Towards a new ITU index

Draft for discussion, 17 April 2020

Introduction and background

The discussions that took place with Member States in Geneva in the context of the Expert Group Meeting on 10 February 2020, and through the Telecommunication Development Advisory Group (TDAG) Web Dialogue held online on 25 March 2020, have allowed to identify a consensus around the idea of launching a new ITU index, linking digital technologies to the Sustainable Development Goals (SDGs) and built around the '5 Ps' of People, Prosperity, Planet, Peace and Partnership. The goal of this new index is to assess how digital technologies may impact the ability of countries to achieve the SDGs. The present document presents a revised conceptual framework for such an index, taking into consideration comments received from Member States and experts from UN agencies[1], and provides the foundation for identifying the component indicators that it should include. The document is complemented by an annex table describing possible indicators associated with the thematic topics outlined in the framework under each of the five pillars. The document represents work in progress and serves as an input to the 2nd Expert Group Meeting on the new ITU index organized on 17 April 2020.

The objectives of the meeting of 17 April are the following:

1. Identify a consensus on the proposed structure of the framework.
2. Receive comments and suggestions on the topics identified under each of the five pillars.

As recalled in the background paper prepared by the ITU Secretariat for the Expert Meeting of 10 February 2020[2], the Plenipotentiary Conference of the ITU provided indications for how to make the measurement tools of ITU more relevant. Resolution 131 (rev. Dubai, 2018) recognises that an ITU index is important for measuring the information society and the extent of the digital divide in international comparisons and stipulates that such an index should reflect the impact of ICT and digital transformation on development, and the real development of the ICT sector, taking into consideration different levels of development and national circumstances as well as ICT trends, in application of the WSIS outcomes. Moreover, resolution 71 (rev. Dubai, 2018) states the mission of the ITU as "*(t)o promote, facilitate and foster affordable and universal access to telecommunication/information and communication technology networks, services and applications and their use for social, economic and environmentally sustainable growth and development*."

An index that reflects the real development of the ICT sector, takes into account ICT trends and the WSIS outcomes and is faithful to the ITU mission at the same time, should have a broad focus, taking

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[1] ILO, UIS, UNCTAD, UN DESA, UN Habitat, UNSD, UN Women, WIPO, WHO, World Bank
[2] See the background document and summary of the meeting.

into account social, economic and environmental aspects. A framework with that scope already exists in the form of the 17 SDGs adopted by the Heads of State and Government and High Representatives, meeting at United Nations Headquarters in New York in September 2015.[3] The 2030 Agenda for Sustainable Development was a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.

The starting point of this process is hence very clearly the set of documents endorsed by the General Assembly of the United Nations as part of its 2030 Agenda for Sustainable Development (the SDGs and associated targets).

The process of developing the new index has followed the roadmap agreed with Member States at the Expert Group Meeting of 10 February 2020. Starting from the official and accepted list of SDGs and SDG targets, a preliminary conceptual framework for a new ITU index was presented during the TDAG Web Dialogue of 25 March 2020, and amended on the basis of comments received during and after the meeting. This was accompanied by the production of a mapping of possible topics (or areas of measurement) to each of the 169 SDG targets, with a view to identify ways in which ICTs and digital transformation could contribute to countries' efforts to pursue, accelerate and reach such targets. In the next step, each of the topics identified will be examined from the point of view of availability of relevant indicators or data meeting minimum quality requirements. A preliminary, non-exhaustive list of potential indicators are shown as an annex to this document.

Philosophy and goals of the new index

As mentioned in the background documents prepared for the meetings of 10 February and 25 March 2020, '*in observation of Resolution 71 and Resolution 131, the ITU Secretariat is proposing to develop a composite index that will provide a monitoring tool for governments to assess how digital transformations may impact our ability to achieve the SDGs. The index will embody a move beyond the often technical world of digital technologies to a more human side touching on well-being and sustainability by addressing all of the SDGs.*

Thus, one of the guiding principles of the index proposed is to go beyond the mere benchmarking of telecommunication infrastructure towards providing a more multi-dimensional, human-centric monitoring tool. This will not only include measures of access to, and use of digital technologies, but will also take into account the role of digital technologies in human development and include dimensions such as health, education, business, government, employment, food and agriculture, gender, and poverty. This fully reflects the mission of ITU to promote, facilitate and foster affordable and universal access to telecommunication/ICT networks, services and applications and their use for social, economic and environmentally sustainable growth and development. It is also aligned with the holistic vision of the UN system on reaching the SDGs.

Moreover, the new index should be readable (i.e. simple enough to be easily understood), actionable (i.e. it should be a tool to help countries to improve their abilities to pursue, accelerate and reach the SDGs), and adaptable (i.e. as new data and priorities emerge in the future, the index should have the flexibility to include them).

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[3] See
https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf.

- Readability: the structure of the index should be intuitive, and reflect the philosophy of the SDGs;
- Actionability: the index should allow interested stakeholders (governments, businesses, individuals and experts) to use it to enhance their abilities to pursue, accelerate and reach SDGs;
- Adaptability: as ICTs will continue to evolve in the future, and more data may become available, the index should be flexible enough to reflect such changes[4].

Last but not least, the new index should not be seen as a tool to promote a broader or deeper use of digital technologies. Rather, it should be a tool to enhance countries' ability to organize their digital transformation in a way that maximizes its benefits to the national economy, and to the global community. It is hence important that the new index should also include the potential negative effects of digitization, on the environment (e.g. through e-waste), on employment (e.g. through the replacement of human workers by machines or algorithms), or on gender (e.g. through possible cognitive biases in AI), to mention only a few examples.

The new index should hence help policy makers design better and more effective policies that promote sustainable development through the adoption of digital technologies and digital transformation, by providing them with a respectable set of data and indicators that they can customize to the needs and expectations of various audiences, both domestically and internationally.

Digital technologies are an important catalyst to enable progress towards achieving the SDGs. This is recognised in the 2030 Agenda, which states that "*the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies.*" Digital change will have impacts – some of them helpful, others detrimental – on every single SDG, ranging from poverty alleviation to resource efficiency, from governance to energy and mobility systems, from employment to transnational partnerships. Digital technology is speeding up fundamental societal and economic change.[5]

Within the United Nations system, specific efforts have been launched and will be pursued by specialized agencies in each and every one of the key areas identified by the SDGs: WHO on health, UNESCO on education, etc. Many UN institutions (for instance the UN Regional Commissions) will be expected to make multiple contributions, as warranted by their respective mandates. ITU's mandate to support and inform Member States and Sector Members on the use of ICTs intersects with all areas of sustainable development, as digital technologies are a potential enabler of all SDGs. For many of them, the process of digital transformation is a key dimension to be considered (negatively or positively) when assessing the world's collective ability to reach specific objectives. This is the case, for example, for SDG 8 (Decent Work and Economic Growth), where digital technology has disrupted labour markets while raising new issues about the 'future of work'.

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[4] From a methodological point of view, it will be important to ensure that such adaptability does not compromise the comparability of index results across time.
[5] See https://irp-cdn.multiscreensite.com/be6d1d56/files/uploaded/190830-Six-Transformations_working-paper.pdf.

By offering a new index focusing on the relationship between digital technologies on the one hand and SDGs on the other, ITU fulfills an important mission, which can be summarized in five points:

1. Enhance the ability of the Member States and Sector Members to world community to identify ways in which digital technologies may affect their ability to foster proper conditions to reach the SDGs;
2. Empower decision makers (public and private) to make better decisions about how they invest resources to provide better living conditions to their employees, customers and citizens in a global digital economy;
3. Provide a fact-based knowledge resource to inform the complex international and national debates arising from perceived competition between specific SDGs, or national priorities regarding the adoption and use of digital technologies;
4. Design an index that can be an effective tool to measure and help identify best practices being adopted by countries in which digital transformation can be harnessed for common good and sustainable development; and
5. Help elevate the importance of ICT for development by bringing it to the attention of heads of government and other key stakeholders.

Refining the conceptual framework of the new index

The 17 Goals of the 2030 Agenda for Sustainable Development, which are regrouped under the '5 Ps': People, Prosperity, Planet, Peace and Partnership, provide a natural point of departure for the construction of such an index. Based on comments received during the virtual meeting of 25 March and additional feedback and research gathered after that meeting, the proposed conceptual framework has been amended and further developed.

**Distributing topics across the 5 pillars of the proposed index**

As mentioned in the background document prepared for the 25 March meeting, the '5-pillar approach' offers an intuitive, multi-dimensional measurement framework for gauging in a comprehensive way how digital transformation contributes to countries' capacities to meet the different SDGs. While digital technologies affect all SDGs, it is useful to generalize their main role in each of these themes:

- *People* includes goals largely related to improving lives. Here digital technologies play an enabling role by enhancing opportunities for increasing income (e.g. easier access to productive information, devices for increasing agricultural production), improving health (e.g. secure digital health records, delivering care remotely, or drones delivering medical supplies), expanding educational opportunities (e.g. distance education) and facilitating female employment via flexible ICT-enabled options that balance work and family.
- *Prosperity* covers goals largely relating to the economy. Here digital technologies play a role in transformational diversification to a digital economy. Digital technologies enhance productivity and create opportunities for new ways of organizing and carrying out economic activities, transforming industries from transportation (e.g. ride hailing, online ticket ordering) to manufacturing (e.g. Industry 4.0) and tourism (e.g. home sharing) to retail (e.g. e-commerce) and trade in services. At the same time, the possession of digital skills creates opportunities for quality employment.
- *Planet* consists of goals largely relating to the environment. Digital technologies can make important contributions to improve the efficient use of resources in such areas as transport, energy and water. They also play a crucial role in earth monitoring, sharing climate and weather information, forecasting and early warning systems, using satellites, drones or sensors.

- *Peace* includes just one SDG. Here, the most important contribution of digital technologies is transparency and citizen engagement. Whether it means open data sets or online public services, the overarching consideration is that transparency and participation are increased, and corruption likely reduced. Open data provides free and public information about government operations allowing users to scrutinize the figures. Online transactions and digital IDs reduce the scope for corruption.
- *Partnership* also includes just one SDG. In the 2030 Agenda, the focus is on Global Partnership. In the current context, however, co-operation among stakeholders within countries is more relevant. Online tools that foster co-operation and collaboration among citizens, businesses and governmental agencies are the prime area of interest in this regard.

Based on the above, the following overall framework is being proposed (see Figure 1 below) which matches the distribution of SDGs to pillars as proposed in the *Human Development Report 2015*.[6]

Figure 1 Mapping SDGs to the five Ps
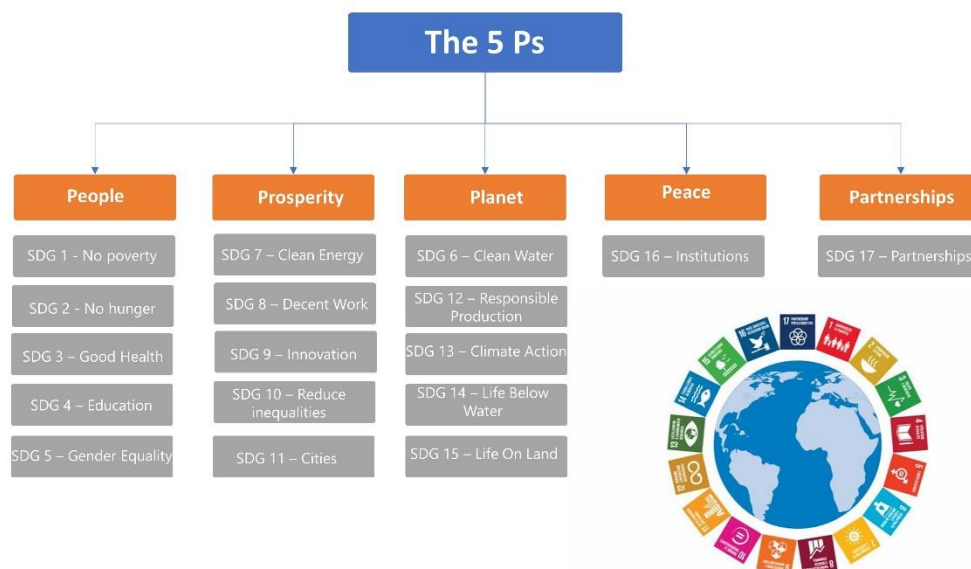
As a next step, for each of the pillars and SDGs allocated to the pillars, specific topics were identified. These are key areas that one can reasonably consider as relevant to describe the potential effects of technologies and digital transformation on countries' abilities to pursue, accelerate and reach specific SDGs and particular SDG targets. The choices made are hence the result of a combination between three main approaches, namely:

(1) Comments received during and after the meetings of 10 February and 25 March 2020;
(2) An initial mapping of topics to all 169 SDG targets;
(3) The consideration of possible alternatives, and identification of a convincing rationale to justify the ways in which various topics have been attributed to different pillars of the new index.

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[6] See UNDP (2015). *Human development report 2015: Work for human development.* United Nations Development Programme. Box 5.1 (p.132)

The basic underlying structure proposed during the 25 March Web Dialogue has not changed. It respects the approach described then, namely that the new index should not just be a benchmarking instrument, but also a tool for action. In other words, it should help decision makers and analysts to have a better understanding of where capacities are, and how well they are used, as well as to identify best practices, roadblocks and how lessons can be learned from the global experience of countries around the world.

The refined structure that is now proposed continues to rest on five pillars, drawn from the five critical areas (the 5 Ps) highlighted in the 2030 Agenda: People, Prosperity, Planet, Peace and Partnership. However, the discussions held on 25 March, and additional feedback and a careful investigation of SDG targets after that meeting have led to several important modifications at the level of topics. As outlined in the background document prepared for the meeting of 25 March, additional work has been carried out to (1) identify specific ICT-related topics that could be linked to as many as possible of the 169 SDG targets, and (2) assess the data available to properly measure each of the topics identified.

The resulting conceptual framework with the pillars and allocated topics can be summarized and explained as follows:

Figure 2 Refined conceptual framework of the proposed new ITU index
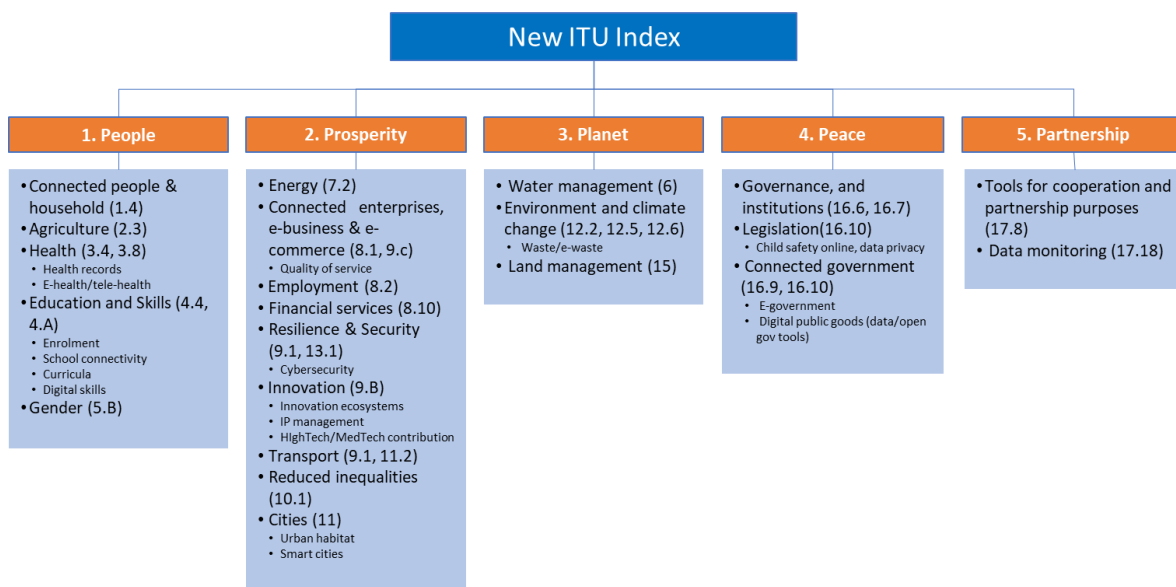
Note: Specific SDGs/SDG targets shown in parenthesis. I.e., "Connected People and Households (1.4)" means that the topic referred to as Connected People and Households relates to SDG 1, Target 1.4.

Choices made in the selection and distribution of topics

One can think of myriads of ways in which ICTs and digital transformation can influence the abilities of countries, people and organizations to pursue, accelerate and reach all of the 169 SDG targets. Hence, any exercise to identify topics worth considering for the new ITU index has to be selective. This document presents work in progress. The development of composite indicators is an iterative process, which starts with the elaboration of a conceptual framework. A framework is revisited and possibly refined in subsequent steps, to verify that good quality data is available for the topics and indicators

proposed and to ensure that the index is statistically coherent and robust.[7] Consequently, the additional review of topics based on data availability is yet to be carried out, keeping in mind the possibility that if no adequate metrics can be found, proxy indicators or placeholders would be used to flag out data needs. This may result in further revisions of the framework outlined in this document.

This section provides further details on the topics that were selected under each pillar. It should be kept in mind that the attribution of a particular topic to a specific pillar (or to a specific SDG or SDG target) does not mean that this area is irrelevant to other pillars, SDGs and SDG targets. It simply means that it is directly and particularly relevant to the SDG or SDG target that is part of the respective pillar.

The topics provided below are examples where the role of digital technologies in accelerating or achieving SDG targets could be measured. This should not be seen as an exhaustive nor final list, as some additional relevant topics could also be added.

Pillar 1 (PEOPLE)

- **Connected people and household (SDG 1):** This is the 'people dimension' of connectivity, access and use. Digital technologies can raise incomes through better access to market information and by widening financial inclusion. New digital techniques are emerging that can substantially lower costs and time required for poverty measurement. It is directly relevant to the achievement of SDG target 1.4 (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, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance). Access to basic services should clearly be understood as including access to telecommunications and basic information services.
- **Agriculture (SDG 2):** Information on prices, weather conditions and production techniques helps to increase production and mitigate risks. Sensors coupled with software analysis provide real-time monitoring that improve agricultural efficiency. There is much anecdotal evidence regarding the impact of ICTs on agriculture. This typically revolves around access to agricultural information systems, weather reports, etc. While mobile phones and the Internet are undoubtedly important, what needs to be captured is actual evidence of their use for agriculture.
  For SDGs target 2.3 (By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment), access to quality communication and data services can be a critical element to enhance productivity (e.g. through better anticipation of weather-related events, the efficient use of seeds, fertilizers and agricultural methods), and foster agricultural revenues (e.g. through the anticipation of changes on market prices and local or international demand for agricultural products).
- **Health (SDG 3):** the availability of health records can be greatly enhanced if digital tools are available to local hospitals, doctors and health authorities. Similarly, ICT can help develop e-health and tele-health strategies, which are often critically important especially in rural or less

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[7] See OECD-JRC (2008) *Handbook on constructing composite indicators: methodology and user guide*. OECD: Paris

densely populated areas. These topics are directly relevant to SDG target 3.4 (By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being and 3.8 (Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all).

- **Education and skills (SDG 4):** Connectivity can supplement shortages of schools, teachers and learning materials through distance education and online educational content. Enrolment, school connectivity, curricula and digital skills all deserve priority attention when SDG targets 4.4 (By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship) and 4.b (By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries) are considered. Enrolment in STEM and ICT classes and programs, the ability of students and teachers to access on-line resources, the weight of ICT-related components in the curricula of schools and universities, and naturally the level of digital skills acquired through existing formal and informal education programmes are of direct relevance here.
- **Gender (SDG 5):** the topic refers explicitly to the wording of SDG 5.b (Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women).

Pillar 2 (PROSPERITY)
- **Energy (SDG 7):** Smart metering and grids are improving electricity efficiency and lowering consumption while mobile-enabled payment is expanding access to solar energy. The topic relates to SDG Target 7.2 (By 2030, increase substantially the share of renewable energy in the global energy mix) since ICT and digital services can significantly enhance the ways in which renewable energies are being produced and used. A reliable energy supply is also a key requirement for the digital economy.
- **Connected enterprises, e-business and e-commerce (SDGs 8 and 9):** this is the 'business dimension' of connectivity, access and use. It includes e-business, e-commerce, and quality of service, which are topics directly relevant to the achievement of SDG target 8.1 (Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries) and 9.c (Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020). Clearly, carrying out business online has become a critical component of growth in many parts of the world, and deserves to be promoted and helped in poorer areas. Quality of service is critical to understand how access to the Internet is provided in various parts of the world.
- **Employment (SDG 8):** ICTs are particularly relevant to the ability of national economies to create new and decent jobs. At the same time, they are often seen as a threat by those working in areas or sectors where human jobs are more likely to be taken over by robots or algorithms. SDG target 8.2 (Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors) tracks how ICTs and digital transformation could contribute to higher productivity, diversification and economic upscaling.

- **Financial services (SDG 8)**: ICTs can greatly help enhance access to finance (e.g., though mobile payments, digital financial services), and the suggested topic is directly relevant to SDG target 8.10 (Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all).
- **Resilience and security (SDGs 9 and 13):** cybersecurity is important vis-à-vis SDG target 9.1 (Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all) and 13.1 (Strengthen resilience and adaptive capacity to climate- related hazards and natural disasters in all countries), for which the availability of reliable security and data systems (including for tracking complex phenomena and allowing business transactions) is vital.
- **Innovation (SDG 9):** under this broad area of measurement, three possible components have been identified, namely innovation ecosystems, IP management, and the contribution of high technology and medium technology, all relevant to SDG target 9.b (Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities). Innovation ecosystems are the basis of successful innovation strategies; their assessment is hence key to being able to improve them and offer a ground base for the implementation of innovation policies. Similarly, IP management (especially through the proper patenting or local innovation) can be greatly enhanced through the use of digital tools. Last but not least, the ability of a country to leverage advances in high and medium technologies to its own economic goals is often a good indicator of its ability to grow and diversify.
- **Transport (SDGs 9 and 11):** This topic relates to a diversity of SDG targets, including 9.1 (Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all), as well as 11.2 (By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons).
- **Reduced inequalities (SDG 10):** ICTs can help to reduce inequalities by facilitating access to information and improve the situation of migrants and refugees enabling them to communicate with friends and family. Mobile money enables safe cash transfers to vulnerable populations and often reduces the cost of migrant remittances. Digital inclusion relates to SDG target 10.2 (By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status).
- **Cities (SDG 11):** Digital technologies have wide application for cities in areas such as transport, safety, environment and utilities. Interconnected sensors and meters coupled with big data analysis are improving transport and utility efficiency. Mobile phone data are used by public administrations to optimize services and the public uses apps to interact with city governments. SDG 11 (Make cities and human settlements inclusive, safe, resilient and sustainable) reflects a global concern about global living conditions in a world where a majority of the population lives in cities. ICT can greatly contribute to better monitor and improve the living conditions of city-dwellers, e.g. through the improved management of electricity, transport and waste (grouped here under the 'urban habitat' topic), and also through the better design and development of smart cities, which are often the testbed of new ICT developments and technologies.

Pillar 3 (PLANET)

- **Water management (SDG 6):** ICTs help to manage water resources and quality through satellite imagery, sensors and smart meters. Digital finance enables lower-income users access to water systems. The ability of countries to pursue, accelerate and reach SDG 6 (Ensure availability and sustainable management of water and sanitation for all) can significantly benefit from the use of ICTs and digital tools. For example, continuous analysis of water quality, as well as the ability to anticipate rainfalls, river overflows or droughts can greatly improve the ways in which water resources are managed and protected.

- **Environment and climate change (SDGs 11, 12, 13 and 14):** ICT enables sustainable consumption through more proficient monitoring of resources, digital innovations for higher efficiency and using digital applications to foster awareness and lifestyle changes by the public. At the same time digital technologies create waste and emit carbon and these activities merit monitoring. ICTs, including satellite monitoring, play a crucial role in earth monitoring, sharing climate and weather information, forecasting, and early warning systems. ICTs strengthen resilience by helping mitigate the effects of climate change through forecasting and early warning systems. SDG targets 12.2 (By 2030, achieve the sustainable management and efficient use of natural resources), 12.5 (By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse), and 12.6 (Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle). Waste and e-waste represent an important element of this topic. Public attention recently brought to e-waste has diminished the overall positive image that information technologies had enjoyed vis-à-vis the sustainable development cause. It is overall clear that ICT and digital transformation can significantly help countries to pursue SDG targets 11.6 (By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management), and 12.4 (By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment): the use of sensors-based information systems and services the tracking and tracing of goods produced are examples of topics that deserve attention in the proposed index. Another relevant SDG target is 13.1 (Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.)

- **Land management (SDG 15):** Digital technologies are critical for monitoring terrestrial ecosystems and counteracting environmental crimes. Satellites, sensors and crowdsourcing distribute real time data for analysis, awareness and mitigation. Similarly, efforts to pursue SDG 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss) can benefit significantly from the use of sensors and satellite communications to survey large areas of land, especially in desertic areas. Land ownership registers can also benefit both owners (especially in poor areas) and the organization of land-related efforts to better manage resources.

Pillar 4 (PEACE)

- **Governance and institutions (SDG 16):** better governance mechanisms, improved decision making, and more stable/efficient institutions can be enhanced by the existence, maintenance and reliability of good systems to collect, store and share information in an accountable and transparent fashion. SDG targets 16.6 (Develop effective, accountable and transparent institutions at all levels) and 16.7 (Ensure responsive, inclusive, participatory and representative decision-making at all levels) are hence directly relevant to this topic.
- **Legislation (SDG 16):** SDG targets 16.10 (Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements) is directly impacted by the ability of a country to develop and manage proper information systems for the benefits of their citizens. This SDG target is also relevant to the topic 'Connected government' (see below).
- **Connected government (SDG 16):** SDG targets 16.9 (By 2030, provide legal identity for all, including birth registration) and 16.10 (see above) call for a measurement of countries' ability to generate public identity records and birth registries, two areas in which ICTs and information systems can significantly benefit all types of economies. E-government services and digital public goods such as those generated by "opengov" and "datagov" policies emerge as natural candidates to be included under that particular topic.

Pillar 5 (Partnership)

- **Tools for cooperation and partnership purposes (SDG 17):** ICTs are indispensable for supporting partnerships by enhancing communication such as email, video conferencing and access to information enabling stakeholders to dialogue no matter where they are in the world. SDG target 17.8 (Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology) refers directly to ICTs, and becomes de facto a natural topic to be included in the index.
- **Data monitoring (SDG 17):** Digital technologies will also be essential to lower the costs of monitoring the SDGs. SDG target 17.18 (By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts) is the perfect example of an area in which countries' ability to work cooperatively around shared data, and to monitor them effectively, will provide them with enhance possibility to achieve SDGs.

Populating the framework with indicators

The conceptual framework of the index as presented above allows the identification of indicators and the collection of data for the selected topics in which the contribution of digital technologies to achieving SDG targets can be monitored. A first attempt was made to compile a preliminary list of indicators that could be included in the measurement framework. The list was prepared in close consultation with specialized UN agencies and experts and aims to include both qualitative and quantitative indicators. This non-exhaustive list of indicators is provided in the annex. Further work is needed to explore the availability and quality of the data, as well as additional relevant indicators to be considered.

Roadmap

28 January 2020	Brainstorming with potential partners	✓
10 February 2020	1st Expert Meeting with Member States to discuss new proposal	✓
February - March 2020	Finalizing conceptual framework and examining possible indicators	✓
17 March 2020	Second brainstorming with partners	✓
25 March 2020	Present concept at TDAG Web Dialogue (remote participation)	✓
March - May 2020	Methodology preparation, data collection/compilation, preliminary indicators testing	In progress
17 April 2020	2nd Expert Meeting with Member States to present and discuss the draft index framework/methodology (half day, remote participation) (relevant document will be shared with Member States in advance)	
June - July 2020	Calculation of the index, sensitivity analysis, finalization of indicators, data and results	
June 2020	Present draft index methodology to Council for discussion (relevant document will be shared with Member States in advance)	
July – September 2020	Drafting/analysis	
Second half 2020	Launch of the new Index	
1-3 December 2020	17th World Telecommunication/ICT Indicators Symposium (WTIS)	

Annex 1: Preliminary list of indicators

There are 17 Sustainable Development Goals (SDGs) consisting of 169 targets and 231 indicators, including seven ICT-related indicators. The tables below identify additional candidate ICT-related indicators associated with an SDG target. The following approach has been taken:

- **Relevance for the topic and target**. Ideally the indicator should relate strongly and specifically to the target linked to each topic identified in the framework. It should also be a clear indicator and easy for a non-ICT specialist to understand.

- **Related to the target they most strongly fit under**. Some indicators are cross-cutting and might be incorporated under several targets. This could be accommodated through breakdowns in some cases. For example SDG 5 Gender Equality can be populated with ICT-related indicators from a number of other indicators through a breakdown by sex when available (e.g., females using the Internet to access health information (SDG 3), proportion of females with ICT skills (SDG 4)). Hence a relevant exercise is to map these inter-relationships.

- **Country coverage.** Only indicators available for at least 50 countries were considered.[8] This includes indicators beyond those collected by the UN family as well as both *quantitative* and *qualitative* data. Sometimes the same indicator is collected by different organizations. These overlapping data sets are consolidated to gauge the number of countries for which data is available. A related issue is that while data exist for a number of promising indicators, they have not been consolidated into a single data set. For these, it is not yet possible to determine the number of countries for which data might be available. Hence their inclusion will necessitate data search and compilation.

- **Indexes**. As far as possible indexes were avoided. It is more sustainable to use actual indicators contained in the index in case production of the index ceases. Also indexes often include superfluous data beyond the relevant subject area.

- **Country relevance**. An indicator should be relevant to all countries. For instance, mobile money is relevant when a person does not have a financial account. Digital manifestations of services will be collected as "sub-indicators" that could be analyzed through a layered view. Hence mobile money is a sub-indicator of "account". Similarly, a digital ID system is a sub indicator of "national ID system".

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[8] Here the SDG tier classifications are relevant. For tier 1 classification "data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant." https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/. The SDG Index methodology is also relevant: "1) In order for an indicator to be included it has to be available for at least 80% of the 149 UN Member States with a national population greater than 1 million." That equates to 119 countries. See: https://www.sdgindex.org. The threshold of 50 countries was included in this list as the indicators fall between the SDG tier 1 and tier 2 definitions.

Pillar 1: People

SDG	Topics	Possible indicators	Target	Source	Comment
1 No Poverty	Connected people and household	Households with broadband Internet access	1.4 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, ownership and control over land and other forms of property, inheritance, natural resources, **appropriate new technology *and financial services***, including microfinance **Note that "access to financial services" is the SDG tracking indicator in 8.10.**	ITU / OECD/ EUROSTAT/ NSOs	Reflects "access to new technology". Coronavirus pandemic highlighted importance of broadband access for online learning classes.[9]
		Households with computer		ITU/OECD/ EUROSTAT/DHS/ UNICEF/NSOs	Reflects "access to new technology". Also linked to digital skills.[10] Coronavirus pandemic also highlighted importance of home computers for online learning classes.[11]
2 Zero Hunger	Agriculture	Households living in rural areas with a computer	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal **access** to land, other productive resources and inputs, **knowledge**, financial services, markets and opportunities for value addition and non-farm employment	ITU/ Eurostat/ OECD/ UNICEF/ DHS/ NSOs	Reflects that family farmers mainly live in rural areas.

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[9] https://www.nytimes.com/2020/03/17/technology/china-schools-coronavirus.html

[10] Ofer et al. (2019). "Home internet access and child development: Evidence from Peru"; Ofer Malamud & Cristian Pop-Eleches (2011). "Home Computer Use and the Development of Human Capital"; Robert Fairlie (2012) "The effects of home access to technology on computer skills: Evidence from a field experiment"

[11] https://www.theguardian.com/world/2020/mar/21/coronavirus-us-digital-divide-online-resources

3 Good Health & Well-Being	Health	Percentage of students who reported feeling miserable sometimes or always, by time spent on the Internet outside of school	3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote **mental health** and well-being	OECD/PISA[12]	Directly relates to how Internet affects mental health.
		Students time spent using the Internet (minutes per day)	3.5 "Strengthen the **prevention and treatment** of substance abuse..."	OECD/PISA	"The more time students reported spending connected to the Internet, the more likely they were to report feeling sad and miserable." [13]
		Countries having adopted a national e-health record	3.8 Achieve universal health coverage, including financial risk protection, access to quality essential **health-care services** and access to safe, effective, quality and affordable essential medicines and vaccines for all	WHO[14]	Binary. Possibly reflects health coverage
		Individuals using the Internet for seeking health information		ITU/Eurostat/OECD/NSOs	Reflects the access to health care information

[12] https://www.oecd.org/pisa/

[13] https://www.oecd-ilibrary.org//sites/acd78851-en/1/2/13/index.html?itemId=/content/publication/acd78851-en&_csp_=34b83bd6f1788b01629355b271dcc687&itemIGO=oecd&itemContentType=book#s89

[14] WHO. 2016. Atlas of eHealth country profiles 2015: The use of eHealth in support of universal health coverage. https://www.who.int/goe/publications/atlas_2015/en/

4 Quality Education	Education and skills	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	4.4 By 2030, substantially increase the number of youth and adults who have **relevant skills, including technical** and vocational skills, for employment, decent jobs and entrepreneurship	ITU / UIS	**Tier II SDG indicator.** Consists of 9 indicators so would need to select one or normalize in some way.
		Digital skills among population, 1-7 (best)		GCI [15]	Possible proxy.
		Proportion of tertiary graduates in ICT		UIS[16]	Available by gender
		4.A.1 Schools with access to the internet for pedagogical purposes, by education level (%)"	4.A **Build and upgrade education facilities** that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	UIS	**Tier II SDG indicator.** Note: broken down by primary, lower secondary, upper secondary, secondary
5 Gender Equality	Gender	5.B.1 Proportion of individuals who own a mobile telephone, by sex	5.B Enhance the use of **enabling technology**, in particular **information and communications technology**, to promote the empowerment of women	ITU/UNICEF / NSOs	**Tier II SDG indicator.** Note that a number of other indicators can be broken down by sex (e.g., using Internet, account, purpose of using Internet, ICT skills, etc.).

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[15] https://tcdata360.worldbank.org/indicators/h945a9708?indicator=41400&viz=line_chart&years=2017,2019
[16] "Distribution of tertiary graduates by field of study" at: http://data.uis.unesco.org

Pillar II: Prosperity

SDG	Topic	Possible indicators	Targets	Source	Comment
SDG7 Affordable and Clean Energy	Energy	Proportion of renewables in data center energy	7.2 By 2030, increase substantially the **share of renewable energy** in the global energy mix	ICT company sustainability reports[17]	Data centers and telecom networks are major users of electricity.[18] Most if not all of the main ICT companies publish statistics on their share of renewables.[19] This is typically broken down by group operations in different countries allowing a wide data set to be compiled.
8 Decent Work and Economic Growth	Connected enterprises, e-business & e-commerce	Businesses with fixed-broadband access (%)	8.1 **Sustain per capita economic growth** in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries	EUROSTAT / OECD / UNCTAD / NSOs	The official SDG indicator for this is 8.1.1: Annual growth rate of real GDP per capita. The proposed indicator matches well as many studies have shown that fixed broadband contributes to economic growth finding GDP growth in the range of 1-2% for every 10pp increase in broadband penetration.[20] Hence the proposed digital indicator relates directly to the existing tracking indicator. Economic impact is from business rather than household use. Proxy would be administrative data on fixed broadband subscriptions broken down by type

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[17] https://database.globalreporting.org
[18] https://www.iea.org/reports/tracking-buildings/data-centres-and-data-transmission-networks
[19] Google. 2019. Environmental Report.
[20] http://pubdocs.worldbank.org/en/391452529895999/WDR16-BP-Exploring-the-Relationship-between-Broadband-and-Economic-Growth-Minges.pdf

	Employment	Information and communications technology professionals (% of labour force)	8.2 Achieve higher levels of economic productivity through **diversification, technological upgrading** and innovation, including through a focus on **high-value added** and labour-intensive sectors	ILO[21]	Indicator of labour force "diversification" and "high-value added".
		ICT sector (% GDP)		UNCTAD[22], OECD[23]	Reflects diversification, tech upgrading and high-value added sector.
	Financial services	8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money service provider	8.10 Strengthen the capacity of domestic financial institutions to encourage and **expand access to banking, insurance and financial services** for all	World Bank FINDEX[24]	**Tier I SDG indicator.** Breakdowns available for various categories (e.g., female, rural, income, etc.). Mobile money account available separately as a sub-indicator.
9 Industry, Innovation and Infra-structure	Resilience and security	Number of companies with ISO 97001 certification	9.1 Develop **quality**, **reliable**, sustainable and **resilient** infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	ISO[25]	Security is a synonym for both reliability and also touches on resilience. ISO/IEC 27001:2013 Information technology- Information security management systems. Normalization required.
		Cybercrime law		UNCTAD[26]	Binary. May require some validating & granularity (i.e., does the law cover everything of relevance).
		Secure servers (per 1 million people)		Netcraft via World Bank[27]	The number of distinct, publicly-trusted TLS/SSL certificates found in the Netcraft Secure Server Survey.

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[21] "Employees by sex and occupation - ISCO level 2" at: https://ilostat.ilo.org/data/

[22] https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

[23] https://stats.oecd.org/Index.aspx?DataSetCode=IOTS

[24] https://datacatalog.worldbank.org/dataset/global-financial-inclusion-global-findex-database

[25] https://www.iso.org/the-iso-survey.html

[26] https://unctad.org/en/Pages/DTL/STI_and_ICTs/ICT4D-Legislation/eCom-Cybercrime-Laws.aspx

[27] https://data.worldbank.org/indicator/it.net.secr.p6

		Country has national CERT/CSIRT		FIRST[28]	Binary. Computer Emergency Response Team / Computer Security Incident Response Team (CSIRT) are critical for monitoring, detecting and responding to security incidents
		Fixed broadband speed (Mbps)	9.1 Develop **quality**, **reliable**, sustainable and **resilient** infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	Ookla Global Index[29]	Quality is explicitly mentioned in the target. Normalize to fastest
		Mobile broadband speeds (Mbps)			Normalize to fastest.
	Innovation	Patent grants by technology (per capita)	9.B Support domestic technology development, **research and innovation** in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	WIPO[30]	Breakdown by gender is also available
		Venture capital investment (% GDP)		Regional / national VC associations	Available from national and regional venture capital associations. Also available for whole world from commercial services such as Crunchbase.
	Connected enterprises, e-business & e-commerce	9.C.1 Proportion of population covered by a mobile network, by technology	9.C Significantly increase access to information and communications technology and strive to provide **universal** and **affordable** access to the Internet in least developed countries by 2020	ITU	**Tier I SDG indicator.**
		Mobile broadband Internet prices per month (% GNI pc)		ITU	The target mentions "universal and affordable". The universal is captured by mobile coverage so an indicator of affordable is also needed.

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[28] https://www.first.org/members/map

[29] https://www.speedtest.net/global-index

[30] https://www3.wipo.int/ipstats/keyindex.htm

10 Reduced Inequalities	Reduced inequalities	Percentage of **"group"** using the Internet (% of overall)	10.2 By 2030, empower and promote the social, economic and political **inclusion** of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.	ITU / EUROSTAT / OECD / NSOs	Digital is one more type of inclusion besides social, economic and political. At the same time, use of the Internet can contribute to promoting social, economic and political inclusion for all. A number of breakdowns are available (e.g. age, income). Gender to be reported under SDG 5.
11 Sustainable Cities and Communities[31]	Cities	Availability of digital services	11.1 By 2030, ensure access for all to adequate, safe and affordable housing **and basic services** and upgrade slums	To be determined	Here a case could be made for something like whether free municipal Wi-Fi is available sponsored by the city. Could also ask about other digital-based services the city makes available.[32]

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[31] While there is a statistical framework for city ICT relevant data, actual availability of data following this framework seems low to non-existent. "Collection Methodology for Key Performance Indicators for Smart Sustainable Cities" https://www.itu.int/en/ITU-T/ssc/Pages/KPIs-on-SSC.aspx

[32] "Servicios digitales" at: https://www.buenosaires.gob.ar/servicios

Pillar 3: Planet

SDG	Topics	Indicator	Target	Source	Comment
12 Responsible Consumption & Production	Environment and Climate change	M2M connections per 100 people	12.2 By 2030, achieve the sustainable management and **efficient** use of natural resources	ITU / OECD / Regulators / Telecom operators	M2M is used for, among other things, water & electric metering. While it would be ideal to have a breakdown of M2M usage, this is not available. However, a significant number of M2M connections are used for metering. This ties into the proposed indicator since metering reduces leaks and makes consumers more aware.
		e-waste recycling rate	12.5 By 2030, substantially reduce waste generation through prevention, reduction, **recycling** and reuse	UNU[33]	Aligns with tracking indicator: 12.5.1 National recycling rate, tons of material recycled.
		12.6.1 Number of **telecom service** companies publishing sustainability reports (% of telecom service companies)	12.6 Encourage **companies**, especially large and transnational companies, to adopt sustainable practices and **to integrate sustainability information into their reporting cycle**	GRI[34] / telecom operators	Aligns with tracking indicator, except this would be for telecom companies in the country. Sustainability reports are widely published by companies in the ICT sector.[35] Normalized by the total number of telecom operators in the country.
13 Climate Action		SMS emergency alert system	13.1 Strengthen resilience and **adaptive capacity** to climate-related hazards and natural disasters in all countries	To be determined	Binary. A number of countries have implemented SMS emergency alert systems.[36] [37]

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[33] http://ewastemonitor.info

[34] https://database.globalreporting.org/SDG-12-6/

[35] KPMG. 2015. *Corporate responsibility reporting in the Telecom sector*. https://assets.kpmg/content/dam/kpmg/xx/pdf/2016/08/corporate-responsibility-reporting-telecom-sector.pdf

[36] https://publicwarning.eu

[37] http://www.brazil.gov.br/about-brazil/news/brazil-is-back/security-and-defense/sms-alert-system-is-extended-to-the-whole-country

Pillar 4: Peace

SDG	Topics	Possible indicators	Targets	Source	Comment
16 Peace, justice and strong institutions	Legislation	National legislation for Child Online Protection	16.2 End abuse, exploitation, trafficking and all forms of violence against and torture of **children**	ITU[38]	Binary. Country profiles with an indication of whether there is COP legislation or strategy. Statistical framework published but there does not appear to be any data.[39] Child Online Safety Index (COSI) is computed for only 30 countries.[40]
	Governance and institutions	ICT regulatory authority score	16.6 Develop effective, **accountable** and **transparent** institutions at all levels	ITU ICT Regulatory Tracker[41]	Reflects accountability and transparency of ICT institutions
	Connected government	E-participation index	16.7 Ensure responsive, inclusive, **participatory** and representative decision-making at all levels	UNDESA[42]	Reflects the "participatory" aspect of the target.
		National ID system	16.9 By 2030, provide **legal identity** for all, including birth registration	World Bank[43]	Binary. Note that countries should not be penalized just because they don't have a digitized ID system (as long as they have a system). 'Digitized ID System' would be a sub-indicator. Some operators report on number of digital birth registrations.[44]

[38] "COP Country Profiles" at: https://www.itu.int/en/cop/Pages/country-profiles.aspx

[39] Child Online Protection. Statistical Framework and Indicators 2010. https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-COP.01-11-2010-PDF-E.pdf

[40] "Child Online Safety Index" at: https://www.dqinstitute.org/child-online-safety-index/

[41] https://www.itu.int/net4/itu-d/irt/#/tracker-by-country/regulatory-tracker/2018

[42] https://publicadministration.un.org/en/Research/UN-e-Government-Surveys

[43] https://datacatalog.worldbank.org/dataset/identification-development-global-dataset

[44] https://www.telenor.com/wp-content/uploads/2020/03/Telenor-SDG-Impact-Assessment-2019.pdf

	Legislation	Data protection privacy law	16.10 Ensure **public access to information** and **protect fundamental freedoms**, in accordance with national legislation and international agreements	UNCTAD[45]	Data privacy is a fundamental right[46] hence a law helps to protect the "fundamental freedoms" of the target.
	Connected government	Online Service Index		UNDESA	This is related to the "ensures" in the target, in the sense of how well the public information is made available.
		Individuals using the Internet for visiting or interacting with public authorities websites		ITU/ OECD/ EUROSTAT / NSOs	Output measure of how well the "ensure public access" is working. Shows how much of the public is actually using the information.
		Global Open Data Index		Open Knowledge Foundation[47]	Reflects availability of public information. Used by EC in the DESI as a measure of public services.[48]

[45] https://unctad.org/en/Pages/DTL/STI_and_ICTs/ICT4D-Legislation/eCom-Data-Protection-Laws.aspx

[46] https://edps.europa.eu/data-protection/data-protection_en

[47] https://index.okfn.org

[48] https://ec.europa.eu/digital-single-market/en/news/international-digital-economy-and-society-index-2018

Pillar 5: Partnership

SDG	Topics	Indicator	Target	Source	Comment
17 Partnership for the goals	Tools for cooperation and partnership purposes	Tax paid by telecom operators (proportion of government revenue)	17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to **improve domestic capacity for tax** and other revenue collection	Available from telecom operator reports.[49]	Relates to the proposed indicator and is very topical with discussions on digitalization and tax taking place at high level within the OECD Base Erosion and Profit Shifting initiative.[50]
		Open source contributors per 1,000 people)	17.6 Enhance North-South, South-South and triangular **regional and international cooperation** on and access to science, technology and innovation and enhance **knowledge sharing** on mutually agreed terms...	GitHub[51]	Open innovation is characterized by collaboration in research and development (R&D). Companies have found that moving from doing all R&D inhouse to cooperative frameworks yields significant benefits and boosts innovation. This collaboration relates to the target. GitHub is the largest open source repository in world and data can be extracted on contributions per country.[52]
		17.8.1 Proportion of individuals using the Internet	17.8 ... **enhance the use of enabling technology, in particular information and communications technology**	ITU	**Tier I SDG Tracking Indicator.**

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[49] For example see: https://www.vodafone.com/our-purpose/reporting-centre/tax-and-our-contribution-to-economics

[50] "Tax and digitalisation" at: https://www.oecd.org/tax/beps/tax-and-digitalisation-policy-note.pdf

[51] https://docs.google.com/spreadsheets/d/1UC6AuwnX6xu8-fUc9KyActyNXXio6rIST6ga5CQFWLQ/view#gid=1419375063

[52] "GitHub" top countries. https://medium.com/@hoffa/github-top-countries-201608-13f642493773

	Data monitoring	NSO using Big Data	17.18 ... enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to **increase significantly the availability of high-quality, timely and reliable data** disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts	UN GWG Big Data Project Inventory[53]	Binary. It has been estimated that the costs of collecting the data for the 169 targets spread across the 17 goals would amount to billions of dollars per year.[54] Given the high costs, it is unlikely that data can be collected for many developing countries using traditional techniques such as household surveys. Lower cost techniques using big data will be essential if the required indicators are to be successfully collected for all countries. The UN GWG Big Data Inventory is a catalogue of big data projects that are relevant for official statistics, SDG indicators and other statistics needed for decision-making on public policies, as well as for management and monitoring of public sector programs/projects. Relates to indicator: 17.18.3 (Number of countries with a national statistical plan that is fully funded and under implementation, by source of funding)

[53] https://unstats.un.org/bigdata/inventory/

[54] Morten Jerven. 2014. "Benefits and Costs of the Data for Development Targets for the Post-2015 Development Agenda." *Data for Development Assessment Paper*. https://www.copenhagenconsensus.com/sites/default/files/data_assessment_-_jerven.pdf