companies cooperate (McKinsey&Company & GSA, 2015). By providing open standards leadership, companies improve digital inclusion through increasing competition and easier adoption. This in turn creates ICTs that function for wider audiences (Centre for Intellectual Property & Policy Management at Bournemouth University, 2012).
- **Best practices:** This indicator is designed to capture the shared benefits of broadening open standards. Research shows that open standards increase access, improve usability and accelerate technological development. Leading companies develop new standards in a collaborative process. Best practices may include companies publicly disclosing their software code, allowing their employees to participate in initiatives setting the open standards or making changes to their products in order to align with existing standards. Leading companies contribute, particularly with employee time, to standards-making bodies, provide documentation, disseminate their work and develop new product and process standards.

I.P.2

- **Indicator:** The company builds technological capacity across developing countries, particularly in least developed countries, e.g. localising engineering operations or funding innovation hubs. [P]
- **Rationale:** Despite ICT's contribution to global growth remaining stable over the past decade, least developed countries have seen the share of the ICT industry in their gross domestic product decline over the same period (United Nations Conference on Trade and Development [UNCTAD], 2019). Further, almost 80% of private R&D investments comes from companies in developed economies (Cornell University, INSEAD, & WIPO, 2019), which increases the divide in technology capacity between developed and developing economies. Closing this disparity-enhancing divide will accelerate the development of innovations, such as mobile money, which are particularly tailored to enable those in developing countries to access the benefits of ICTs.
- **Best practices:** This indicator is designed to capture the gap between developing and developed countries in ICT. Excluding China, most ICT companies are headquartered in the developed world. Leading companies are well-positioned to help close this gap. Building technological capacity in developing countries means enabling those countries to bridge the geographic digital divide. Possessing ICT skills facilitates the adoption of new technologies. Best practices may involve companies allocating significant R&D resources to developing countries, investing in start-ups or established companies, or building innovation hubs. It may also involve taking minority stakes in emerging companies in which they invest and facilitating company management by local actors.

I.P.3

- **Indicator:** The company promotes interoperability. [P]
- **Rationale:** Major inefficiencies exist because digital products are not able to work with each other without restrictions (Association Francophone des Utilisateurs de Logiciels Libres [AFUL], 2015) (European Commission, 2014). Even in developed countries, the lack of interoperability influences the SDGs. In the United States, 72% of health IT managers manually sort patient records due to non-compatible e-health records systems (Dooling, et al., 2016). Companies are well positioned to increase interoperability for new and existing ICTs through their role in governing codebases, hardware standards and telecom network connectivity. By achieving interoperability, companies ensure that the benefits of their products and services can reach the largest number of different users and sectors.
- **Best practices:** The indicator intends to encourage companies to provide products and services that are interoperable with those developed by both competitors and natural partners. Best practices may include adhering to existing interoperability standards and tracking new standards for company products and services. Leading companies not only build partnerships across corporate entities in order

to broaden the scope for interconnection but also conduct research on the possibility for product and service interoperability and take appropriate action to ensure it. The indicator applies similarly across the three layers.

I.P.4

- **Indicator:** The company has mechanisms for ensuring inclusive product/service research and development (R&D). [P]
- **Rationale:** R&D is both geographically divided and not targeted to the needs of marginalised groups. In the United States, those with disabilities are three times more likely never to go online due in part to a lack of products tailored to their specific needs [footnote 8]. In Kenya, R&D spending as a percentage of gross domestic product is a tenth of that in Israel (The World Bank, n.d.). To ensure technology, particularly frontier technology such as artificial intelligence, creates maximum benefits and minimises inequalities, R&D must consider the specific needs of marginalised groups as well as bridge the geographic digital divide (Foraus, 2019).
- **Best practices:** The indicator intends to capture the responsibility of companies to regularly consider the needs of marginalised groups during R&D of core products. This particularly relates to shifts in localisation; too much product development takes place in developed countries. Leading companies employ marginalised groups in research roles and may localise these activities in developing countries. Diverse social and economic groups are likely best suited to understand the needs of their peers. Leading companies take steps to consider the needs of marginalised groups by creating new products tailored to their specific needs. Mechanisms may include pledges, funding commitments or operational processes to empower R&D teams to develop inclusive technologies. For example, an e-commerce company may develop an app to help farmers in developing countries sell their products by setting up R&D teams in countries where these farmers live. The indicator applies similarly across the three layers.

Appendices

Appendix 1: Review of ICT-related benchmarks

ICT Development Index

Published yearly since 2009 by the International Telecommunication Union. Benchmarks more than 160 countries. Uses 11 indicators across three sub-indexes: ICT access, ICT use and ICT skills. Uses official statistics submitted by governments. Uses proxies instead of direct indicators due to a lack of official statistics, especially for ICT use and ICT skills (e.g. subscriptions for use and enrolment ratios for skills). Openly published methodology.

Ranking Digital Rights

Published yearly since 2015. Evaluates more than 20 of the most influential telecommunications companies and internet platform giants on their disclosed commitments and policies affecting freedom of expression and privacy. Contains 35 indicators in three main categories: governance, freedom of expression and privacy. Each indicator is categorical and awarded a score (e.g. 100 for full disclosure, 50 for partial disclosure and 0 for none or no disclosure found). Indicators are evaluated at both parent company and local level depending on company structure. Openly published methodology.

Global Competitiveness Index

Published yearly by the World Economic Forum as part of its Global Competitiveness Report since 2005. However, the Global Competitiveness Index (GCI) has been in existence for four decades and is one of the most cited and influential country-level indexes. It compares more than 130 countries on their national

competitiveness – defined as a set of institutions, policies and factors that determine the level of productivity. The GCI assesses over 100 indicators across 12 pillars. One of these pillars measures technological readiness using seven indicators: availability of latest technologies, firm-level technology absorption, foreign direct investment and technology transfer, internet users, fixed-broadband internet subscriptions per 100, internet bandwidth per capita and mobile-broadband subscriptions per 100. Openly published methodology.

Inclusive Internet Index

Commissioned by Facebook and conducted by the Economist Intelligence Unit since 2017. Measures national-level internet inclusion for over 80 countries across four categories: availability, affordability, relevance and readiness. Acknowledges that inclusion goes beyond infrastructure access. Countries are also evaluated on cost of access, market competition, availability of relevant and local content, as well as capacity in terms of education and skills. However, certain aspects of the methodology are not clearly explained, and countries are ranked but not scored.

Affordability Drivers Index

Published by the Web Foundation's Alliance for Affordable Internet annually since 2014. It is a composite measure of the drivers of internet affordability in more than 60 countries. The index scores and ranks countries according to two key aspects of affordability: communications infrastructure and access. The infrastructure sub-index tracks infrastructure deployment, as well as enabling policy and regulation that encourages network expansion. The access sub-index tracks current broadband adoption rates, as well as policy and regulatory frameworks that ensure affordable and equitable access. The 28 indicators are sourced from an expert survey and from statistics published elsewhere (e.g. ITU). Openly published methodology.

Global Innovation Index

Published annually by the World Intellectual Property Organization together with INSEAD and Cornell University since 2008. Composite benchmark that aims to track innovation in all its complexity across more than 120 countries. Methodology is published openly. The index has two sub-indexes, innovation input and innovation output, built on five and two pillars respectively. Each pillar has sub-pillars, and the index has about 80 indicators. The ICT sub-pillar itself is a composite of four other indexes: ICT access, ICT use, online service by governments and online participation by citizens.

Australian Digital Inclusion Index

Research is supported by telecommunications company Telstra and conducted by Roy Morgan Research and researchers from RMIT and Swinburne University. Tracks internet inclusion in terms of three sub-indexes – access, affordability and digital ability – across different states and territories in Australia. Each sub-index is broken down into components, and the index has more than 30 indicators. The index uses survey data for the indicators and is consequently able to highlight digital skills in more detail.

Digital Access Index

Published by an industry group, Global e-Sustainability Initiative. The index tracks digital and technology indicators for the whole digital industry. It has 21 indicators across three categories: connectivity (e.g. infrastructure, use, affordability), technologies (e.g. machine-to-machine connections) and digital solutions (e.g. e-health, e-learning). No additional details about the methodology and results are known since the index is available only to members. Not clear whether the analysis is at the company, industry or country level.

E-Government Development Index

Assesses and compares 193 United Nations member states based on the level of development of e-government services to promote access and inclusion of their people. It recognises that e-government development depends not only on the supply of online services but also on the country's capacity to participate in the information society. The index is a weighted average of normalised scores for three

dimensions of e-government development: scope and quality of online services, development status of telecommunications infrastructure and inherent human capital. It is regularly revised to reflect changing trends in e-government strategies. Openly published methodology.

Appendix 2: Terms

Capital acquisition: Usually known as capital investment, capital acquisition involves the provision of funds to another company to further its business objectives. It can also include the acquisition of long-term assets such as real estate, manufacturing plants and machinery.

Cybersecurity: According to the International Telecommunication Union, cybersecurity is defined multidimensionally as a 'collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organisation and user's assets' (ENISA, 2016).

Developing country: UNCTAD, the United Nations trade, investment and development agency, uses the term developing countries for statistical convenience, and many international organisations have refrained from defining it (UNCTAD, n.d.). The International Monetary Fund uses the term for the bottom group in its hierarchy of advanced, transition and developing countries, a classification which is not based on strict criteria (IMF, 2019). There is, however, a consensus to classify as developing all countries classified by the World Bank as low- and lower-middle-income countries (Advocates for International Development, n.d.).

Developed country: The opposite to the definition above, there is a consensus to classify as developed all countries classified by the World Bank as upper-middle and high-income countries (Advocates for International Development, n.d.).

Equity financing: A model in which instead of receiving interest on a loan, an investor is granted an ownership share in the company. In the ICT sector, particularly for new market entrants, equity financing is typically 'not long-term money'; the goal is for the investor to be able to 'exit with the help of an investment banker' or through another instrument such as being issued shares in an initial public offering (Zider, 1998).

Fixed device: A device used to connect to the internet and input and transmit data, which only works while stationary. The device may be capable of working without wires attached, but it cannot maintain its connection while moving. Examples include laptop and desktop computers.

High-performance computing/supercomputer: A system of smaller computers linked together to perform tasks involving lots of processing power. In contrast to a desktop computer, which usually has a single processing chip (CPU), a high-performance computing (HPC) system is a network of nodes, each of which contains one or more processing chips, as well as its own memory (The National Institute for Computational Sciences, n.d.). HPCs are key drivers of innovation. Not only do HPCs help produce new ICTs, they help engineers learn how to reduce the amount of computing power needed to complete existing computing tasks, such as speech recognition, so that these processes can be performed by more basic consumer devices.

Informal, micro, small and medium-sized enterprises: There is a range of definitions for this term. The DIB uses the broadest, as defined by the International Finance Corporation (IFC), to promote inclusivity. The IFC defines medium enterprises as having between USD 3-15 million in annual sales and 50-300 employees, whereas small enterprises have USD 100,000-3 million in annual sales. Micro enterprises are anything smaller than this and informal refers to casual business activity, for instance a person reselling personal items or preparing food for neighbours in exchange for payment (IFC).

Interoperability: The ‘ability of two or more information and communication *technology* applications to accept data from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention’ (European Commission, 2012). In other words, two technological systems that can communicate with one another, share information and operationalise an ICT process automatically.

Least developed country: The classification of a least developed country (LDC) is assigned by the Committee for Development Policy, which is mandated by the United Nations General Assembly and the Economic and Social Council to review the list of LDCs every three years. Countries need to meet certain thresholds on income, human assets and economic vulnerability to be defined as an LDC. The income threshold is set at the three-year average of the level of gross national income per capita, which in 2018 amounted to USD 1,025. The human assets threshold is defined with the help of the Human Assets Index and has been set at 60. Economic vulnerability is also defined with the help of an index, the Economic Vulnerability Index, and is set at 36 (United Nations, n.d.).

Marginalised groups: Groups of people who are socially excluded for various reasons, such as age, physical or mental disabilities, economic status, access to education, or live in isolated places or depressed areas (Morato, Ruiz-Robles, Sanchez-Cuadrado, & Marzal, 2015).

Mobile device: An apparatus to connect to the internet and input and transmit data, which works while moving. Examples are smartphones, feature phones and tablets with mobile internet connection.

Open standards: Public processes for harmonising hardware, software and/or operational processes made available to the general public that are developed (or approved) and maintained via a collaborative and consensus-driven process. Open standards facilitate interoperability and data exchange among different products or services and are intended for widespread adoption (ITU, 2018).

Research and development: Any ‘creative systematic activity undertaken in order to increase the stock of knowledge [...] and the use of this knowledge to devise new applications’ (OECD, 2003). It can take three main forms: fundamental research, applied research and experimental development.

Switch: A device used to interconnect multiple data networks and provide transfer of data from one network to another.

Telecommunications base station: Base stations ensure that mobile phone users are always within range by being positioned in networks of overlapping cells. They pick up incoming and send out outgoing signals at a slightly different frequency (GSMA, 2011).

Telecommunications company: A company that provides connection to enable data transfer. There are two major types, retail and backbone providers. Retail providers typically provide internet connection, fixed or mobile too consumers or organisational clients. These providers may also engage in the delivery of content such as video streaming. The second type, backbone providers, facilitate data transfer by owning or managing connectivity infrastructure. Many companies, such as Verizon and Vodafone, operate both types of services.

Appendix 3: External Contributors

Expert Review Committee

The Expert Review Committee (ERC) is a key component in the stakeholder engagement process. The ERC is made up of individuals from a variety of stakeholder groups, all active in some capacity in relation to digital inclusion. The expertise of the ERC members covers all relevant areas within the scope of the DIB. The ERC members provide the DIB team with strategic guidance, recommendations and advice on the scope,

structure, content and methodology of the benchmark. The ERC's diverse composition ensures that different viewpoints and perspectives are taken into consideration when developing and refining the DIB methodology. The ERC members have provided their general support for the methodology.

The following experts are members of the ERC:

- **Dr Alexandre Barbosa** – Head of the Regional Center for Studies on the Development of the Information Society (Cetic.br)
- **Dr Anita Patil-Deshmukh** – Executive Director, PUKAR
- **Gregory Francis** – Managing Director, Access Partnership
- **Edward Hsu** – Senior Advisor on Disruptive Technologies, World Bank
- **Dr Michael Kende** – Senior Advisor, Analysys Mason and World Bank
- **Esperanza Magpantay** – Senior Statistician, ICT Data and Statistics Division of the International Telecommunication Union's Telecommunication Development Bureau
- **Julie Owono** – Executive Director, Internet Sans Frontières
- **Claire Scharwatt** – Director of Policy and Advocacy, GSMA

Roundtable attendees

Roundtables are another key component in the stakeholder engagement process. The DIB roundtables brought together participants from various stakeholder groups, including companies, non-governmental organisations, multilateral and bilateral organisations, and financial and research institutions, to gather feedback.

The following stakeholders participated in at least one of the two DIB roundtables held in Mumbai, India and San Francisco, USA or met for talks during the DIB engagement trip to China.

- Advanta Seeds
- Aspen Institute
- Bharat Inclusion Initiative
- Business for Social Responsibility
- Caux Round Table Japan
- Cellular Operators Association of India
- Cisco Systems
- Cloudera Foundation
- Digital Empowerment Foundation
- Dutch Consulate (San Francisco)
- Entirety LLC
- Fintech Yatra
- Geneva Association
- Gram Mar: Rural Broadband Project
- Haas School of Business, University of California
- IDOBRO
- Indus OS
- Internet and Mobile Association of India
- IT for Change
- JD.com
- Kobe University
- Lenovo
- LIRNEasia
- Maharashtra Information Technology Corporation (MahaIT)

- Mahindra
- Meituan-Dianping
- Microsoft
- Ministry of Commerce, Government of China
- Ministry of Electronics & Information Technology, Government of India
- Mozilla Foundation
- NASSCOM Foundation
- Navana Tech
- Observer Research Foundation
- Orange
- Pavan Duggal Associates
- PUKAR
- Salesforce
- Stanford Angels
- Stanford University
- Sustainability Accounting Standards Board
- Swissnex SF
- Tandem Research
- Tata Communications
- UN Foundation
- Verizon Communications
- Wikimedia Foundation
- Women's Startup Lab
- Xiaomi

References

- Abshagen, M., Cavazzini, A., Graen, L., & Obenland, W. (2018).** Hijacking the SDGs? The Private Sector and the Sustainable Development Goals. Von <https://www.2030agenda.de/sites/default/files/Hijacking%20the%20SDGs.pdf> abgerufen
- Accenture Security. (2019). THE COST OF CYBERCRIME.** Von https://www.accenture.com/_acnmedia/PDF-96/Accenture-2019-Cost-of-Cybercrime-Study-Final.pdf#zoom=50 abgerufen
- Advocates for International Development.** (kein Datum). Understanding the Developed/Developing Country Taxonomy. Von Advocates for International Development: <http://www.a4id.org/policy/understanding-the-developeddeveloping-country-taxonomy/> abgerufen
- Algorithmic Justice League & Center on Technology & Privacy at Georgetown Law. (2019).** Safe Face Pledge. Von <https://www.safefacepledge.org/> abgerufen
- Asian Development Bank Institute. (2019).** REALIZING EDUCATION FOR ALL IN THE DIGITAL AGE. Tokyo: Asian Development Bank Institute. Von <https://www.adb.org/sites/default/files/publication/503706/adbi-realizing-education-all-digital-age.pdf> abgerufen
- “ASSESSING PRIVATE SECTOR CONTRIBUTIONS TO JOB CREATION: IFC OPEN SOURCE STUDY.”** Access to Finance, IFC, <http://documents.worldbank.org/curated/en/602291468183841622/pdf/819960BRIOMeas00Box379851B00PUBLIC0.pdf>.
- Association Francophone des Utilisateurs de Logiciels Libres [AFUL]. (30 January 2015).** Groupe de travail sur l'interopérabilité. Von Association Francophone des Utilisateurs de Logiciels Libres: <https://aful.org/gdt/interop> abgerufen
- Castle, D. (2017). Women and ICT.** Von UNESCO: <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/images/GWIDanieleCastle.pdf> abgerufen

Centre for Intellectual Property & Policy Management at Bournemouth University. (2012). Open Standards in Government IT: A Review of the Evidence. Von https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/78891/Review-of-the-Evidence_CIPPM.pdf abgerufen

Centre for International Governance Innovation & Chatham House. (2016). Global Commission on Internet Governance: One Internet. Von <https://www.chathamhouse.org/sites/default/files/publications/research/2016-06-21-global-commission-internet-governance.pdf> abgerufen

Chakravorti, B. (12 December 2017). There's a Gender Gap in Internet Usage. Closing It Would Open Up Opportunities for Everyone. Harvard Business Review. Von <https://hbr.org/2017/12/theres-a-gender-gap-in-internet-usage-closing-it-would-open-up-opportunities-for-everyone> abgerufen

Charlton, E. (13 December 2018). The internet has a language diversity problem. Von World Economic Forum: <https://www.weforum.org/agenda/2018/12/chart-of-the-day-the-internet-has-a-language-diversity-problem/> abgerufen

Chemuturi, M. (2011). Mastering Software Quality Assurance. J. Ross Publishing.

Cornell University, INSEAD & WIPO. (2019). GLOBAL INNOVATION INDEX 2019. Ithaca, Fontainebleau, and Geneva: Cornell University; INSEAD; and World Intellectual Property Organization (WIPO). Von https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf abgerufen

Corporate Citizenship. (2016). Hard Outcomes or Hollow Promises? Realising the True Impact of Corporate Community Investment. Corporate Citizenship. Von <https://corporate-citizenship.com/wp-content/uploads/Hard-Outcomes-or-Hollow-Promises.pdf> abgerufen

"Definition of Telecommunications Company." Encyclopaedia, PC Magazine, <https://www.pcmag.com/encyclopedia/term/52673/telecom-company>.

Diop, M. (30 November 2017). Innovation in Africa. Von World Bank: <https://www.worldbank.org/en/news/speech/2017/11/30/innovation-in-africa> abgerufen

Dooling, J., Fernande, L., Kirby, A., Landsbach, G., Lusk, K., Munns, M., . . . Patten, M. (January 2016). Survey: Patient Matching Problems Routine in Healthcare. Von Journal of AHIMA: <https://journal.ahima.org/2016/01/06/survey-patient-matching-problems-routine-in-healthcare/> abgerufen

Duggan, M. (22 October 2014). Part 1: Experiencing Online Harassment. Von Pew Research Center: <https://www.pewresearch.org/internet/2014/10/22/part-1-experiencing-online-harassment/> abgerufen

ENISA. (2016). Definition of Cybersecurity - Gaps and overlaps in standardisation. Von <https://www.enisa.europa.eu/publications/definition-of-cybersecurity> abgerufen

Ericsson. (June 2019). Mobile data traffic outlook. Von Ericsson: <https://www.ericsson.com/en/mobility-report/reports/june-2019/mobile-data-traffic-outlook> abgerufen

Ericsson. (November 2019). Mobile technology trends: traffic by application category. Von Ericsson: <https://www.ericsson.com/en/mobility-report/mobile-traffic-by-application-category> abgerufen

European Commission. (2 June 2014). Putting interoperability into the Internet of Things. Von European Commission: <https://ec.europa.eu/digital-single-market/en/news/putting-interoperability-internet-things> abgerufen

Fitchard, K. (21 June 2013). Project Loon: Google's biggest obstacle isn't technology. It's politics. Von Gigaom: <https://gigaom.com/2013/06/21/project-loon-googles-biggest-obstacle-isnttechnology-its-politics/> abgerufen

Foraus. (2019). Towards an Inclusive Future in AI . Von https://www.foraus.ch/wp-content/uploads/2019/10/20191022_Policy-Kitchen-AI_WEB-1.pdf abgerufen

Frederickson, B. (24 April 2018). Where Do The World's Software Developers Live? Von Ben Frederickson: <https://www.benfrederickson.com/github-developer-locations/> abgerufen

Gai, B. "Driven Approach to Government Investing & Policy Making." World Startup Report, https://www.itu.int/en/ITU-D/Statistics/Documents/events/wtis2017/Plenary1_Gai.pdf.

Gajane, P., & Pechenizkiy, M. (2017). On Formalizing Fairness in Prediction with Machine Learning. Von https://www.fatml.org/media/documents/formalizing_fairness_in_prediction_with_ml.pdf abgerufen

GSMA. (2011). Spectrum Handbook: Understanding the Basics of Spectrum Policy for Mobile Telecommunications. Von <https://www.gsma.com/spectrum/wp-content/uploads/2012/09/Spectrum-GSMA-Spectrum-Handbook-2012.pdf> abgerufen

- GSMA. (2014).** Digital Inclusion. Von https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/11/GSMA_Digital-Inclusion-Report_Web_Singles_2.pdf abgerufen
- GSMA. (2017).** Accelerating affordable smartphone ownership in emerging markets. Von https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/08/Accelerating-affordable-smartphone-ownership-in-emerging-markets-2017_we.pdf abgerufen
- GSMA. (2019).** Digital identity opportunities for women: Insights from Nigeria, Bangladesh, and Rwanda. Von <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/05/Digital-identity-opportunities-for-women-Insights-from-Nigeria-Bangladesh-and-Rwanda-Web.pdf> abgerufen
- ICO. (n.d.).** What is Personal Data? Von ico. International Commissioner's Office: <https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/key-definitions/what-is-personal-data/> abgerufen
- IETF. (kein Datum).** Internet standards. Von IETF: <https://www.ietf.org/standards/> abgerufen
- IGF. (2017).** Best Practice Forum on Cybersecurity. In Best Practice Forum on Cybersecurity. Von <https://www.intgovforum.org/multilingual/book/export/html/5375> abgerufen
- IMF. (2018).** Measuring the Digital Economy. Von <https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/04/03/022818-measuring-the-digital-economy> abgerufen
- IMF. (2019).** World Economic Outlook 2019. Von <https://www.imf.org/en/Publications/WEO> abgerufen
- International Telecommunication Union [ITU] & Global Initiative for Inclusive ICTs [G3ict]. (2012).** Making Mobile Phones and Services Accessible for Persons with Disabilities. ITU. Von <https://www.itu.int/en/ITU-D/Digital-Inclusion/Persons-with-Disabilities/Documents/Making%20Mobile-English.pdf> abgerufen
- International Telecommunication Union [ITU]. (2018).** Measuring the Information Society Report. Volume 1. Geneva: ITU. Von <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf> abgerufen
- ITU & UNESCO. (2019).** Connecting Africa Through Africa. Von https://www.broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf abgerufen
- ITU. (2017).** ICT Facts and Figures 2017. Von <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf> abgerufen
- ITU. (2019).** Definition of 'Open Standards'. Von ITU: <https://www.itu.int/en/ITU-T/ipr/Pages/open.aspx> abgerufen
- Johansson, E., Wesslén, A., & Host, M. (2001).** The importance of quality requirements in software platform development - a survey. Proceedings of the 34th Annual Hawaii International Conference on System Sciences, 10.
- Lee Kuan Yew School of Public Policy & Microsoft. (2015).** Shared Prosperity: An ICT Manifesto for the Philippines for 2016 and Beyond. Von <https://news.microsoft.com/en-ph/2015/11/25/microsoft-philippines-announces-technology-manifesto-on-ict-for-shared-prosperity-to-drive-economic-progress-in-the-philippines/> abgerufen
- Mathew, T. (18 September 2017).** Broadband Is Largely Inaccessible to Those Who Need it Most. Von City Lab: <https://www.citylab.com/equity/2017/09/broadband-is-the-most-inaccessible-to-those-who-need-it-most/539880/> abgerufen
- McKetta, I. (4 September 2019).** IN-DEPTH ANALYSIS OF CHANGES IN WORLD INTERNET PERFORMANCE USING THE SPEEDTEST GLOBAL INDEX. Von Speed Test: <https://www.speedtest.net/insights/blog/global-index-2019-internet-report/> abgerufen
- McKinsey & Company & GSA. (2015).** The Internet of Things: Opportunities and Challenges for Semiconductor Companies. Von https://www.gsaglobal.org/wp-content/uploads/2015/05/1.-GSA-McK_Report-IoT_Text_Executive-Summary.pdf abgerufen
- Morato, J., Ruiz-Robles, A., Sanchez-Cuadrado, S., & Marzal, M. (2015).** Technologies for Digital Inclusion: Good Practices Dealing With Diversity. In B. Passarelli, J. Straubhaar, & A. Cuevas-Cervero, Handbook of Research on Comparative Approaches to the Digital Age Revolution in Europe and the Americas.
- Muhammad, Z. (28 October 2019).** Study Shows 90 Percent of Internet Users Do Not Want to Sell Personal Data. Von <https://www.digitalinformationworld.com/2019/10/study-shows-90-percent-of-internet-users-do-not-want-to-sell-personal-data.html> abgerufen

- NETSCOUT SYSTEMS INC. (2010).** DAWN OF THE TERRORBIT ERA. NETSCOUT SYSTEMS INC. Von https://www.netscout.com/sites/default/files/2019-02/SECR_001_EN-1901%20-%20NETSCOUT%20Threat%20Intelligence%20Report%20H%202018.pdf abgerufen
- Nganji, J., & Nggada, S. (2011).** Disability-Aware Software Engineering for Improved System Accessibility and Usability. International Journal of Software Engineering and Its Applications, 47-62. Von https://www.researchgate.net/publication/264422652_Disability-Aware_Software_Engineering_for_Improved_System_Accessibility_and_Usability abgerufen
- Nowicki, S. (8 October 2019).** Big Tech Needs to Use Hazardous Materials Warnings. Von Wired: <https://www.wired.com/story/big-tech-needs-hazardous-materials-warnings/> abgerufen
- OECD. (2003).** Glossary of statistical terms. Von OECD Statistics Portal: <https://stats.oecd.org/glossary/detail.asp?ID=2312> abgerufen
- OECD. (2016).** Skills for a Digital World. Von [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/IIS\(2015\)10/FINAL&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/IIS(2015)10/FINAL&docLanguage=En) abgerufen
- Open Stand. (kein Datum).** 5 Core Principles for Open Standards Development. Von Open Stand: <https://open-stand.org/resources/infographics/> abgerufen
- Österblom, H., Jouffray, J.-B., Folke, C., Crona, B., Troell, M., & Merrie, A. (2015).** Transnational Corporations as 'Keystone Actors' in Marine Ecosystems. PLoS ONE, 10(5). Von <https://doi.org/10.1371/journal.pone.0127533> abgerufen
- Porru, S., Pinna, A., Marchesi, M., & Tonelli, R. (2017).** Blockchain-Oriented Software Engineering: Challenges and New Directions. 2017 IEEE/ACM 39th International Conference on Software Engineering Companion. Von <https://ieeexplore.ieee.org/abstract/document/7965292> abgerufen
- Privacy International. (7 March 2019).** #IWD2019 Online gender-based violence: a privacy matter? Von Privacy International: <https://privacyinternational.org/long-read/2760/iwd2019-online-gender-based-violence-privacy-matter> abgerufen
- Ranking Digital Rights. (2019).** Ranking Digital Rights Corporate Accountability Index. Von <https://rankingdigitalrights.org/index2019/assets/static/download/RDRindex2019report.pdf> abgerufen
- Ranking Digital Rights. (2017).** 2018 Corporate Accountability Index Research Indicators. Von <https://rankingdigitalrights.org/index2018/assets/static/download/RDRindex2018indicators.pdf> abgerufen
- Risk Based Security. (2019).** Cyber Risk Analytics 2019 MidYear QuickView Data Breach REport. Risk Based Security. Von <https://pages.riskbasedsecurity.com/hubfs/Reports/2019/2019%20MidYear%20Data%20Breach%20QuickView%20Report.pdf> abgerufen
- Robertson, A. (16 April 2018).** OLPC'S \$100 LAPTOP WAS GOING TO CHANGE THE WORLD — THEN IT ALL WENT WRONG. Von The Verge: <https://www.theverge.com/2018/4/16/17233946/olpcs-100-laptop-education-where-is-it-now> abgerufen
- Roisman, E. L. (5 December 2019).** Remarks by Commissioner Elad L. Roisman at the Elder Justice Coordinating Council Fall 2019 Meeting. Von Harvard Law School Forum on Corporate Governance and Financial Regulation: <https://corpgov.law.harvard.edu/2019/09/02/cyber-risk-board-oversight> abgerufen
- Rothrock, R. A., Kaplan, J., & Oord, A. F. (16 November 2017).** The Board's Role in Managing Cybersecurity Risks. Von MIT Sloan Management Review: <https://sloanreview.mit.edu/article/the-boards-role-in-managing-cybersecurity-risks/> abgerufen
- Symantec. (2018).** 10 cyber security facts and statistics for 2018. Von Norton: <https://us.norton.com/internetsecurity-emerging-threats-10-facts-about-todays-cybersecurity-landscape-that-you-should-know.html> abgerufen
- The National Institute for Computational Sciences. (kein Datum).** What is HPC? Von The National Institute for Computational Sciences: <https://www.nics.tennessee.edu/computing-resources/what-is-hpc> abgerufen
- The World Bank. (kein Datum).** Research and development expenditure (% of GDP). Von World Bank Data: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS> abgerufen
- UN. (2015).** About Sustainable Development Goals. Von United Nations Sustainable Development Goals: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> abgerufen
- UNCTAD. (kein Datum).** Classifications. Von UNCTADStat: <https://unctadstat.unctad.org/EN/Classifications.html> abgerufen

- UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT [UNCTAD]. (2016).** UNITED NATIONS GUIDELINES FOR CONSUMER PROTECTION. Geneva: UNCTAD. Von https://unctad.org/en/PublicationsLibrary/ditccplpmisc2016d1_en.pdf abgerufen
- United Nations Conference on Trade and Development [UNCTAD]. (2019).** Digital Economy Report. New York: United Nations. Von https://unctad.org/en/PublicationsLibrary/der2019_en.pdf abgerufen
- United Nations General Assembly. (1948).** The Universal Declaration of Human Rights. Paris. Von https://www.ohchr.org/EN/UDHR/Documents/UDHR_Translations/eng.pdf abgerufen
- United Nations General Assembly. (2013).** Resolution A/68/167. The right to privacy in the digital age. Von <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N13/449/47/PDF/N1344947.pdf?OpenElement> abgerufen
- United Nations General Assembly. (2016).** Resolution A/RES/70/125 Outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the World Summit on the Information Society. Von https://unctad.org/en/PublicationsLibrary/ares70d125_en.pdf abgerufen
- United Nations. (kein Datum).** LDC Identification Criteria & Indicators. Von United Nations Department of Economic and Social Affairs: <https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-criteria.html> abgerufen
- UNSG High-level Panel on Digital Cooperation. (2019).** The Age of Digital Interdependence. Von <https://www.un.org/en/pdfs/DigitalCooperation-report-for%20web.pdf> abgerufen
- Utz, C., Degeling, M., Fahl, S., & Holz, T. (2019).** (Un)informed Consent: Studying GDPR Consent Notices in the Field. ACM SIGSAC Conference on Computer and Communications Security (CCS '19), November 11–15, 2019, London, United Kingdom (S. 18). London: ACM. Von https://www.syssec.ruhr-uni-bochum.de/media/emma/veroeffentlichungen/2019/09/05/uninformed-consent_YI7FPEh.pdf abgerufen
- van Dijk, J. (2005).** The Deepening Divide: Inequality in the Information. Sage Publications.
- Williams, L. C. (17 March 2017).** Report suggests AT&T is blocking quality internet access in poor neighborhoods. Von Think Progress. abgerufen
- Witkind Davis, V., Blank, L., Landsbergen, D., Zearfoss, N., Lawton, R., & Hoag, J. (1996).** Telecommunications service quality.
- Women's Media Centre. (n.d.).** WMC Speech Project: Research and Statistics. Von WMC Speech Project: <https://www.womensmediacenter.com/speech-project/research-statistics> abgerufen
- World Bank Group. (2018).** Digital Development Partnership Annual Review 2018. Washington, DC. Von <http://pubdocs.worldbank.org/en/225781554301401135/DDP-Annual-Review-2018-Final-Web.pdf> abgerufen
- World Economic Forum. (2019).** Responsible Use of Technology. Geneva. Von http://www3.weforum.org/docs/WEF_Responsible_Use_of_Technology.pdf abgerufen
- Zider, B. (1998).** How Venture Capital Works. Harvard Business Review. From <https://hbr.org/1998/11/how-venture-capital-works>.

Guiding principles WBA

WBA developed a set of Guiding Principles to guide its work and reflect its values and mission. These Principles have been formed in collaboration with global stakeholders throughout the consultation phase, refined based on input and feedback from the roundtable consultations, online surveys and expert meetings.

The Principles are divided into three categories: operational principles explain how the Alliance functions, benchmark development principles address how benchmarks are designed, and content principles cover what the benchmarks assess.

Currently, the Guiding Principles reflect the outcomes and findings from the global consultation phase. However, the world is changing rapidly, and additional insights and perspectives are likely to emerge over time. These Principles may evolve – in consultation with stakeholders – to reflect new findings and realities.

Operational principles	
Inclusive	The WBA actively engages with and involves all stakeholders in building the Alliance and the benchmarks.
Impartial	The WBA and its benchmarks are equally responsive to all stakeholders.
Independent	The WBA and its benchmarks are independent from the industries and companies they assess.
Focused on impact	The WBA and its benchmarks promote dialogue and measure impact on the SDGs to create positive change.
Collaborative	The WBA collaborates with stakeholders and Allies to enhance alignment of corporate performance with internationally agreed sustainability objectives.
Free and publicly available	The WBA is a public good, and its benchmarks and methodologies are free and publicly available to all.
Benchmark development principles	
Relevant	WBA benchmarks focus on sustainable development issues most relevant to industries' core businesses and on the industries and companies that can make the most significant, actionable and unique contributions to these issues.
Clear in method and intent	WBA benchmarks are transparent about their methodology, development processes and results.
Complementary	WBA benchmarks build upon the work done by others, adding further value with a focus on SDG impact.
Responsive and iterative	WBA benchmarks are updated regularly to reflect evolving stakeholder expectations, policies, developments, and company performance.
Content principles	
Balanced	WBA benchmarks assess both positive and negative impacts that companies might have on the SDGs.
Reflective of societal expectations	WBA benchmarks reflect the extent to which companies' performance on relevant SDGs aligns with stakeholders' expectations.
Forward-looking	The WBA and its benchmarks engage and assess companies on their current performance on the SDGs and on exposure to sustainability risks and future opportunities.

DRAFT

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