



19th Global Symposium for Regulators (Port Vila, 2019)

Inclusive connectivity: The future of regulation

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Introducing the New G5 Benchmark

...the Gold Standard for Collaboration amongst Regulators

This paper outlines the new G5 Benchmark for collaborative regulation – based on data from more than 80 countries (mostly mature G4 countries), and presents initial findings. The G5 Benchmark is a powerful, straightforward tool for policy-makers and regulators. It enables you to track how regulatory frameworks are evolving in the digital economy and dives deep into policy trends. It enriches global policy debate and sets out new goals for regulatory excellence. The G5 Benchmark identifies policy and implementation shortcomings in pursuit of SDGs, and points to how collaborative regulation can remedy them. It constitutes the gold standard for collaboration amongst regulators, and for the design of digital policy and legal instruments that maximize digital transformation. The full dataset as well as in-depth analysis on the findings of this first G5 Benchmark will be published in the 2019 edition of the Global ICT Regulatory Outlook.

The G5 Benchmark is based on data provided by ITU Member State Administrations through annual ITU surveys. Additional research was carried out to complement the dataset. The Benchmark is set to evolve and we invite ITU Members to provide their comments, views, suggestions or questions on its methodology and structure. We will continue the conversation beyond GSR19 and count on Members to provide contributions to enhance the tool.

This paper was prepared by the ITU Telecommunication Development Bureau (BDT). For questions and comments, please contact Ms Youlia Lozanova at youlia.lozanova@itu.int.

Collaborative regulation – key to unlocking digital transformation

The flood of digital change continues full spate – and digital transformation, while a reality for some, remains distant for many. A period of hope and aspiration buoyed by smartphones and increasingly accessible broadband has now darkened somewhat as misuse of profiling and data commercialization in this age of hyper-connectedness have come to light.

While some still plead for unconditionally liberal markets, others call for caution, increased regulation and a rules-based digital order. Still others are supporting a third way – a new deal which champions shared perspectives and common responsibility and which strikes a robust balance between people's rights and the technology that impacts so much on our everyday lives. This new deal seeks to fast forward digital transformation for all – and that 'deal' is embodied in *collaborative regulation*.

Industry and regulators charting a common future

ITU forged 'collaborative regulation' in 2016 and have tested it annually at every Global Symposium for Regulators (GSR) since. While the concept continues to evolve, it can best be cast in 2019 as a framework to discuss the evolution of regulatory pattern and policy while charting the way ahead for industry and regulators as one constituency, towards digital transformation.

Box 1: Collaborative regulation: a forward-looking concept

Collaborative regulation or 5th generation regulation (G5) is a broad notion that ITU has defined based on the concept of generations of ICT regulation (see Figure 1). It marks a fundamental shift in the way regulation is executed and the stakeholders that it brings together – from policy-makers, single-sector and multi-sector regulators to market players of any size. Collaborative regulation puts consumer benefits and protection in its focus and leverages the resources of government institutions and industry to deliver them, through organic consultation, collaboration and conciliation. Collaborative regulation is driven by leadership, incentive and reward rather than by command and control schemes. The concept also refers to the set of new tools used by regulators to tackle the issues related to digital transformation and the data economy.

Source: ITU, [2018 Global ICT Regulatory Outlook](#)

Why do we need collaborative regulation?

All roads point to more collaboration, better channels and more bandwidth. But while the case for collaboration is irrefutable, progress has been stalled by power battles, lack of resources and misconceptions. Good progress towards inclusive, collaborative regulation is needed for the good of all users of digital services, now and into the future – a need borne out by four fundamentals:

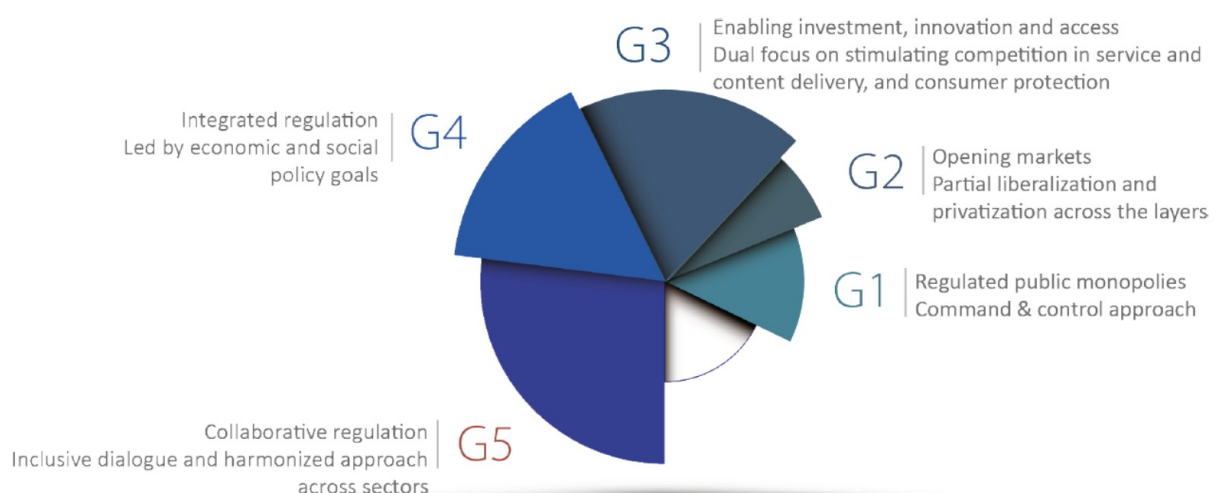
- **Digital transformation is a game changer**
ICTs have moved far beyond the realm of simple 'communications'. They have become the foundation for every economic sector and a sine qua non of business performance and national growth.

- **The new digital world needs a new take on regulation**
ICTs can dramatically transform education, health care, environmental management, agriculture, trade and entrepreneurship, the provision of government services – and so much more. But enabling frameworks of policy and regulation, the right networks and services – all of these need to be put in place.
- **Holistic and harmonized approach can deliver greater impact**
Silo-style ICT sector regulation isn't viable in the digital world. G5 regulation will mirror the interplay between digital infrastructure, services and content across industries and national borders. It will also harmonize rules and ensure consistent implementation of policy and regulatory frameworks that have evolved independently in many sectors over the years.
- **Development and inclusion have become a primary focus of regulation**
Collaborative regulation is people-centred regulation – it looks at sustainability and long-term gains as opposed to industry profit maximization and exclusive economic growth. G5 champions are also engaged in connecting marginalized individuals, persons with disabilities, low-income communities, communities challenged by educational impoverishment, and remote or isolated populations which may also lack basic infrastructure such as electricity – so we need to be much more innovative and much more collaborative in our approach to policy-making.

Generations of regulation: analysis tool and a roadmap for action

The concept of 'regulation generations' helps us analyse the maturity of modern regulatory frameworks. The [ICT Regulatory Tracker](#) pinpoints changes taking place in the regulatory environment and tracks the progress of all countries' regulatory oversight of telecommunication/ICT markets through generations one to four (see Figure 1).

Figure 1: Generations of ICT regulation – conceptual framework



Source: ITU

This new benchmark for fifth generation collaborative regulation complements and builds on the ICT Regulatory Tracker; it focuses on the G5 generation of regulation and identifies what is needed to

facilitate digital transformation across economic sectors. Both the Tracker and the G5 Benchmark correspond closely to guiding principles outlined in the ITU Best Practice Guidelines of GSR adopted by ICT regulators globally for close to two decades. These [Best Practice Guidelines](#) are considered to be the core of modern and future-facing ICT regulation. Table 1 below outlines the main characteristics and complementarities of the two metrics.

Table 1: ICT Regulatory Tracker and G5 Benchmark side-by-side

| | ICT Regulatory Tracker | G5 Benchmark |
|---|---|---|
| Focus | Telecom/ICT regulation | Regulation for the digital economy |
| Defines generations of regulation | G1 through G4 | G5 |
| Based on | GSR Best Practice Guidelines | GSR Best Practice Guidelines & ITU research and analysis |
| Number of indicators and maximum score | 50 (including 11 composite indicators); goalpost = 100 | 25 individual indicators; goalpost = 50 |
| Countries covered | 193 | 84 (G4 countries & top G3 tier) |
| Structures | 4 pillars: - regulatory authority - regulatory mandates - regulatory regime - competition framework | 3 tracks: - collaboration among regulators - policy design principles - G5 toolbox |
| Data series | 2007-2018 | 2018/2019 |
| Data source | ITU World Telecommunication/ICT Regulatory Survey + ITU research | ITU World Telecommunication/ICT Regulatory Survey + ITU research |
| Data comparable over time | Yes | Yes |

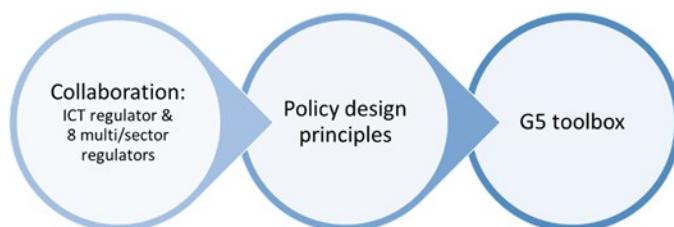
Source: ITU

G5 Benchmark – fast-tracking collaborative regulation

We have identified the broad tracks for regulatory reform and have pinpointed how countries can work to leapfrog towards the next level – regulatory initiative and response.

The G5 Benchmark for collaborative regulation is built around 25 indicators. We expect its implementation to be pivotal in creating a digital market-place that is inclusive, sustainable and pro-development and a cornerstone of digital transformation. These indicators are clustered into three tracks: collaboration, policy design principles and G5 toolbox. The Benchmark builds further on the now established [ICT Regulatory Tracker](#).

Figure 2: G5 Benchmark design



Source: ITU

The G5 Benchmark occupies high ground, and affords perspectives on the regulatory road already travelled as well as on the pathways into the future. It:

- reflects how digital transformation is shifting regulatory perspective and patterns and the need for new tools;
- reveals regulatory gaps, and helps with building custom roadmaps for navigating the digital transformation;
- facilitates high-value debate on the future of markets and regulation, based on unbiased, non-judgmental evidence.

The G5 Benchmark is needed – especially now

The G5 Benchmark arrives when regulators need it most. The following five elements explain why:

1. Regulation is changing as digital markets mature

Evidence suggests that digital development trajectories are shifting: economies in the course of digital transformation in this decade will follow a different path from those that did so earlier. The Benchmark is there to guide regulators through uncertain times – not to rank a country or calculate a score.

To borrow the emblem of ITU's work on policy and regulation over the past 20 years, the fifth generation of regulation – and the G5 Benchmark – is like the lighthouse illuminating rough seas of digital technology phenomena and leading the way to a safe harbor for all.

2. Existing metrics do not tell the whole story

The Benchmark builds a shared and global perspective across all economic sectors and lays out clear regulatory tracks which ensure that digital markets thrive while achieving development goals.

3. High-level policy design principles feature – for the first time

The G5 Benchmark combines high-level principles and specific instruments, recognizing that G5 regulation is contextual, modular and multi-dimensional. Different layers of regulation are integrated to highlight the complexity of regulatory action in the digital age.

4. Collaboration among sector/multi-sector regulators features – for the first time

As set out in the Global ICT Regulatory Outlook 2018, collaboration among institutions is an essential ingredient for regulatory relevance, coherence and impact. The G5 Benchmark takes into account the breadth and depth of collaboration between the ICT regulator and sector-specific or multi-sector regulators.

5. A benchmark is worth a thousand words

The Benchmark is based directly on relevant indicators, enabling policy-makers easily to evaluate regulatory set-up and tools – comparing apples with apples. It facilitates the easy modelling of one country's digital development experience in setting out strategy and decision-making for development and regulation.

Looking ‘under the bonnet’ of the G5 Benchmark

We have identified three regulatory tracks which correspond to processes and practices facilitating digital transformation. For each track, metrics define the profile of digital regulation in G4 countries and in the upper G3 tier and will help them progress to G5 regulation. The three tracks are as follows:

1. **Collaboration** is the dominant element – the very watermark of G5 regulation. It measures the breadth and depth of cross-sector collaboration between the ICT regulator and her/his peers. This track factors in institutional set-up (agencies and their mandate) as well as practices around regulatory collaboration, formal and informal (see Table 2).

Digital regulation now occurs across a network of centres of expertise and enforcement. Shared focus and accountability among government agencies and stakeholders is replacing the ICT silo model, and the G5 Benchmark reflects this trend.

Track 1: Collaboration

» Focus:

- Established sector or multi-sector government regulatory agencies for competition, consumer protection, finance, energy, broadcasting, spectrum management and Internet issues.
- Degree of regulatory collaboration between the ICT regulator and other regulatory agencies.

» Best-case scenario:

Combines the greatest number of agencies collaborating with the highest official status of collaboration.

2. **High-level principles:** as regulation shifts from rules to principles, the design of frameworks and what keeps them together have acquired especial importance. While rules will not disappear soon, principles are better suited for finding balanced, sound solutions, especially in complex areas. Today’s effective regulators will rely on sound policy principles, tried-and-tested institutional wisdom and a vanguard spirit – from infrastructure investment to consumer protection to data privacy, and any area where there are no good or bad responses.

Track 2: Policy design

» Focus:

Policy design principles lay the foundation of collaborative regulation and define a new approach to market regulation, taking into account the broad economic and policy context.

» **Best-case scenario:**

The goalpost here is to have all nine high-level policy design principles enshrined in laws and regulatory decision through concrete tools that are:

- Forward-looking
- Holistic
- SDG-oriented
- Evidence-based
- Market-proof
- Incentive-based
- Innovation-based
- Inclusive
- Technology-neutral

3. **G5 regulatory toolbox:** to switch on the digital economy, regulators need new tools over and above the established instruments of modern regulation. Adapting old tools for use in digital markets which are leaping ahead is not sufficient. New consumer needs, business models and market dynamics call for retooling regulatory inventory and the development of coherent, outcome-oriented policy instruments.

Track 3: G5 toolbox

» **Focus:**

New market realities and the challenges they bring about require a new perspective and new tools. Policies that used to be 'nice to have' and formerly associated with developed countries have become a stepping-stone in leading the digital transformation.

» **Best-case scenario:**

The more these tools have been adopted and become functional, the greater the chances to create a safe place for digital experimentation and a safe experience for consumers.

The baskets of indicators corresponding to each of the three tracks are set out in Table 2.

Table 2: Canvas for assessing countries' readiness to leapfrog to the fifth generation of regulation

| Track 1 | Degree of collaboration between the ICT regulator and: | |
|--------------------------------------|--|--------------------------------|
| | 1 | Competition authority |
| | 2 | Consumer protection commission |
| | 3 | Data protection commission |
| | 4 | Spectrum agency |
| | 5 | Broadcasting regulator |
| | 6 | Financial regulator |
| | 7 | Energy regulator |
| | 8 | Internet agency |
| 8 indicators/ max. score = 16 points | | |

| | | |
|--------------|---|--|
| Track 2 | Policy design principles | |
| | 9 | Forward-looking * Digital strategy exists |
| | 10 | Holistic * Digital strategy spreads over multiple sectors |
| | 11 | SDG-oriented (or development in general) * Digital strategy SDG-oriented |
| | 12 | Evidence-based * Regulatory Impact Assessment (RIA) |
| | 13 | Market-proof * Regulatory space for digital experimentation such as sandboxes, pilots, new focus of regulation (AI, IoT, fintech) |
| | 14 | Incentive-based * Incentives for network operators |
| | 15 | Innovation-based * ICT Innovation policy |
| | 16 | Inclusive * Stakeholder input & engagement |
| | 17 | Technology-neutral * Spectrum licensing |
| | | <i>9 indicators/ max. score = 18 points</i> |
| Track 3 | G5 toolbox: policies & regulations | |
| | 18 | Competition |
| | 19 | Data protection |
| | 20 | Cybersecurity |
| | 21 | e-Commerce/e-Transactions |
| | 22 | Digital financial services |
| | 23 | Accessibility |
| | 24 | Taxation of Internet services |
| | 25 | Infrastructure mapping |
| | | <i>8 indicators/ max. score = 16 points</i> |
| Total | | <i>25 indicators/ max. score = 50 points</i> |

Note: The full methodological framework for the G5 Benchmark including indicator definitions is featured in Annex 1.

The G5 Benchmark encapsulates a vision where countries build their digital development path around their local and national priorities, and one where policy instrument configurations lead to the same goals. The Benchmark structure reflects the interplay of the three tracks – policy principles, tools and collaboration – with each track building on the others (see Figure 2 and Table 2). Overall, the Benchmark facilitates analysis of each country’s progress along the path towards the digital economy.

G5 Benchmark – spotlighting the shifts in regulatory frameworks

Three features ensure the Benchmark has a laser focus on how regulatory frameworks are evolving: scope, clarity and objectivity.

- Its scope: it covers 80 economies from all regions and uses 2018-2019 data. These countries are on the glide path towards collaborative regulation. The Benchmark's uniquely wide scope and the ease with which it 'plugs in' to the ICT Regulatory Tracker make it a powerful tool to assess cross-sector regulatory frameworks and for conducting regulatory gap analysis.
- The Benchmark has a clear, straightforward methodology (see Annex 1). The 25 indicators at its heart are easily measurable, enabling policy-makers to check and update their country data and to run 'what-if' projections that measure policy impact. This ease-of-use also enables regulators to compare their level of maturity with peers, at similar and different levels of ICT development.
- The Benchmark is built on objective criteria and factual evidence, not on opinion, pundit commentary or other subjective data.

A snapshot of G5 Benchmark features is provided in Box 2.

The G5 Benchmark sifts through huge volumes of data to deliver an executive understanding of the digital regulatory landscape – and facilitates measured navigation through a landscape of fast-changing complexity. In particular it enables you to:

- **Monitor the evolution of regulation as digital markets mature**
Monitoring policy and implementation ensures that countries promote a take-up of digital technologies that is broad-based and meaningful. Country profiles, together with regional and global trends, provide insight into how ready regulation is for the challenges of digital transformation – while gaps in policy and implementation are clearly visible. Building custom country roadmaps for collaborative regulation becomes easier.
- **Compare countries and analyse their paths towards regulatory maturity**
The G5 Benchmark is unique in featuring high-level policy design and regulatory collaboration very much in a holistic, cross-sector context – essential for regulatory effectiveness. It becomes a valuable tool for benchmarking regulatory performance within and across countries. Together the three tracks enable you to look in-depth into a single track as well as looking at linkages across all tracks. You can also deconstruct each track to assess countries' strengths and areas for improvement, providing useful evidence on areas of priority for regulatory reform.
- **Construct complex models that explore the interplay between market take-up, regulation and development**
The G5 Benchmark's holistic approach, its three digital regulation tracks and its modular structure, can be combined with other metrics to quantify the interplay between digitization and regulation, or the impact of regulatory decisions on market development. Such studies provide rich evidence to further inform policy-making in the digital age.

Box 2: What's in a metric? A 360° overview of the Benchmark for collaborative regulation

Structure & scores

The Benchmark for collaborative regulation and the ICT Regulatory Tracker are designed as complementary metrics to capture the transformation of regulatory frameworks.

The Benchmark therefore mirrors the scoring rationale of the Tracker and uses scores of 0 (absence), 1 (partial occurrence) and 2 points (presence of desired characteristic) for each indicator. Table 2 provides the scoring structure of the Benchmark.

Table 2: Benchmark for collaborative regulation: structure and scores

| Track | Number of indicators | Maximum score (in points) |
|-----------------------------|----------------------|---------------------------|
| 1. Collaboration | 8 | 16 |
| 2. Policy design principles | 9 | 18 |
| 3. G5 toolbox | 8 | 16 |
| Benchmark | 25 | 50 |

Countries and year

The dataset covers 84 countries (G4 and higher G3 tier), for 2018 (Track 1) and 2019 (Tracks 2 and 3).

Data sources

The indicators come from two main sources:

- ITU World Telecommunication/ICT Regulatory Survey
- Desktop research based on official sources

How to read the scores?

The Benchmark can be seen as a roadmap towards G5.

- Countries obtaining scores of 35 and higher (corresponding to 70 per cent of the reference frame goalpost) qualify as G5 regulatory champions.
- Countries obtaining scores of 25 to 35 points are the rising stars and are expected to join G5 next.
- Countries with scores lower than 25 need to continue enhancing and refining their regulatory frameworks, while turning to new tools and collaborative regulatory mechanisms.

Going forward

The G5 Benchmark will be updated every two years to allow for tracking changes over time, both changes in absolute scores and changes in rankings relative to other economies. The future data series will provide a useful tool for measuring progress in narrowing the gaps in collaborative regulation between countries.

The full dataset as well as in-depth analysis on the findings of the first G5 Benchmark will be published in the 2019 edition of the Global ICT Regulatory Outlook.

Note: The full list of indicators and the detailed scoring rationale per indicator are available in Annex 1. The list of countries covered is in Annex 2.

Source: ITU

G5 countries – movers, shakers... and some surprises

This first edition of the G5 Benchmark examines how mature ICT frameworks leverage cross-sector, collaborative regulation. While many ICT regulators have been watching how communication services have been reshaped by digital technologies and new business models, few have adapted to capture the benefits of digital flows in adjacent sectors – for example by expanding collaboration with other regulators, harmonizing rules or applying new policy design principles and tools. Nevertheless, we have identified sixteen G5 regulators forging ahead, demonstrating thought leadership and a holistic yet practical perspective (see Table 3) – and importantly, charting the route ahead for the many G4 and G3 regulators navigating towards collaborative regulation.

Box 3: Understanding G5, a non-linear evolution of the regulatory approach from ICTs to digital

- Fifth generation or G5 regulation builds upon the solid foundation of G3 and G4 regulation; G5, however, isn't merely an upgrade of the G4 status.
G3 countries, along with G4, can leapfrog to G5.
- G5 regulation is defined by more complex and diverse patterns. Tools and processes set G5 apart from previous generations, not the nature of its regulation.
In G1-G4, we assess the maturity of countries' competition frameworks for the ICT sector; in G5, the focus expands to competition in all sectors where digital underpins service delivery.
- G5 is therefore seen as complementary to the previous generations – as a different paradigm – and G3 and G4 countries can join G5 for their outlook on digital markets.
G5 countries thus still belong under the G3 or G4 'brand' based on the maturity of their regulatory frameworks for the ICT sector, more narrowly.

Some emerging insights are intuitive while others reveal more surprising trends across geographies, income groups and across countries at different levels of development (Table 3):

- Norway and Singapore lead the way to collaborative regulation with a score of 39 out of 50. Innovation and pro-active multi-stakeholder initiatives have paved their way to the top world spot.
- Europe performs strongly featuring ten of 16 G5 countries globally – not surprising as the region boasts the greatest number of G4 regulators. Europe is arguably the region with the highest level of regulatory harmonization across economies while a structured, coordinated traditional approach to policy-making is successful in shaping digital economies.
- Whilst G5 level countries mostly feature those transitioning from the G4 category, two previously G3 countries make it directly into G5. Japan achieves second highest world score in the G5 Benchmark despite its 106th rank in the ICT Regulatory Tracker. Albania comes 4th in the G5 Benchmark while ranking 69 on the Tracker. Both countries demonstrated innovation in boosting digital markets while retaining a traditional approach to ICT regulation.
- Of the world's top ten most mature ICT regulatory frameworks, only Norway and UK are G5. They have consistently built synergies between ICT regulation on the one hand, and digital services, on the other.
- While few of the most mature ICT regulatory countries have shifted to collaborative regulation, countries like Estonia and Kenya have been skillful in prioritizing regulatory reforms which benefit the broader digital economy, not the ICT sector alone.

- Six countries from outside Europe join the G5 group distinguishing themselves through regulatory initiatives enabling digital markets to deliver better services and higher value to consumers: Brazil, Canada, Japan, Kenya, Morocco and Singapore.

Table 3: G5 countries, by score, rank and compared to the ICT Regulatory Tracker

| G5 Benchmark 2019 | | | | ICT Regulatory Tracker 2018 | |
|-------------------|----------------|-------|------|-----------------------------|-----|
| | Country | Score | Rank | Tracker Rank | Gen |
| 1 | Norway | 39 | 1 | 3 | G4 |
| 2 | Singapore | 39 | 1 | 26 | G4 |
| 3 | Japan | 37 | 2 | 106 | G3 |
| 4 | Estonia | 37 | 2 | 47 | G4 |
| 5 | United Kingdom | 37 | 2 | 4 | G4 |
| 6 | Canada | 37 | 2 | 58 | G4 |
| 7 | Kenya | 37 | 2 | 45 | G4 |
| 8 | Croatia | 36 | 3 | 11 | G4 |
| 9 | Romania | 36 | 3 | 23 | G4 |
| 10 | Spain | 36 | 3 | 52 | G4 |
| 11 | Germany | 36 | 3 | 16 | G4 |
| 12 | Albania | 35 | 4 | 69 | G3 |
| 13 | Brazil | 35 | 4 | 36 | G4 |
| 14 | Netherlands | 35 | 4 | 19 | G4 |
| 15 | Sweden | 35 | 4 | 33 | G4 |
| 16 | Morocco | 35 | 4 | 36 | G4 |

Source: ITU

Breaking it down track by track – more surprising insights

The insights set out below help identify current trends and emerging patterns as regulation evolves, providing valuable evidence of best practice. These G5 Benchmark insights help build a canvas for evidence-based decision-making and for developing fit-for-purpose regulation for digital markets.

Different paths to collaborative regulation (Table 4) emerge as the G5 Benchmark examines the top-scoring countries track by track:

Collaboration

- The countries ranked as top three in this track represent three different regions – Africa, Asia-Pacific and Europe – underlining the universal value of collaboration in regulating digital markets.
- Many countries lack mechanisms that connect the ICT regulator with financial or data protection regulators (55 and 52 countries).
- The great majority of countries have collaboration mechanisms in place for spectrum management and broadcasting regulation (78 and 71 countries), followed by competition issues (60 countries).
- Formal collaboration occurs most often in broadcasting and spectrum management while informal collaboration more often occurs in relation to competition and consumer protection authorities.

Policy design principles and their implementation:

- 90 per cent of countries surveyed (73 countries) have adopted digital strategy. 51 countries' strategies are holistic in scope and address interplay across digital markets. Only 16 countries have clear references to the SDGs and link development goals with global priority areas. While many strategies pre-date SDG adoption, incoherence across national and global frameworks will pose a challenge in harmonizing cross-border digital markets.
- Almost half of countries (41) have a space for digital experimentation, providing a testbed for new technologies and services before fully launching them commercially. In this group, we count regulatory sandboxes and pilot initiatives as well as regulation of new and emerging phenomena such as fintech, Artificial Intelligence and the Internet of Things.
- Around 30 countries are using targeted regulatory incentives for regulators; however only in half of these have such incentives been translated into concrete, targeted measures.

G5 tools for holistic regulatory oversight:

- Between 80 and 90 per cent of surveyed countries have adopted holistic policies for competition, mobile financial services and cybersecurity. This underlines the critical role these elements play in digital transformation.
- Most countries have introduced forward-looking competition policies and data protection laws, safeguarding both providers and consumers.
- Over recent years, many countries have adopted regulatory frameworks for ICT accessibility for persons with disabilities, a foundation for digital inclusion across the board. This is the case for three-quarters of surveyed countries.
- Despite a consensus on the importance of digital services, 45 countries still have taxes on Internet services, raising additional barriers to service provision and adoption. Taxation remains an area for scrutiny and regulatory action in many developing countries.

Table 4: G5 Benchmark top countries, by track, 2019

| Rank | Collaboration | Score |
|---------------|----------------|-------|
| 1 | Singapore | 13 |
| 1 | Botswana | 13 |
| 3 | Norway | 12 |
| 3 | United Kingdom | 12 |
| Max score: 16 | | |

| Rank | Principles | Score |
|---------------|------------|-------|
| 1 | Kenya | 17 |
| 2 | Japan | 17 |
| 3 | Bulgaria | 16 |
| Max score: 18 | | |

| Rank | G5 toolbox | Score |
|---------------|------------|-------|
| 1 | Canada | 16 |
| 1 | Spain | 16 |
| 1 | Romania | 16 |
| 1 | Germany | 16 |
| 1 | Greece | 16 |
| 1 | Ireland | 16 |
| 1 | Sweden | 16 |
| Max score: 16 | | |

Source: ITU

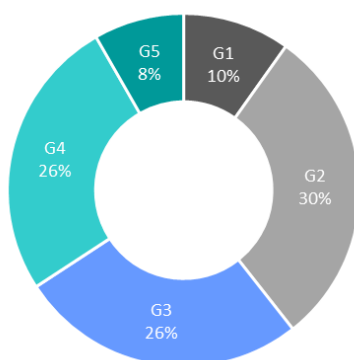
The G5 Benchmark allowed us to cover the full array from G1 through G5. The current snapshot of regulation maturity of regulation for ICT and beyond is highlighted in Box 4.

Box 4: Generations of regulation – where do we stand in 2019?

The Benchmark also allows us to draw a full picture of the current level of maturity of regulatory frameworks for the ICT sector and beyond, for the digital economy (Figure 3):

- While in the majority of countries worldwide, or nine out of ten countries, regulation still deals with ICTs as a separate economic sector, a lead group of 8 per cent now has holistic, forward-looking regulatory frameworks enabling digital transformation across the economy.
- One-third of all countries have achieved G4, integrated ICT regulation led by social and economic goals. These are the countries with the lowest proportion of unconnected population and have thriving markets for ICT services. The small group of G5 countries is also part of this group, embracing digital and taking their whole economies to the next level.
- One-quarter of countries are only half way through their journey, making steady progress in strengthening policy and regulatory frameworks while being unable to unlock the full potential of ICT markets.
- More than half of world's population is concentrated in G2 and G3 countries, poised to leapfrog to near universal digital inclusion and lead vibrant ICT markets.
- As many as 40 per cent of countries are still in G1 or G2, missing development opportunities and running the risk of remaining disconnected from global digitization and transformation of their economies.

Figure 3: Generations of regulation, breakdown, world, 2018



Source: ITU

Opportunity awaits regulators who embrace collaboration

Increasing numbers of countries are embracing the new approach to collaborative regulation. While opportunities associated with digital transformation are undeniable, most countries still face quite a journey in getting there. Such opportunities await those government regulators who sit down with peers from different economic sectors and embrace collaborative regulation, meeting the challenges ahead openly and holistically.

Feedback loop and living Benchmark

The G5 Benchmark is based on data provided by ITU Member State Administrations through annual ITU surveys. Additional research was carried out to complement the dataset.

The Benchmark is set to evolve and we invite ITU Members to provide their comments, views, suggestions or questions on its methodology and structure. We will continue the conversation beyond GSR19 and count on Members to provide contributions to enhance the tool. Please contact us at treg@itu.int.

Based on comments received and updates to the Benchmark, ITU will publish a full-fledged analysis on it in the 2019 Global ICT Regulatory Outlook.

Annex 1: Note on methodology: G5 Benchmark composition and scoring rationale

| Track | Indicators | Coding guidelines | Remarks |
|-----------------------------|--|---|--|
| Institutional collaboration | Collaboration with competition authority | Memorandum of understanding or joint program/committee = 2 Semi-formal and informal collaboration = 1 No mechanism for collaboration/No data = 0 | For spectrum, broadcasting and energy – when no separate regulator exists but the ICT regulator has explicit mandate to cover that area, score = 2 |
| | Collaboration with consumer protection authority | | |
| | Collaboration with data protection authority | | |
| | Collaboration with spectrum agency | | |
| | Collaboration with broadcasting authority | | |
| | Collaboration with financial regulator | | |
| | Collaboration with energy regulator | | |
| | Collaboration with the agency in charge for Internet-related issues | | |
| Policy Design Principles | Is there a digital strategy in place? | Yes = 2 Digital strategy is being planned, digital strategy is part of a broader development strategy, only specific plans such as e-government strategy existing or not clearly implemented = 1 No = 0 | Is there evidence of a document containing a plan or strategy to develop the digital economy or sector? |
| | Is the digital strategy SDG-oriented? | Has a digital transformation/development strategy plan which explicitly mentions SDGs = 2 No explicit mention of SDGs = 0 | Mention of SDGs in the digital strategy statement/document is required. |
| | Does the digital strategy include multiple sectors of the economy? | Yes = 2 Not clearly expounded = 1 No = 0 | E.g. government, health, education, finance etc. |
| | Is there a formal requirement for Regulatory Impact Assessment (RIA) before regulatory decisions are made? | Yes = 2 No = 0 | |
| | Are there mechanisms for regulatory experimentation? | Yes = 2 No = 0 | Does the ICT regulator have a sandbox, allows pilots of or |

Max score: 16

| | | |
|---|---|--|
| | | demonstrates awareness of emerging tech and exploring ways to regulate, e.g. AI, IoT, fintech? |
| Are there regulatory incentives targeted at network operators? | Regulatory incentives for all operators = 2 Regulatory incentives for specific operators = 1 No = 0 | e.g., reduced regulatory fees, tax holidays, longer/cheaper licences |
| Is there an innovation policy for the ICT sector? | Yes = 2 Planned or not clearly implemented = 1 No = 0 | |
| Does the regulator uses public consultations to guide regulatory decision-making? | Public consultation are required by law prior to major regulatory decisions, has clear timelines and process for undertaking public consultation, and the regulator incorporates results in their decision-making = 2 Public consultation is required by law prior to regulatory decisions but there is no requirement or it is not clear what the timeline and process is and whether the regulator incorporates results in their decision-making = 1 Public consultation is not undertaken or required by law/No data = 0 | |
| Are spectrum licenses technology neutral? | Yes = 2 There are exceptions to which bands of the spectrum are technology neutral = 1 No = 0 | |
| Max score = 20 | | |
| Is there a forward-looking competition policy applied to digital markets? | Yes = 2 No = 0 | Is competition policy being applied not only to telcos but also to other digital markets like content providers and digital platforms? This could be ex ante and ex post, such as merger approval and investigation. |

| | | |
|---|---|---|
| Are there data protection rules? | <p>There is a general data protection law and a data protection agency has been established = 2</p> <p>There is a data protection law but either: i) a data protection agency has not yet been established, ii) the data protection law is not yet implemented, or iii) the law covers only a limited number of activities = 1</p> <p>No data protection law or regulations yet = 0</p> | |
| Is there cybersecurity legislation or regulation? | <p>Yes = 2</p> <p>Partial coverage = 1</p> <p>No = 0</p> | |
| Are there policies and regulations for e-commerce/e-transactions? | <p>Yes = 2</p> <p>Rules at regional level (e.g., EU) but has not yet formulated national rules to match or no monitoring and enforcement of rules or has limited provisions = 1</p> <p>No policies rules = 0</p> | |
| Are there policies and regulations for digital financial services/electronic money? | <p>Yes = 2</p> <p>No policies or rules = 0</p> | |
| Have you established a regulatory framework to ensure ICT accessibility for persons with disabilities? | <p>Yes = 2</p> <p>No clear evidence/enforcement or partial = 1</p> <p>No = 0</p> | |
| Are there specific taxes on Internet services? | <p>Laissez faire/No taxes = 2</p> <p>Yes = 0</p> | Taxes can be interpreted as restrictions on Internet diffusion and innovation |
| Does an official register or a mapping exist in your country of all telecommunication/ICT infrastructure? | <p>Yes = 2</p> <p>Yes, but only for some infrastructure or evidence is not clear = 1</p> <p>No = 0</p> | |
| | | Max score = 18 |
| | | Total score = 50 |

Annex 2: List of countries in the G5 Benchmark 2019

| | Country | Generation* |
|----|------------------------|-------------|
| 1 | Albania | G3 |
| 2 | Argentina | G4 |
| 3 | Australia | G4 |
| 4 | Austria | G4 |
| 5 | Bahamas | G4 |
| 6 | Bahrain | G4 |
| 7 | Belgium | G4 |
| 8 | Bosnia and Herzegovina | G4 |
| 9 | Botswana | G4 |
| 10 | Brazil | G4 |
| 11 | Bulgaria | G4 |
| 12 | Canada | G4 |
| 13 | Chile | G3 |
| 14 | China | G2 |
| 15 | Colombia | G3 |
| 16 | Costa Rica | G4 |
| 17 | Croatia | G4 |
| 18 | Cyprus | G4 |
| 19 | Czech Republic | G4 |
| 20 | Denmark | G4 |
| 21 | Dominican Rep. | G4 |
| 22 | Ecuador | G4 |
| 23 | Egypt | G3 |
| 24 | Estonia | G4 |
| 25 | Finland | G4 |
| 26 | France | G4 |

| | | |
|----|--------------|----|
| 27 | Georgia | G4 |
| 28 | Germany | G4 |
| 29 | Ghana | G4 |
| 30 | Greece | G4 |
| 31 | Honduras | G3 |
| 32 | Hungary | G4 |
| 33 | Iceland | G4 |
| 34 | India | G3 |
| 35 | Indonesia | G3 |
| 36 | Iran (I.R.) | G3 |
| 37 | Ireland | G4 |
| 38 | Italy | G4 |
| 39 | Jamaica | G3 |
| 40 | Japan | G3 |
| 41 | Jordan | G4 |
| 42 | Kenya | G4 |
| 43 | Korea (Rep.) | G3 |
| 44 | Latvia | G4 |
| 45 | Lithuania | G4 |
| 46 | Malawi | G4 |
| 47 | Malaysia | G4 |
| 48 | Malta | G4 |
| 49 | Mexico | G4 |
| 50 | Moldova | G4 |
| 51 | Monaco | G4 |
| 52 | Mongolia | G2 |
| 53 | Montenegro | G4 |

| | | |
|----|--------------|----|
| 54 | Morocco | G4 |
| 55 | Netherlands | G4 |
| 56 | New Zealand | G3 |
| 57 | Nigeria | G3 |
| 58 | Norway | G4 |
| 59 | Oman | G4 |
| 60 | Pakistan | G4 |
| 61 | Panama | G4 |
| 62 | Peru | G4 |
| 63 | Poland | G4 |
| 64 | Portugal | G4 |
| 65 | Romania | G4 |
| 66 | Rwanda | G3 |
| 67 | Saudi Arabia | G4 |
| 68 | Senegal | G4 |
| 69 | Serbia | G4 |

| | | |
|----|----------------------|----|
| 70 | Singapore | G4 |
| 71 | Slovakia | G4 |
| 72 | Slovenia | G4 |
| 73 | South Africa | G3 |
| 74 | Spain | G4 |
| 75 | Sweden | G4 |
| 76 | Switzerland | G4 |
| 77 | Tanzania | G4 |
| 78 | Thailand | G3 |
| 79 | Trinidad and Tobago | G4 |
| 80 | Turkey | G3 |
| 81 | Uganda | G4 |
| 82 | United Arab Emirates | G4 |
| 83 | United Kingdom | G4 |
| 84 | United States | G4 |

The G5 Benchmark – in a Nutshell

What is it?

The [G5 Benchmark](#) is a new tool for policy-makers and regulators. It fast-tracks collaborative, cross-sector regulation – the best and quickest means to leverage digital transformation for the benefit of everyone. It uses a brand-new three-lens approach which focuses in on collaborative regulation – and throws up insights that are surprising and high-value. The G5 Benchmark is the new gold standard for collaboration amongst regulators.

What does the G5 Benchmark do?

It is a powerful, straightforward tool that makes sense of shifts in regulatory frameworks as policy-makers/regulators navigate a complex digital landscape – and shines a light on pathways through it. It also delivers on additional aspects of high-value for policy-makers and regulators:

- Sets out new goals for regulatory excellence
- Highlights shortcomings in the pursuit of SDGs, and proposes solutions
- Dives deep into policy trends
- Enriches global policy debate

Why is the G5 Benchmark different?

First, it uses a brand-new three-lens approach which focuses in laser-sharp on collaborative regulation.

Second, three features combined make it especially powerful:

1. *Scope*: 80 countries, all regions, 2018-2019 data.
2. *Ease-of-use*: straightforward methodology, three regulatory tracks and 25 easy-to-measure indicators. Policy-makers can check and update country data, compare with others and run ‘what-if’ projections. Easy interplay with ICT Regulatory Tracker. Easy assessment of cross-sector regulatory frameworks and quick identification of ‘win’ opportunities.
3. *Objectivity*: built on latest data, factual evidence.

What is the three-track approach and why is that important?

The G5 Benchmark is built with simplicity to cut through complexity. It uses three regulatory tracks, or lenses, which together focus in on the DNA of G5 collaborative regulation:

1. *Collaboration* – the very watermark of G5 regulation. Focuses on breadth and depth of cross-sector collaboration between the ICT regulator and peers.
2. *High-level principles*: focuses on use of policy principles (increasingly replacing rules in policy design).
3. *G5 regulatory toolbox*: focuses on use of reimagined, innovative policy instruments that ‘switch on’ the digital economy.

Why is the G5 Benchmark especially important at this time?

1. *Regulation is changing as digital markets mature*. Economies in the course of digital transformation in this decade follow a very different path from previously.
2. *Existing metrics do not tell the whole story*. The Benchmark’s three clear regulatory tracks expose new perspectives and new insights, previously not apparent.
3. *High-level policy design principles are fully taken on-board*. Regulation is multi-layered and complex in our digital age – and rules are increasingly giving way to principles.
4. *Collaboration among sector/multi-sector regulators*. Collaboration, the very watermark of G5 regulation, is essential for relevance, coherence and impact.
5. *A benchmark is worth a thousand words*. Policy-makers need a tool that simply and quickly evaluates and models regulatory set-up and tools – comparing apples with apples.

[Tracker by Country](#)[Country Card](#)[Tracker by Region](#)[Comparison](#)[Map](#)[Generations of Regulation](#)[About the Tracker](#)

Select an option

ICT Regulatory Tracker 2018



| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|---------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Afghanistan | 15 | 20 | 19 | 19.33 | 73.33 |
| Albania | 18 | 16 | 25 | 24 | 83.00 |
| Algeria | 18 | 16 | 16 | 11.5 | 61.50 |
| Andorra | 6 | 8 | 8 | 0 | 22.00 |
| Angola | 14 | 20 | 20 | 10.67 | 64.67 |
| Antigua and Barbuda | 8 | 11.5 | 8 | 13.33 | 40.83 |
| Argentina | 17 | 20 | 21 | 28 | 86.00 |
| Armenia | 19 | 19.5 | 20 | 27 | 85.50 |
| Australia | 19 | 21.5 | 26 | 28 | 94.50 |
| Austria | 18 | 16.5 | 28 | 27 | 89.50 |
| Azerbaijan | 8 | 13.5 | 24 | 25 | 70.50 |
| Bahamas | 19 | 18.5 | 26 | 25.33 | 88.83 |
| Bahrain | 17 | 18 | 26 | 26.33 | 87.33 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|----------------------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Bangladesh | 17 | 20 | 15 | 22.67 | 74.67 |
| Barbados | 17 | 12.5 | 18 | 21 | 68.50 |
| Belarus | 6 | 11.5 | 11 | 16 | 44.50 |
| Belgium | 18 | 19 | 30 | 27 | 94.00 |
| Belize | 17 | 18.5 | 20 | 7.33 | 62.83 |
| Benin | 16 | 16 | 21 | 12 | 65.00 |
| Bhutan | 15 | 20 | 16 | 18.33 | 69.33 |
| Bolivia (Plurinational State of) | 9 | 9 | 8 | 8.5 | 34.50 |
| Bosnia and Herzegovina | 19 | 21 | 27 | 26 | 93.00 |
| Botswana | 18 | 22 | 19 | 26 | 85.00 |
| Brazil | 16 | 18.5 | 26 | 28 | 88.50 |
| Brunei Darussalam | 15 | 17 | 17 | 12.33 | 61.33 |
| Bulgaria | 19 | 16.5 | 28 | 28 | 91.50 |
| Burkina Faso | 19 | 19 | 20 | 26 | 84.00 |
| Burundi | 11 | 18 | 12 | 23 | 64.00 |
| Cabo Verde | 17 | 20 | 23 | 21.33 | 81.33 |
| Cambodia | 13 | 17 | 14 | 21.33 | 65.33 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-------------------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Cameroon | 17 | 18 | 16 | 13 | 64.00 |
| Canada | 19 | 16.5 | 30 | 20 | 85.50 |
| Central African Rep. | 14 | 18 | 9 | 17 | 58.00 |
| Chad | 15 | 16 | 13 | 14.33 | 58.33 |
| Chile | 14 | 20 | 18 | 27 | 79.00 |
| China | 7 | 11 | 16 | 15 | 49.00 |
| Colombia | 15 | 15 | 22 | 27 | 79.00 |
| Comoros | 17 | 19 | 24 | 22.33 | 82.33 |
| Congo (Rep. of the) | 17 | 17 | 22 | 19.67 | 75.67 |
| Costa Rica | 19 | 16 | 26 | 24 | 85.00 |
| Croatia | 19 | 19 | 28 | 28 | 94.00 |
| Cuba | 2 | 12 | 14 | 5 | 33.00 |
| Cyprus | 18 | 16 | 28 | 23.67 | 85.67 |
| Czech Republic | 17 | 17 | 30 | 25 | 89.00 |
| Côte d'Ivoire | 17 | 15.5 | 14 | 15.33 | 61.83 |
| Dem. Rep. of the Congo | 14 | 20 | 20 | 25.33 | 79.33 |
| Denmark | 18 | 18 | 28 | 23.67 | 87.67 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Djibouti | 0 | 2.5 | 2 | 0 | 4.50 |
| Dominica | 11 | 15.5 | 20 | 26 | 72.50 |
| Dominican Rep. | 19 | 19.5 | 28 | 28 | 94.50 |
| Ecuador | 20 | 18.5 | 21 | 26 | 85.50 |
| Egypt | 15 | 20.5 | 21 | 24.33 | 80.83 |
| El Salvador | 19 | 14.5 | 14 | 26 | 73.50 |
| Equatorial Guinea | 13 | 15 | 13 | 9.33 | 50.33 |
| Eritrea | 8 | 11 | 4 | 2 | 25.00 |
| Estonia | 14 | 20 | 26 | 27 | 87.00 |
| Eswatini | 19 | 19 | 14 | 7.33 | 59.33 |
| Ethiopia | 7 | 12 | 8 | 2 | 29.00 |
| Fiji | 13 | 14 | 19 | 17 | 63.00 |
| Finland | 18 | 17 | 30 | 27 | 92.00 |
| France | 18 | 20 | 30 | 26 | 94.00 |
| Gabon | 15 | 17 | 16 | 15 | 63.00 |
| Gambia | 20 | 19 | 16 | 18.67 | 73.67 |
| Georgia | 18 | 16.5 | 30 | 28 | 92.50 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-----------------------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Germany | 16 | 20.5 | 30 | 27 | 93.50 |
| Ghana | 18 | 21 | 22 | 27 | 88.00 |
| Greece | 20 | 17 | 28 | 26.33 | 91.33 |
| Grenada | 14 | 17 | 20 | 23 | 74.00 |
| Guatemala | 12 | 12.5 | 10 | 18.67 | 53.17 |
| Guinea | 16 | 18 | 22 | 12.33 | 68.33 |
| Guinea-Bissau | 10 | 10 | 8 | 18 | 46.00 |
| Guyana | 18 | 18 | 15 | 11 | 62.00 |
| Haiti | 14 | 19.5 | 10 | 15 | 58.50 |
| Honduras | 17 | 19 | 26 | 20 | 82.00 |
| Hong Kong, China | 18 | 18.5 | 20 | 27.33 | 83.83 |
| Hungary | 19 | 22 | 28 | 28 | 97.00 |
| Iceland | 18 | 18 | 22 | 28 | 86.00 |
| India | 18 | 14.5 | 20 | 23 | 75.50 |
| Indonesia | 16 | 13.5 | 18 | 25 | 72.50 |
| Iran (Islamic Republic of) | 19 | 19 | 28 | 16 | 82.00 |
| Iraq | 17 | 21.5 | 16 | 3.33 | 57.83 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Ireland | 20 | 19 | 30 | 28 | 97.00 |
| Israel | 8 | 11.5 | 28 | 24 | 71.50 |
| Italy | 18 | 22 | 30 | 27.33 | 97.33 |
| Jamaica | 19 | 12.5 | 19 | 28 | 78.50 |
| Japan | 8 | 11.5 | 26 | 27 | 72.50 |
| Jordan | 19 | 20 | 24 | 21.5 | 84.50 |
| Kazakhstan | 6 | 10 | 14 | 24 | 54.00 |
| Kenya | 18 | 21.5 | 21 | 27 | 87.50 |
| Kiribati | 13 | 18.5 | 4 | 12 | 47.50 |
| Korea (Rep. of) | 18 | 22 | 20 | 21.67 | 81.67 |
| Kuwait | 20 | 19 | 12 | 12 | 63.00 |
| Kyrgyzstan | 16 | 16.5 | 16 | 26 | 74.50 |
| Lao P.D.R. | 0 | 12 | 17 | 7.67 | 36.67 |
| Latvia | 18 | 16.5 | 30 | 26 | 90.50 |
| Lebanon | 8 | 18 | 5 | 0.67 | 31.67 |
| Lesotho | 16 | 17.5 | 16 | 18.33 | 67.83 |
| Liberia | 17 | 20 | 22 | 12.33 | 71.33 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-------------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Libya | 2 | 2.5 | 0 | 0 | 4.50 |
| Liechtenstein | 14 | 14 | 24 | 26.33 | 78.33 |
| Lithuania | 19 | 21 | 28 | 27 | 95.00 |
| Luxembourg | 18 | 17 | 22 | 26 | 83.00 |
| Madagascar | 17 | 17.5 | 18 | 17 | 69.50 |
| Malawi | 18 | 22 | 20 | 27 | 87.00 |
| Malaysia | 18 | 22 | 24 | 23 | 87.00 |
| Maldives | 13 | 20 | 12 | 8.33 | 53.33 |
| Mali | 18 | 18 | 18 | 26.33 | 80.33 |
| Malta | 19 | 20 | 28 | 28 | 95.00 |
| Marshall Islands | 2 | 6.5 | 4 | 3 | 15.50 |
| Mauritania | 17 | 19 | 18 | 17 | 71.00 |
| Mauritius | 18 | 20.5 | 15 | 27.33 | 80.83 |
| Mexico | 19 | 17 | 26 | 28 | 90.00 |
| Micronesia | 0 | 4 | 4 | 0 | 8.00 |
| Moldova | 19 | 17.5 | 26 | 26 | 88.50 |
| Monaco | 0 | 15 | 8 | 12 | 35.00 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|----------------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Mongolia | 18 | 19 | 18 | 14.67 | 69.67 |
| Montenegro | 19 | 19 | 28 | 28 | 94.00 |
| Morocco | 18 | 19.5 | 24 | 27 | 88.50 |
| Mozambique | 16 | 10.5 | 16 | 15.17 | 57.67 |
| Myanmar | 6 | 17 | 17 | 23.67 | 63.67 |
| Namibia | 19 | 17 | 22 | 12.67 | 70.67 |
| Nauru | 10 | 11.5 | 6 | 23 | 50.50 |
| Nepal (Republic of) | 18 | 17 | 11 | 22 | 68.00 |
| Netherlands | 19 | 18 | 28 | 28 | 93.00 |
| New Zealand | 17 | 13.5 | 22 | 28 | 80.50 |
| Nicaragua | 18 | 18 | 12 | 26 | 74.00 |
| Niger | 15 | 20 | 20 | 19 | 74.00 |
| Nigeria | 17 | 20 | 20 | 21.33 | 78.33 |
| North Macedonia | 18 | 20 | 30 | 19 | 87.00 |
| Norway | 20 | 18.5 | 30 | 27 | 95.50 |
| Oman | 17 | 19 | 28 | 26.33 | 90.33 |
| Pakistan | 20 | 19 | 22 | 27 | 88.00 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|---|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Palestine | 4 | 11.5 | 13 | 13.67 | 42.17 |
| Panama | 19 | 21 | 20 | 26 | 86.00 |
| Papua New Guinea | 16 | 19.5 | 12 | 11 | 58.50 |
| Paraguay | 18 | 15.5 | 12 | 16.33 | 61.83 |
| Peru | 18 | 13 | 28 | 28 | 87.00 |
| Philippines | 16 | 12 | 17 | 22 | 67.00 |
| Poland | 16 | 17.5 | 28 | 27 | 88.50 |
| Portugal | 19 | 18 | 30 | 27 | 94.00 |
| Qatar | 14 | 18 | 21 | 16.67 | 69.67 |
| Romania | 18 | 19 | 28 | 27 | 92.00 |
| Russian Federation | 4 | 11 | 13 | 14 | 42.00 |
| Rwanda | 20 | 20 | 18 | 24.33 | 82.33 |
| Saint Kitts and Nevis | 5 | 15 | 6 | 20 | 46.00 |
| Saint Lucia | 16 | 18 | 24 | 27 | 85.00 |
| Saint Vincent and the Grenadines | 17 | 18 | 18 | 27 | 80.00 |
| Samoa | 14 | 17 | 22 | 13.33 | 66.33 |
| San Marino | 0 | 4 | 2 | 16 | 22.00 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3. Regulatory Regime | C4. Competition Framework | Overall Score |
|-----------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Sao Tome and Principe | 16 | 17 | 21 | 21 | 75.00 |
| Saudi Arabia | 19 | 22 | 29 | 22 | 92.00 |
| Senegal | 19 | 19 | 24 | 18 | 80.00 |
| Serbia | 20 | 19.5 | 26 | 27 | 92.50 |
| Seychelles | 6 | 12 | 16 | 28 | 62.00 |
| Sierra Leone | 16 | 19 | 14 | 7 | 56.00 |
| Singapore | 17 | 21.5 | 26 | 27 | 91.50 |
| Slovakia | 15 | 18.5 | 28 | 26.67 | 88.17 |
| Slovenia | 20 | 18.5 | 28 | 27 | 93.50 |
| Solomon Islands | 9 | 14 | 8 | 3.67 | 34.67 |
| Somalia | 14 | 19 | 10 | 24 | 67.00 |
| South Africa | 17 | 17 | 24 | 13.33 | 71.33 |
| South Sudan | 12 | 17 | 12 | 13.67 | 54.67 |
| Spain | 16 | 14 | 28 | 28 | 86.00 |
| Sri Lanka | 18 | 20 | 15 | 9.33 | 62.33 |
| Sudan | 15 | 20 | 18 | 18.67 | 71.67 |
| Suriname | 15 | 17 | 18 | 9.67 | 59.67 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|----------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| Sweden | 19 | 20 | 24 | 26 | 89.00 |
| Switzerland | 18 | 18.5 | 30 | 27 | 93.50 |
| Syrian Arab Republic | 19 | 15 | 15 | 6.33 | 55.33 |
| Tajikistan | 2 | 6 | 2 | 4 | 14.00 |
| Tanzania | 20 | 21 | 19 | 25 | 85.00 |
| Thailand | 20 | 19.5 | 22 | 19.83 | 81.33 |
| Timor-Leste | 13 | 21 | 3 | 5 | 42.00 |
| Togo | 15 | 22 | 20 | 12 | 69.00 |
| Tonga | 1 | 11 | 15 | 22.67 | 49.67 |
| Trinidad and Tobago | 18 | 19 | 22 | 26.33 | 85.33 |
| Tunisia | 19 | 16 | 25 | 14.67 | 74.67 |
| Turkey | 19 | 19.5 | 30 | 26 | 94.50 |
| Turkmenistan | 0 | 6 | 0 | 1.67 | 7.67 |
| Tuvalu | 0 | 4.5 | 0 | 5 | 9.50 |
| Uganda | 17 | 20 | 22 | 27 | 86.00 |
| Ukraine | 17 | 17.5 | 23 | 24 | 81.50 |
| United Arab Emirates | 19 | 21 | 27 | 16 | 83.00 |

| Cluster | C1: Regulatory Authority | C2: Regulatory Mandate | C3: Regulatory Regime | C4: Competition Framework | Overall Score |
|-------------------|--------------------------|------------------------|-----------------------|---------------------------|---------------|
| Max Score: | 20 | 22 | 30 | 28 | 100 |
| Country | | | | | |
| United Kingdom | 20 | 20 | 28 | 27 | 95.00 |
| United States | 19 | 17.5 | 28 | 24 | 88.50 |
| Uruguay | 17 | 17 | 20 | 13 | 67.00 |
| Uzbekistan | 7 | 6.5 | 2 | 6.33 | 21.83 |
| Vanuatu | 17 | 14.5 | 14 | 25.67 | 71.17 |
| Venezuela | 20 | 21.5 | 16 | 25 | 82.50 |
| Viet Nam | 10 | 19 | 24 | 13 | 66.00 |
| Yemen | 0 | 3 | 4 | 4 | 11.00 |
| Zambia | 19 | 18 | 15 | 19.67 | 71.67 |
| Zimbabwe | 20 | 19 | 18 | 17 | 74.00 |

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(https://www.itu.int/net4/itu-d/irt/tracker_interactif.pdf)

Insights from Tracker 2018 (https://www.itu.int/net4/itu-d/irt/tracker_interactif.pdf)

ITU Regulatory Knowledge Resources (<http://www.itu.int/treg>) | Contact: treg@itu.int (<mailto:treg@itu.int?subject=Query> regarding the ICT Regulatory Tracker)



JRC TECHNICAL REPORTS

JRC Statistical audit of the ICT Regulatory Tracker

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Abstract

The ICT Regulatory Tracker, developed by International Telecommunication Union, is an evidence-based tool that helps decision-makers and regulators monitor the rapid evolution of ICT regulation. It also helps identify the gaps in existing regulatory frameworks, making the case for further regulatory reform.

The statistical assessment of the ICT Regulatory Tracker presented herein delves into two main issues. First, we analyse the statistical coherence of the conceptual framework, and second, the impact of key modelling assumptions on the final country scores and ranks. In addition, we discuss briefly some outstanding trends in the scores of regions and countries over the period 2007-2018.

All in all, the results of the statistical assessment suggest that the Tracker is a conceptually sound, statistically coherent and robust monitoring tool. Notwithstanding, throughout the report we also present and discuss some alternative approaches for calculating the final scores and presenting the results. These suggestions might be taken on board by the developers of the Tracker in future releases of the tool.

1 Introduction

The ICT Regulatory Tracker is an evidence-based tool to help decision-makers and regulators make sense of the rapid evolution of ICT regulation. The Tracker is developed by the International Telecommunication Union (ITU), which is the United Nations specialized agency for information and communication technologies. Using both quantitative and qualitative data, the Tracker makes possible to pinpoint the changes taking place in the ICT regulatory environment, enabling benchmarking and the identification of trends in ICT legal and regulatory frameworks. It likewise helps identify the gaps in existing regulatory frameworks, making the case for further regulatory reform towards achieving a vibrant and inclusive ICT sector.

In May 2018, the developers of the Tracker invited the European Commission's Competence Centre on Composite Indicators and Scoreboards at the Joint Research Centre to undertake a statistical assessment of the tool and to make suggestions for improvement. Since then, the ITU team and the JRC have engaged in an iterative process to discuss potential refinements to the monitoring framework.

The third edition of the Tracker has been launched in 2019. The statistical assessment of the current edition of the ICT Regulatory Tracker presented herein is based on two main issues: the statistical soundness of its conceptual framework, and the impact of key modelling assumptions on the country results. In this report we also include a brief analysis of outstanding trends in regions and countries' scores over the period 2007-2018.

In the following sections, we will present the different stages of the statistical assessment carried out for the ICT Regulatory Tracker. All in all, the results of the analysis suggest that the Tracker is a conceptually sound, statistically coherent and robust monitoring tool. Notwithstanding, some potential alternatives to the current methodological choices have also been discussed in the framework and, as a result, some proposals for improvement have been laid out for the developers to consider in future editions of the Tracker.

2 Conceptual and statistical coherence

2.1 Index framework

The ICT Regulatory Tracker looks at the changes taking place in the ICT regulatory environment using both quantitative and qualitative data. The Tracker does not measure the quality, the level of implementation or the performance of regulatory frameworks in place, but records their existence and features. The Tracker is based on self-reported information collected through two surveys¹, desktop research and direct outreach to national telecom/ICT regulatory authorities.

Overall, the Tracker is composed of 50 indicators grouped into four pillars: 1) the regulatory authority (focusing on the functioning of the separate regulator), 2) regulatory mandates (who regulates what), 2) the regulatory regime (what regulation exists in major areas), and 4) the level of competition in the ICT sector main market segments. The distribution of indicators and maximum scores by pillars is presented in Table 1.

Table 1. ICT Regulatory Tracker pillars

| Pillar | Name | Number of Indicators | Max Score |
|------------------------|-----------------------|----------------------|------------|
| 1 | Regulatory Authority | 10 | 20 |
| 2 | Regulatory Mandates | 11 | 22 |
| 3 | Regulatory Regime | 15 | 30 |
| 4 | Competition Framework | 14 | 28 |
| ICT Regulatory Tracker | | 50 | 100 |

Source: ITU, 2019

The overall score is the sum of the four pillar scores. Hence, every pillar contributes to the score proportionally to the number of indicators it contains. The sum of the maximum pillar scores equals 100, which is the maximum theoretical score any country could achieve. The economies are classified in different generations of regulation (from G1 to G4), which showcase progress within the same country over time and for comparing different countries. Countries with a Tracker score below 40 are considered to belong to the first generation of regulation (G1), a score between 40 and 69 to the second (G2), a score between 70 and 84 to the third (G3) and finally, a score above 85 belong to the fourth (G4).

¹ ITU World Telecommunication Regulatory Survey and ITU Tariff Policies Survey.

2.2 Data availability and missing values

Since the first edition of the Tracker, the developers have defined the thresholds for exclusion/inclusion of countries in view of including the highest number of countries possible. Inclusion is decided on the basis of the available data while providing a reasonable depiction of the situation in a given area (corresponding to the pillars). For the 2018 edition, those thresholds have been increased to cover at least 50 per cent of data for each pillar. The ITU team is confident that such a threshold provides for a robust metric for the regulatory maturity of ICT frameworks.

As explained by the ITU developers, both in the past and in the current edition they have used “reasonable extrapolation” to fill in gaps in some cases. This is the case, for example, when a country skips an annual survey. Therefore, if in year X they reported “Yes” on having a broadband plan, skipped the survey in year X+1, and then reported “Yes” to the same question in year+2, the ITU team extrapolates “Yes” for the middle year (X+1). So in that sense, extrapolated data is treated as real data, not as an estimate. The current 2019 edition is augmented with additional data research, and some of the parameters have been enhanced. Concretely, the data points that were missing in the 2018 Tracker but are now filled in the 2019 edition are hard data based on either desk research or direct outreach. They are not extrapolated but verified by research.

Missing values which cannot be filled using extrapolation have been left intentionally blank in the data set. However, it is worth noting that, when adding up the indicators to calculate the pillar scores, those cells with missing values will be implicitly treated as if a zero value had been imputed. On a related note, the developers agree that it is probably correct to assume that missing values are equal to zero, since for example some survey respondents may prefer leaving blanks rather than stating that their country does not comply with international best practices.

As shown in Table 2, among the included economies, most of the missing values in the data set are concentrated in indicators 43, 45, 46, 47, 48, 49 and 50.

Table 2. Quantity of missing data for every indicator of the ICT Regulatory Tracker

| Pillar 1: Regulatory authority | | | Pillar 2: Regulatory mandate | | | Pillar 3: Regulatory regime | | | Pillar 4: Competition framework | | |
|--------------------------------|------------|-----------|------------------------------|------------|-----------|-----------------------------|------------|-----------|---------------------------------|------------|-----------|
| Ind | Nr missing | % missing | Ind | Nr missing | % missing | Ind | Nr missing | % missing | Ind | Nr missing | % missing |
| 1 | 0 | 0% | 11 | 0 | 0% | 22 | 0 | 0% | 37 | 0 | 0% |
| 2 | 0 | 0% | 12 | 0 | 0% | 23 | 0 | 0% | 38 | 1 | 1% |
| 3 | 0 | 0% | 13 | 0 | 0% | 24 | 0 | 0% | 39 | 0 | 0% |
| 4 | 0 | 0% | 14 | 0 | 0% | 25 | 0 | 0% | 40 | 2 | 1% |
| 5 | 0 | 0% | 15 | 0 | 0% | 26 | 0 | 0% | 41 | 3 | 2% |
| 6 | 0 | 0% | 16 | 1 | 1% | 27 | 1 | 1% | 42 | 0 | 0% |
| 7 | 0 | 0% | 17 | 0 | 0% | 28 | 0 | 0% | 43 | 5 | 3% |
| 8 | 0 | 0% | 18 | 0 | 0% | 29 | 0 | 0% | 44 | 0 | 0% |
| 9 | 0 | 0% | 19 | 1 | 1% | 30 | 0 | 0% | 45 | 7 | 4% |
| 10 | 0 | 0% | 20 | 1 | 1% | 31 | 0 | 0% | 46 | 5 | 3% |
| | | | 21 | 1 | 1% | 32 | 1 | 1% | 47 | 10 | 5% |
| | | | | | | 33 | 0 | 0% | 48 | 17 | 9% |
| | | | | | | 34 | 0 | 0% | 49 | 19 | 10% |
| | | | | | | 35 | 0 | 0% | 50 | 24 | 12% |
| | | | | | | 36 | 0 | 0% | | | |

2.3 Normalisation

The ICT Regulatory Tracker has been conceived both as a scoring tool and an analysis tool. Each indicator provides a score, and scores are added up first at pillar level and then at the overall score level. Therefore, no normalisation has been deemed necessary at indicator or pillar level.

As an alternative to improve the readability of the results, pillar scores could be normalised. For example, a min-max normalisation formula could be applied to the pillar scores. Accordingly, the raw pillar score for any given country \tilde{x}_i , can be scaled onto a normalised pillar score x_i by subtracting from the raw pillar the theoretical minimum score for that pillar (zero) and dividing by the difference between the theoretical maximum and the theoretical minimum value for the pillar:

$$x_{i,c} = \frac{\tilde{x}_{i,c} - \min(\tilde{x}_i)}{\max(\tilde{x}_i) - \min(\tilde{x}_i)} \times 100$$

The result of this operation is that each of the four pillars in the Tracker would now have a minimum of zero, and a maximum of 100. The main advantage of this alternative approach to building pillar scores from the underlying indicators is that it would render those pillar scores directly comparable across pillars. As we will discuss in the following sections, including a normalisation stage would also allow us to introduce more flexibility when it comes to calculating the final index scores. For instance, we could envisage

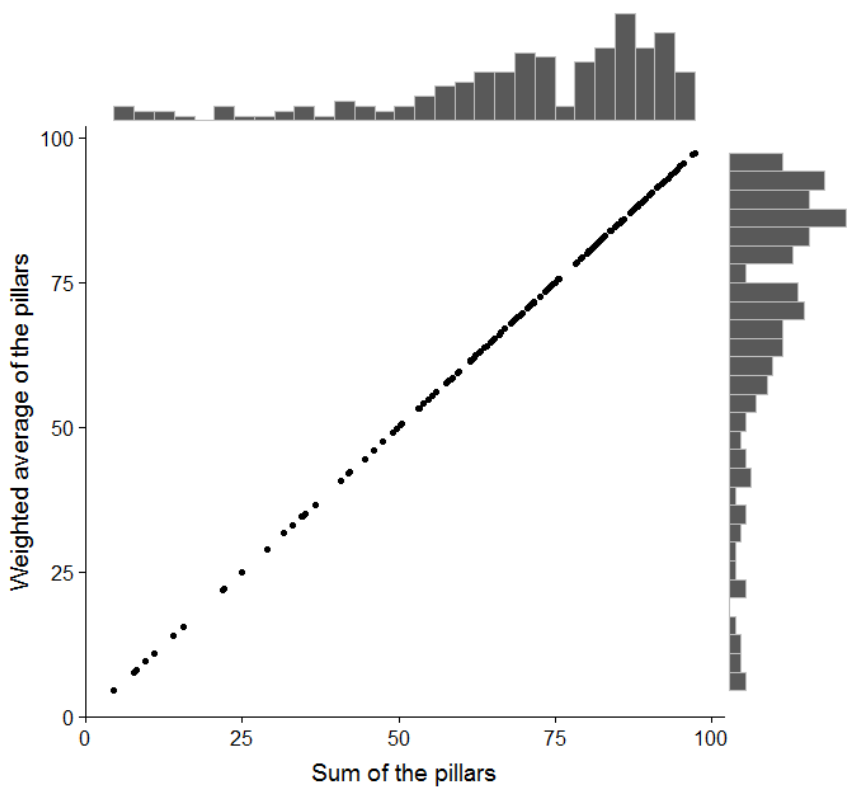
setting alternative weights for the pillars (e.g. equal weights) or even implementing not-fully compensatory aggregation formulas, such as geometric averaging. In particular, we will discuss how the same overall index can be obtained starting from the normalised pillars and assigning weights to each pillar based on their theoretical maximum scores.

2.4 Weighting and aggregation

As discussed in the previous section, we could normalize the pillar scores prior to aggregation, and then calculate the overall score as the weighted average of those normalised pillar scores. The weights to be used for this calculation would be given by the maximum theoretical scores achievable at pillar level. For example, since the maximum score for the first pillar (Regulatory authority) is 20, we would assign a weight of 20 per cent (maximum pillar score divided by maximum overall score in the Tracker) to the first pillar. Accordingly, the weights for the four pillars in the weighted average formula would be set equal to 0.20, 0.22, 0.30 and 0.28, respectively. As shown in Figure 1, the overall scores following this approach are identical to those initially calculated for the developers.²

² Annex IV presents a table with the default pillar scores and the normalised pillar scores for each country.

Figure 1 - Comparison of the values of the default regulatory tracker with the weighted mean of the pillars



2.5 Statistical coherence

In this section we assess to what extent the conceptual framework is confirmed by statistical approaches. We use correlation analysis and Principal Component Analysis to evaluate whether the indicators fit statistically in their respective pillar and to what extent the pillars and the overall index are able to summarise the information contained in the underlying data [7].

As expected, results in Table 3 confirm that the grouping of indicators into pillars is statistically coherent, since individual indicators tend to be more correlated to their own pillar than to any other.³ The four pillars are also strongly correlated to each other and to the overall index, which suggests that the index is well balanced in its four pillars [1]. The latter result is also confirmed by the PCA carried out at the overall index level. PCA reveals the presence of a single latent dimension (i.e. one component with eigenvalue greater than 1.0) which captures 72% of the variance in the four underlying pillars.

³ Annex II presents the full correlation matrix between individual indicators.

Table 3: Correlations between indicators, pillars and overall scores

| | Pillar 1 | Pillar 2 | Pillar 3 | Pillar 4 | Overall |
|-----|----------|----------|----------|----------|---------|
| I1 | 0.50 | 0.46 | 0.33 | 0.27 | 0.42 |
| I2 | 0.60 | 0.43 | 0.40 | 0.28 | 0.47 |
| I3 | 0.58 | 0.33 | 0.31 | 0.21 | 0.37 |
| I4 | 0.56 | 0.39 | 0.27 | 0.23 | 0.37 |
| I5 | 0.42 | 0.20 | 0.30 | 0.25 | 0.32 |
| I6 | 0.57 | 0.50 | 0.39 | 0.31 | 0.48 |
| I7 | 0.55 | 0.42 | 0.35 | 0.31 | 0.45 |
| I8 | 0.42 | 0.37 | 0.40 | 0.34 | 0.41 |
| I9 | 0.40 | 0.33 | 0.34 | 0.30 | 0.37 |
| I10 | 0.50 | 0.15 | 0.37 | 0.38 | 0.42 |
| I11 | 0.46 | 0.57 | 0.36 | 0.28 | 0.44 |
| I12 | 0.42 | 0.54 | 0.31 | 0.19 | 0.38 |
| I13 | 0.48 | 0.47 | 0.39 | 0.29 | 0.45 |
| I14 | 0.34 | 0.53 | 0.23 | 0.14 | 0.31 |
| I15 | 0.42 | 0.57 | 0.25 | 0.20 | 0.35 |
| I16 | 0.32 | 0.50 | 0.27 | 0.17 | 0.33 |
| I17 | 0.36 | 0.48 | 0.38 | 0.33 | 0.44 |
| I18 | 0.30 | 0.46 | 0.28 | 0.28 | 0.36 |
| I19 | 0.16 | 0.49 | 0.12 | 0.08 | 0.18 |
| I20 | 0.20 | 0.52 | 0.11 | 0.11 | 0.19 |
| I21 | 0.23 | 0.36 | 0.19 | 0.12 | 0.21 |
| I22 | 0.32 | 0.24 | 0.49 | 0.30 | 0.43 |
| I23 | 0.20 | 0.07 | 0.43 | 0.30 | 0.36 |
| I24 | 0.31 | 0.21 | 0.54 | 0.36 | 0.46 |
| I25 | 0.33 | 0.24 | 0.49 | 0.31 | 0.43 |
| I26 | 0.28 | 0.33 | 0.29 | 0.21 | 0.28 |
| I27 | 0.40 | 0.30 | 0.41 | 0.32 | 0.39 |
| I28 | 0.27 | 0.19 | 0.42 | 0.22 | 0.35 |
| I29 | 0.27 | 0.17 | 0.46 | 0.27 | 0.37 |
| I30 | 0.33 | 0.26 | 0.60 | 0.36 | 0.51 |
| I31 | 0.31 | 0.15 | 0.56 | 0.40 | 0.50 |
| I32 | 0.40 | 0.33 | 0.46 | 0.33 | 0.44 |
| I33 | 0.36 | 0.18 | 0.63 | 0.48 | 0.58 |
| I34 | 0.43 | 0.27 | 0.63 | 0.44 | 0.58 |
| I35 | 0.22 | 0.17 | 0.40 | 0.34 | 0.36 |
| I36 | 0.32 | 0.20 | 0.40 | 0.31 | 0.36 |
| I37 | 0.33 | 0.24 | 0.49 | 0.65 | 0.58 |
| I38 | 0.19 | 0.18 | 0.24 | 0.38 | 0.30 |
| I39 | 0.31 | 0.15 | 0.43 | 0.61 | 0.51 |
| I40 | 0.34 | 0.19 | 0.43 | 0.62 | 0.52 |
| I41 | 0.27 | 0.19 | 0.43 | 0.60 | 0.50 |
| I42 | 0.17 | 0.08 | 0.28 | 0.49 | 0.34 |
| I43 | 0.43 | 0.25 | 0.47 | 0.44 | 0.47 |

| | | | | | |
|----------|------|------|------|------|------|
| I44 | 0.42 | 0.26 | 0.51 | 0.47 | 0.52 |
| I45 | 0.21 | 0.22 | 0.31 | 0.58 | 0.44 |
| I46 | 0.12 | 0.10 | 0.19 | 0.47 | 0.32 |
| I47 | 0.32 | 0.24 | 0.47 | 0.70 | 0.58 |
| I48 | 0.26 | 0.21 | 0.33 | 0.62 | 0.47 |
| I49 | 0.25 | 0.26 | 0.30 | 0.55 | 0.43 |
| I50 | 0.23 | 0.22 | 0.27 | 0.48 | 0.38 |
| Pillar 1 | 1.00 | 0.78 | 0.68 | 0.57 | 0.85 |
| Pillar 2 | 0.78 | 1.00 | 0.58 | 0.48 | 0.77 |
| Pillar 3 | 0.68 | 0.58 | 1.00 | 0.71 | 0.90 |
| Pillar 4 | 0.57 | 0.48 | 0.71 | 1.00 | 0.86 |
| Overall | 0.85 | 0.77 | 0.90 | 0.86 | 1.00 |

Note: Kendall's Tau is used to measure the correlation between the indicators and the pillars; Pearson's correlation coefficient is used to measure the correlation between the pillars.

3 Impact of modelling assumptions on the ICT Regulatory Tracker

In this section we perform an analysis of the impact of modelling choices on the final results of the ICT Regulatory Tracker results. In particular, we assess to what extent the final ranks would be affected by changes in the weights assigned to each pillar. We also assess the impact of using a partially compensatory formula (geometric aggregation formula) to calculate the overall scores, as an alternative to a fully compensatory formula such as the arithmetic average, being the latter an exact reproduction of the sum of items as introduced in Section 2.4. Note that the use of simple arithmetic averages allows countries with a comparative advantage in some pillars to compensate for comparative disadvantages in others. Conversely, geometric averages tend to reward more balanced profiles, and the formula used to calculate the average makes it more difficult to compensate low scores in one pillar with higher scores in another [4]. Table 4 shows the different sources of uncertainty taken into account for the analysis. The 2,000 simulated scenarios used in the analysis result from the combination of two alternative aggregation formulas and 1,000 sets of randomly generated weights [5]. This type of assessment aims to respond to any criticism that the country scores associated with aggregate measures are generally not calculated under conditions of certainty, even though they are frequently presented as such [6].

Table 4. Sources of uncertainty – Uncertainty analysis

| Assumptions | Reference | Alternative assumptions |
|-----------------------------------|---|--|
| I. Aggregation formula | Arithmetic Mean | Geometric Mean |
| II. Weights of the pillars | Reference values (based on number of indicators per pillar) | Range of variation (+/- 20% from reference values) |
| | Pillar 1: 0.20 | U[0.160,0.240] |
| | Pillar 2: 0.22 | U[0.176,0.264] |
| | Pillar 3: 0.30 | U[0.240,0.360] |
| | Pillar 4: 0.28 | U[0.224,0.336] |

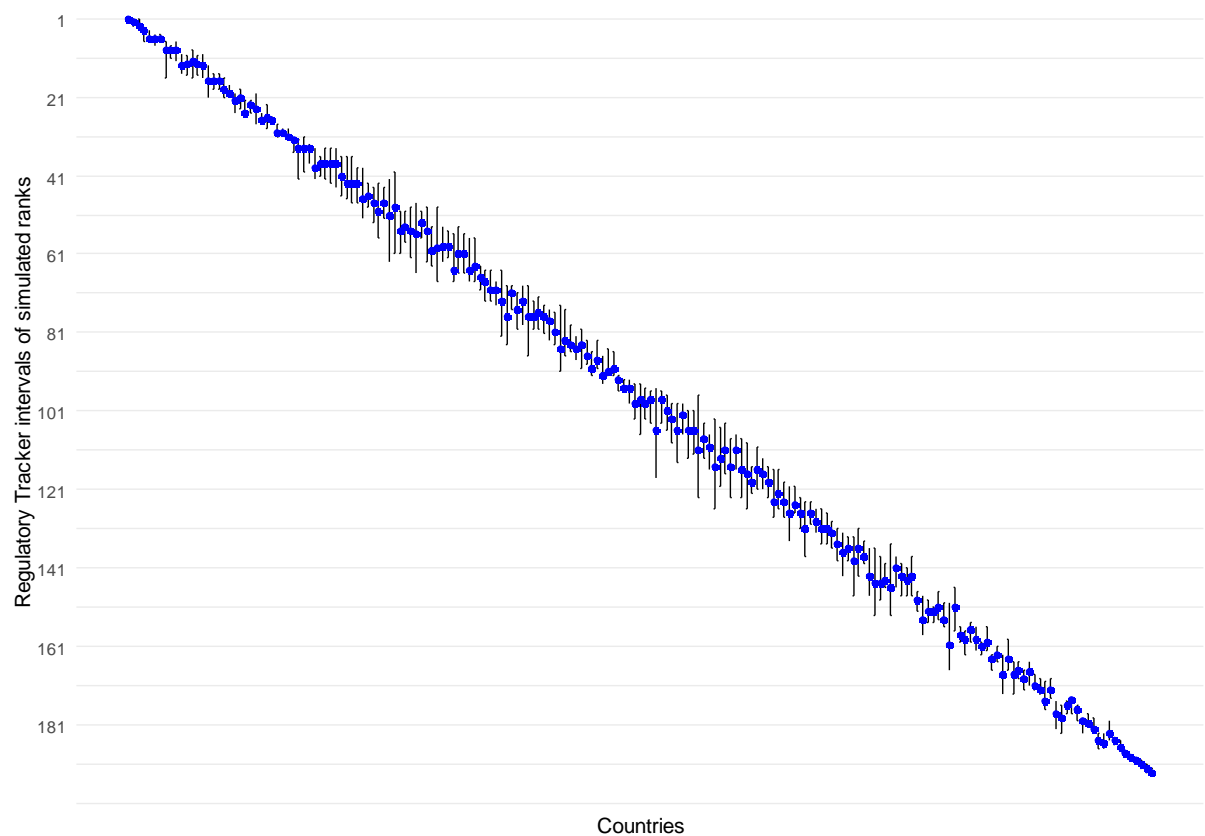
Source: European Commission, Joint Research Centre, 2019

The main results of the uncertainty analysis are shown in Figure 2 with median ranks and 90% confidence intervals computed across the simulated scenarios.⁴ All the ICT Regulatory Tracker ranks lie within the simulated 90% confidence intervals. With very

⁴ The complete table of results for the uncertainty analysis is presented in Annex III.

few exceptions, the width of the confidence intervals is narrow enough. Only 23.8% of the countries present confidence interval widths over 10 (7.2% over 15). Moreover, the original rank is less than 5 positions away from the simulated median for 97.4% of the countries. This analysis confirms the robustness of the Tracker, which is not influenced by the assumptions on importance of the pillars and by the aggregation procedure.

Figure 2. Results of the uncertainty analysis of the ICT Regulatory Tracker (nominal ranks in 2018 vs median rank, 90% confidence intervals)

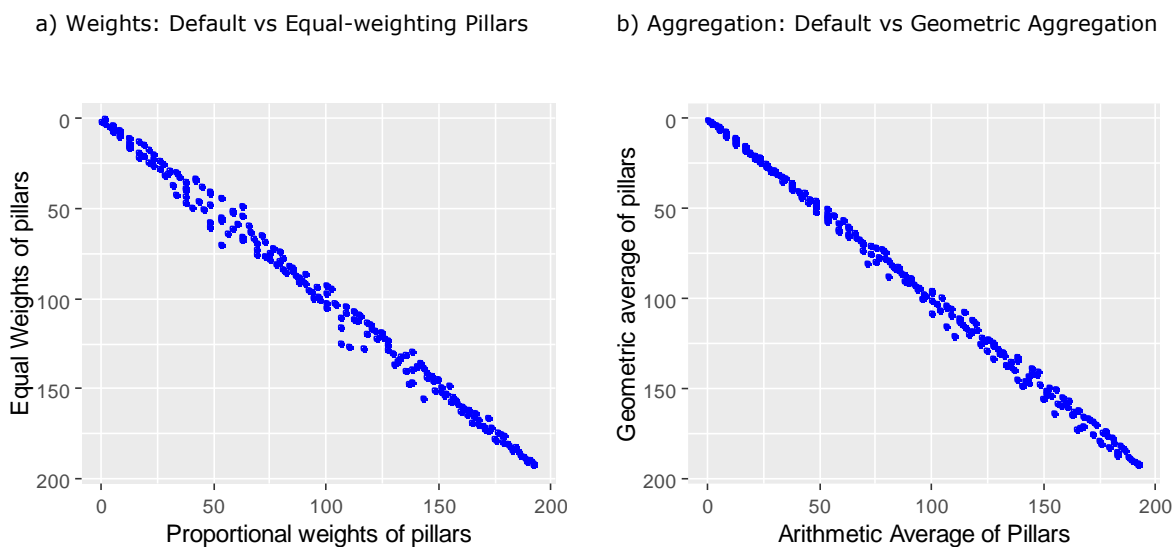


Note: Countries are arranged along the horizontal axis in descending order of nominal rank; the dots represent the simulated median ranks; the vertical bars represent the simulated 90% confidence intervals.
Source: European Commission, Joint Research Centre, 2019

Complementary to the results from the uncertainty analysis, Figure 3 shows the impact of one-at-a-time changes in weights and in aggregation formulas. On the left-hand side of the figure, the default ranks are plotted against the ranks obtained assuming an equal weighting scheme across the four pillars. On the right-hand side, we plot the ranks resulting from the arithmetic aggregation of pillar scores (i.e. the default aggregation option) against the ranks resulting from applying a geometric aggregation formula. We have calculated the values of the Spearman correlation coefficients for each pair of ranks in each plot. The results suggest that the impact on the ranks of either using a geometric aggregation formula or assigning equal weights to all the pillars would be of a similar

magnitude, with only a marginal difference between the Spearman correlation coefficients calculated for both options (0.996 for default versus equal weighting, and 0.998 for default versus geometric average).

Figure 3. Sensitivity analysis on: a) levels of aggregation and b) level and formula of aggregation



Source: European Commission, Joint Research Centre, 2019

4 Major shifts in the ICT Regulatory Tracker scores over the period 2007-2018

A number of countries monitored by the ICT Regulatory Tracker have experienced major shifts in their scores over the period 2007-2018. Those shifts provide rich analytical evidence and require special attention by the developers of the Tracker. In particular, strong and rapid improvements in the scores should be backed in every single case by significant evidence of major changes having taken place in the regulatory environment of those countries. If that was not the case, the evolution in the scores might be attributed to arbitrariness or subjectivity from those responsible for filling out the questionnaires that serve as the basis for the qualitative indicators on which the Tracker is based. In this section, we signal which countries have experienced rapid and significant improvements in their scores, and invite the developers to perform additional checks on those countries as an opportunity to learn lessons that could be shared with other countries and to gain deeper insights in the fundamentals of such an outstanding performance.

The ICT Regulatory Tracker is available from 2007 to 2018. There are 193 countries ranked in 2018 (190 in 2007). For nearly all of those 193 countries there is a score available for each of the 12 time points. The countries are divided into six regions based on the geographical groupings used by ITU. Table 5 gives information on the number of countries belonging to each region (for the last considered year). The Commonwealth of Independent States (CIS) is the region with the lowest number of countries (9 countries⁵) while the European region has the highest number of countries (45 countries).

Table 5. Number of countries belonging to each region.

| Nr | Region | Number of countries (2018) |
|----|--------------|----------------------------|
| 1 | Africa | 44 |
| 2 | America | 35 |
| 3 | Arab States | 22 |
| 4 | Asia-Pacific | 38 |
| 5 | CIS | 9 |
| 6 | Europe | 45 |

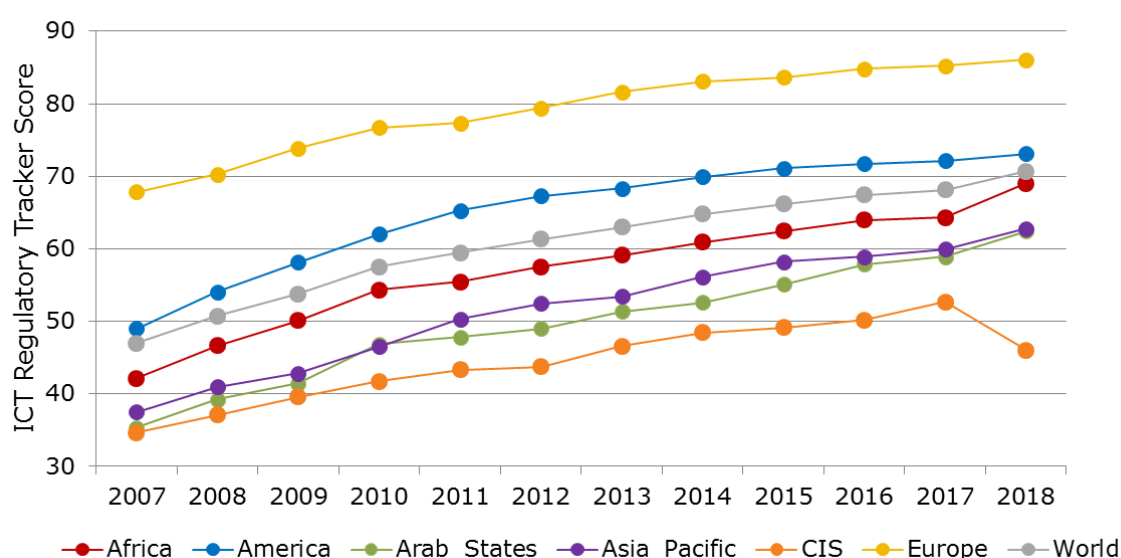
Source: European Commission, Joint Research Centre, 2019

Figure 4 illustrates the progress in average scores by region during the period from 2007 to 2018. The trend is positive for all regions and there is a positive increase in average scores for all years apart from the last year for the CIS region, the decrease being due to

⁵ Three countries (Georgia, Moldova and Ukraine) moved from CIS to Europe region in 2018, according to ITU's internal regional classification.

the change of the number of countries in the region in 2018. The European averages remain the highest for all years, followed by the American region values. These two regions are the only ones with higher average scores than the World average. The CIS region averages are the lowest for all years. The low values of Turkmenistan, Tajikistan and Uzbekistan are dragging down the average scores inside this region. The world average score has increased by 51%, from 47.0 in 2007 to 70.7 in 2018. The sharpest increase (77%) has been experienced by the Arab States region, with the scores shifting from 35.3 to 62.5.

Figure 4. Progress in average scores, by region, 2007-2018



Note: CIS region counts 12 countries until 2017 and 9 countries in 2018.

Source: European Commission, Joint Research Centre, 2019

Table 6 lists the ten countries with the largest increase in scores from 2007 to 2018. All the regions except for CIS are represented in that list. The island Comoros has the biggest increase in score values from (merely) 7.5 in 2007 (G1) to 82.3 in 2018 (G3 almost G4). Somalia has also made considerable effort, rising from 0.0 in 2014 to 67.0 in 2018. The increase in the scores of both countries is largely due to the establishment of national regulatory authorities (in 2010 in Comoros and in 2018 in Somalia) and the broad regulatory reforms they have engaged in since. Four of the ten countries in Table 6 are small-sized countries, with around or less than one million inhabitants⁶. Finally, Figure 5 shows in detail the time line of the five countries that experienced the largest increase in scores.

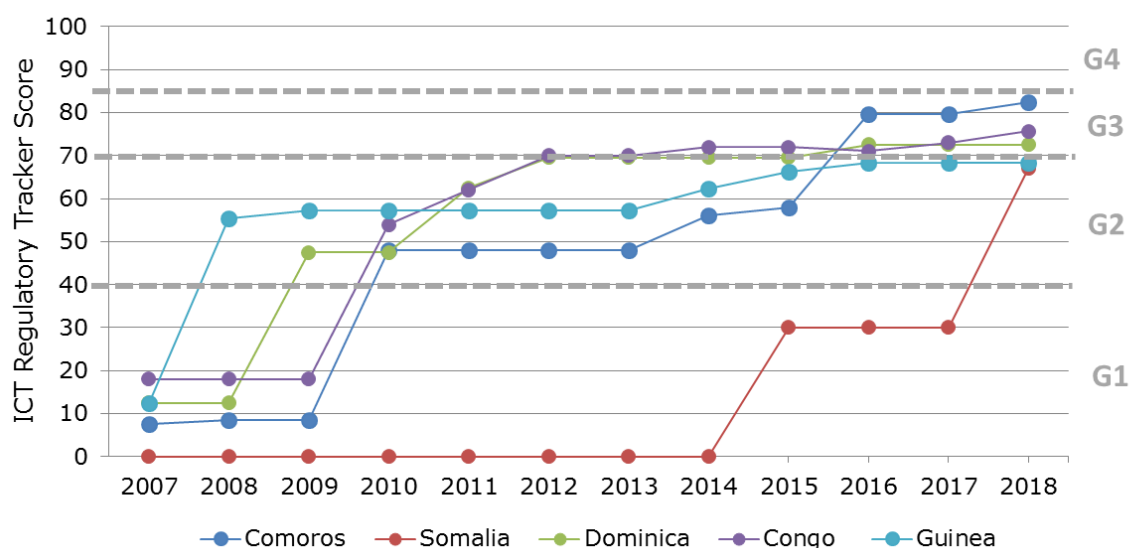
⁶ The countries are Comoros, Dominica, Eswatini and Vanuatu. All are islands apart from Eswatini. The country with the smallest population, Dominica, officially the Commonwealth of Dominica, is an island country in the West Indies and had an estimated population of 71,625 (reference <https://data.worldbank.org/country/dominica> 2018 data).

Table 6. Top 10 countries by increase in scores, 2007-2018

| Order | Country | Region | Score 2007 | Score 2018 | Score increase 2007-2018 |
|-------|---------------------|--------------|------------|------------|--------------------------|
| 1 | Comoros | Arab States | 7.5 | 82.3 | 74.8 |
| 2 | Somalia | Arab States | 0.0 | 67.0 | 67.0 |
| 3 | Dominica | America | 12.5 | 72.5 | 60.0 |
| 4 | Congo (Rep. of the) | Africa | 18.0 | 75.7 | 57.7 |
| 5 | Guinea | Africa | 12.3 | 68.3 | 56.0 |
| 6 | Myanmar | Asia-Pacific | 8.8 | 63.7 | 54.8 |
| 7 | Eswatini | Africa | 5.5 | 59.3 | 53.8 |
| 8 | Vanuatu | Asia-Pacific | 17.3 | 71.2 | 53.8 |
| 9 | Honduras | America | 28.7 | 82.0 | 53.3 |
| 10 | Italy | Europe | 44.7 | 97.3 | 52.7 |

Source: European Commission, Joint Research Centre, 2019

Figure 5. Time line of the top five by increase in scores, 2007-2018



Source: European Commission, Joint Research Centre, 2019

5 Analysis of the distribution of regional ICT Regulatory Tracker scores in 2018

In this section we study the distribution of the regional scores for the latest available year (2018). As Table 7 and Figure 6 show, the scores in the European region are clearly above the other regions. 18 of the 20 countries with the highest scores are in fact coming from this region. Italy, Ireland and Hungary have the highest scores (97 or above). Small-sized countries with largely monopolistic markets like Andorra, San Marino and Monaco⁷ lie at the other end of the spectrum and deviate from the rest of European region, with scores of 35 or below.⁸

Table 7. Summary statistics of regional ICT Regulatory Tracker scores in 2018

| Region | Average Score | Median Score | Std Score | Nr of countries |
|--------------|---------------|--------------|-----------|-----------------|
| Africa | 69.0 | 71.0 | 14.1 | 44 |
| America | 73.1 | 79.0 | 16.4 | 35 |
| Arab States | 62.5 | 70.3 | 27.4 | 22 |
| Asia-Pacific | 62.8 | 66.7 | 21.2 | 38 |
| CIS | 46.1 | 44.5 | 27.7 | 9 |
| Europe | 86.1 | 91.5 | 17.0 | 45 |

Source: European Commission, Joint Research Centre, 2019

The scores within the Africa and the Americas regions are similarly distributed (from 25 to 88 for Africa and from 33 to 95 for America). The scores for the Arab States and the Asia-Pacific countries are also comparable. There are three deviating countries in each of these two regions⁹. The nine CIS countries are divided into three distinct groups with similar scores¹⁰.

For five regions (Africa, Americas, Arab States, Asia-Pacific and Europe) the median scores are (somewhat) greater than the average scores, so the distributions are slightly skewed to the left. The non-parametric¹¹ Kruskal Wallis rank sum test confirms that the

⁷ The three countries are among the least populated in Europe with populations of less than 80 000 inhabitants, <https://data.worldbank.org/country/>.

⁸ Coincidentally, these three small-sized European countries are currently negotiating an Association Agreement with the EU (http://www.europarl.europa.eu/doceo/document/TA-8-2019-0188_EN.html).

⁹ Yemen, Djibouti and Libya in the Arab States and Marshall Islands, Tuvalu and Micronesia in Asia.

¹⁰ High CIS scores for Armenia, Kyrgyzstan and Azerbaijan, middle CIS scores for Kazakhstan, Belarus and Russian Federation and low CIS scores for Uzbekistan, Tajikistan and Turkmenistan.

¹¹ Since the ANOVA assumptions of normality and homogeneity of variances are not met for the six regions, a non-parametric alternative may be used. The Kruskal-Wallis chi-squared test statistic with 5 df is large (66.5) and the p-value is very small (<0.01), so the null hypothesis is there for rejected.

six regions are significantly different. The pairwise comparisons using Wilcoxon rank sum test¹², show that Europe is significantly different from the other five regions [3], [8].

Figure 6. Box-plot of regional ICT Regulatory Tracker scores in 2018



Source: European Commission, Joint Research Centre, 2019

Note: A box-plot is a method for graphically displaying data. It includes a box indicating the central 50 percent of the data, i.e. the top and bottom of the box are the 25th and 75th percentiles. The horizontal band inside the box represents the median, and the size of the box is called the Interquartile Range (IQR). The lines extending vertically from the boxes (whiskers) indicate variability outside the upper and lower quartiles. The dots beyond the vertical lines represent potential outliers in the data.

¹² We correct for multiple testing using the adjustment method of Benjamini & Yekutieli (2001)[2].

6 Conclusions

Simplicity and clarity stand out as two of the main strengths of the ICT Regulatory Tracker monitoring framework. In addition, the present statistical assessment also underscores the fact that the conceptual structure of the index is supported by the results of the analysis. The grouping of indicators into pillars is statistically coherent, and the overall index appears to be a good and balanced summary measure of its four underlying pillars. Moreover, the robustness of the index with respect to changes in the modelling assumptions is supported also by the results of the uncertainty and sensitivity analysis.

Throughout this document, we have pointed out to the developers some elements that merit further reflection. This is the case of the additive scoring approach used to arrive at the final index scores. The additive scoring approach could be easily substituted by an equivalent arithmetic aggregation formula, prior normalisation of the pillar scores. Normalisation would have the benefit of rendering the pillar scores directly comparable and easier to read and analyse. And as explained in the section dedicated to the uncertainty analysis, arithmetic averages are not the only options that could be considered for aggregating pillar scores. Applying a geometric average formula to aggregate the four pillars could be a possible alternative. As a matter of fact, the developers' preference has been to not penalise countries with uneven performance across pillars and reward those with similar high scores in all pillars. This choice of methodology reflects the overall vision where countries build their ICT regulatory reform path around their local and national priorities, and where varying policy instrument configurations lead to the same goals. All in all, the analyses conducted herein by the Joint Research Centre suggest that the ICT Regulatory Tracker framework is a conceptually sound, statistically coherent and robust monitoring tool.

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Annexes

Annex I. List of indicators included in the ICT Regulatory Tracker

| Indicator description | |
|-------------------------------|--|
| Pillar 1 Regulatory authority | 1 Separate telecom/ICT regulator |
| | 2 Autonomy in decision making |
| | 3 Accountability |
| | 4 Percentage of diversified funding |
| | 5 Public consultations mandatory before decisions |
| | 6 Enforcement power |
| | 7 Sanctions or penalties imposed by regulator |
| | 8 Dispute resolution mechanism |
| | 9 Appeals to decisions |
| | 10 Existence of Competition authority |
| 20 | Max score |
| Indicator description | |
| Pillar 2 Regulatory mandate | 11 Traditional mandate: entity in charge of quality of service obligations measures and |
| | 12 Traditional mandate: entity in charge of licensing |
| | 13 Traditional mandate: entity in charge of interconnection rates and price regulation |
| | 14 Spectrum: Entity in charge of radio frequency allocation and assignment |
| | 15 Entity in charge of Spectrum Monitoring and Enforcement |
| | 16 Entity in charge of universal service/access |
| | 17 New mandate: entity in charge of broadcasting (radio and TV transmission) |
| | 18 New mandate: entity in charge of broadcasting content |
| | 19 New mandate: entity in charge of Internet content |
| | 20 New mandate: entity in charge of IT |
| | 21 Consumer issues: entity responsible for comparative tariff information, consumer education and handling consumer complaints |
| 22 | Max score |
| Indicator description | |
| Pillar 3 Regulatory regime | 22 Types of licences provided |
| | 23 License exempt |
| | 24 Operators required to publish Reference Interconnection Offer (RIO) |
| | 25 Interconnection prices made public |
| | 26 Quality of service monitoring required |
| | 27 Infrastructure sharing for mobile operators permitted |
| | 28 Infrastructure sharing mandated |
| | 29 Co-location/site sharing mandated |
| | 30 Unbundled access to the local loop required |
| | 31 Secondary trading allowed |
| | 32 Band migration allowed |
| | 33 Number portability available to consumers and required from fixed-line operators |
| | 34 Number portability available to consumers and required from mobile operators |
| | 35 Individual users allowed to use VoIP |
| | 36 National plan that involves broadband |
| 30 | Max score |

| Indicator description | |
|--------------------------------|--|
| Pillar 4 Competition framework | 37 Level of competition in local and long distance (domestic and international) fixed line |
| | 38 Level of competition in IMT (3G, 4G, etc.) services |
| | 39 Level of competition in cable modem, DSL, fixed wireless broadband |
| | 40 Level of competition in leased lines |
| | 41 Level of competition in International Gateways |
| | 42 Status of the main fixed line operator |
| | 43 Legal concept of dominance or SMP |
| | 44 Criteria used in determining dominance or SMP |
| | 45 Foreign participation/ownership in facilities-based operators |
| | 46 Foreign participation/ownership in spectrum-based operators |
| | 47 Foreign participation/ownership in local service operators/long-distance service |
| | 48 Foreign participation/ownership in international service operators |
| 28 | 49 Foreign participation/ownership in Internet Service Providers (ISPs) |
| | 50 Foreign participation/ownership in value-added service providers |
| Max score | |

Annex II. Correlations between indicators

| | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 | I13 | I14 | I15 | I16 | I17 | I18 | I19 | I20 | I21 | I22 | I23 | I24 | I25 | I26 | I27 | I28 | I29 | I30 | I31 | I32 | I33 | I34 | I35 | I36 | I37 | I38 | I39 | I40 | I41 | I42 | I43 | I44 | I45 | I46 | I47 | I48 | I49 | I50 |
|-----|------|------|------|------|------|------|------|------|------|-------|------|------|------|------|------|------|------|------|------|------|-------|------|-------|------|------|------|------|------|------|------|------|------|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| I1 | 1.00 | 0.68 | 0.52 | 0.60 | 0.28 | 0.82 | 0.73 | 0.46 | 0.43 | 0.17 | 0.68 | 0.67 | 0.68 | 0.68 | 0.67 | 0.64 | 0.44 | 0.23 | 0.08 | 0.24 | 0.35 | 0.21 | 0.07 | 0.33 | 0.39 | 0.34 | 0.43 | 0.32 | 0.25 | 0.24 | 0.23 | 0.34 | 0.22 | 0.24 | 0.12 | 0.26 | 0.24 | 0.26 | 0.20 | 0.30 | 0.21 | 0.14 | 0.37 | 0.34 | 0.26 | 0.16 | 0.33 | 0.29 | 0.30 | 0.30 |
| I2 | 0.68 | 1.00 | 0.48 | 0.55 | 0.25 | 0.73 | 0.61 | 0.35 | 0.33 | 0.21 | 0.55 | 0.52 | 0.58 | 0.53 | 0.53 | 0.45 | 0.39 | 0.22 | 0.13 | 0.30 | 0.28 | 0.32 | 0.11 | 0.31 | 0.38 | 0.28 | 0.45 | 0.33 | 0.30 | 0.34 | 0.28 | 0.28 | 0.32 | 0.33 | 0.24 | 0.25 | 0.22 | 0.16 | 0.20 | 0.24 | 0.25 | 0.14 | 0.39 | 0.32 | 0.27 | 0.18 | 0.29 | 0.32 | 0.31 | 0.26 |
| I3 | 0.52 | 0.48 | 1.00 | 0.45 | 0.13 | 0.52 | 0.53 | 0.33 | 0.34 | 0.19 | 0.41 | 0.40 | 0.39 | 0.41 | 0.46 | 0.34 | 0.27 | 0.20 | 0.12 | 0.20 | 0.28 | 0.23 | 0.21 | 0.22 | 0.27 | 0.24 | 0.33 | 0.29 | 0.32 | 0.27 | 0.20 | 0.28 | 0.19 | 0.23 | 0.08 | 0.21 | 0.13 | 0.20 | 0.10 | 0.21 | 0.18 | 0.10 | 0.37 | 0.36 | 0.10 | 0.02 | 0.17 | 0.20 | 0.21 | 0.19 |
| I4 | 0.60 | 0.55 | 0.45 | 1.00 | 0.18 | 0.55 | 0.53 | 0.33 | 0.27 | 0.23 | 0.52 | 0.44 | 0.48 | 0.46 | 0.46 | 0.43 | 0.37 | 0.22 | 0.12 | 0.25 | 0.28 | 0.16 | 0.05 | 0.26 | 0.29 | 0.27 | 0.37 | 0.25 | 0.25 | 0.21 | 0.10 | 0.36 | 0.17 | 0.23 | 0.14 | 0.23 | 0.17 | 0.18 | 0.19 | 0.19 | 0.15 | 0.04 | 0.35 | 0.32 | 0.15 | 0.11 | 0.20 | 0.21 | 0.22 | 0.26 |
| I5 | 0.28 | 0.25 | 0.13 | 0.18 | 1.00 | 0.22 | 0.17 | 0.41 | 0.29 | 0.24 | 0.29 | 0.14 | 0.27 | 0.09 | 0.19 | 0.16 | 0.23 | 0.20 | 0.12 | 0.03 | 0.18 | 0.31 | 0.16 | 0.21 | 0.24 | 0.25 | 0.23 | 0.08 | 0.10 | 0.20 | 0.23 | 0.33 | 0.21 | 0.29 | 0.18 | 0.31 | 0.28 | 0.20 | 0.28 | 0.26 | 0.21 | 0.09 | 0.25 | 0.24 | 0.16 | 0.08 | 0.28 | 0.18 | 0.19 | 0.16 |
| I6 | 0.82 | 0.73 | 0.52 | 0.55 | 0.22 | 1.00 | 0.82 | 0.54 | 0.56 | 0.22 | 0.62 | 0.67 | 0.68 | 0.62 | 0.66 | 0.56 | 0.45 | 0.29 | 0.13 | 0.30 | 0.36 | 0.30 | 0.16 | 0.38 | 0.45 | 0.37 | 0.49 | 0.33 | 0.25 | 0.27 | 0.26 | 0.39 | 0.30 | 0.28 | 0.20 | 0.32 | 0.28 | 0.29 | 0.21 | 0.36 | 0.28 | 0.18 | 0.43 | 0.38 | 0.32 | 0.24 | 0.35 | 0.34 | 0.36 | 0.29 |
| I7 | 0.73 | 0.61 | 0.53 | 0.53 | 0.17 | 0.82 | 1.00 | 0.46 | 0.52 | 0.14 | 0.52 | 0.60 | 0.57 | 0.58 | 0.60 | 0.57 | 0.38 | 0.27 | 0.05 | 0.24 | 0.35 | 0.26 | 0.15 | 0.33 | 0.37 | 0.34 | 0.44 | 0.34 | 0.28 | 0.24 | 0.15 | 0.38 | 0.26 | 0.26 | 0.22 | 0.28 | 0.23 | 0.28 | 0.17 | 0.35 | 0.24 | 0.16 | 0.37 | 0.35 | 0.33 | 0.17 | 0.35 | 0.33 | 0.33 | 0.30 |
| I8 | 0.46 | 0.35 | 0.33 | 0.33 | 0.41 | 0.54 | 0.46 | 1.00 | 0.74 | 0.37 | 0.46 | 0.39 | 0.44 | 0.32 | 0.43 | 0.33 | 0.34 | 0.31 | 0.22 | 0.30 | 0.31 | 0.35 | 0.22 | 0.40 | 0.36 | 0.52 | 0.43 | 0.29 | 0.26 | 0.26 | 0.23 | 0.52 | 0.24 | 0.31 | 0.32 | 0.48 | 0.35 | 0.30 | 0.25 | 0.43 | 0.35 | 0.17 | 0.38 | 0.38 | 0.29 | 0.12 | 0.40 | 0.24 | 0.23 | 0.24 |
| I9 | 0.43 | 0.33 | 0.34 | 0.27 | 0.29 | 0.56 | 0.52 | 0.74 | 1.00 | 0.32 | 0.41 | 0.36 | 0.46 | 0.34 | 0.45 | 0.34 | 0.31 | 0.25 | 0.19 | 0.30 | 0.33 | 0.30 | 0.21 | 0.38 | 0.38 | 0.48 | 0.44 | 0.28 | 0.20 | 0.18 | 0.14 | 0.46 | 0.21 | 0.27 | 0.34 | 0.49 | 0.32 | 0.35 | 0.20 | 0.43 | 0.37 | 0.16 | 0.36 | 0.31 | 0.24 | 0.07 | 0.33 | 0.26 | 0.25 | 0.17 |
| I10 | 0.17 | 0.21 | 0.19 | 0.23 | 0.24 | 0.22 | 0.14 | 0.37 | 0.32 | 1.00 | 0.19 | 0.10 | 0.23 | 0.00 | 0.05 | 0.04 | 0.20 | 0.31 | 0.15 | 0.11 | -0.04 | 0.17 | 0.27 | 0.24 | 0.23 | 0.16 | 0.31 | 0.16 | 0.20 | 0.30 | 0.35 | 0.29 | 0.36 | 0.43 | 0.24 | 0.31 | 0.36 | 0.09 | 0.37 | 0.36 | 0.25 | 0.20 | 0.46 | 0.42 | 0.19 | 0.12 | 0.31 | 0.21 | 0.20 | 0.17 |
| I11 | 0.68 | 0.55 | 0.41 | 0.52 | 0.29 | 0.62 | 0.52 | 0.46 | 0.41 | 0.19 | 1.00 | 0.59 | 0.66 | 0.58 | 0.68 | 0.61 | 0.46 | 0.30 | 0.21 | 0.32 | 0.39 | 0.26 | 0.10 | 0.27 | 0.35 | 0.50 | 0.42 | 0.32 | 0.24 | 0.26 | 0.20 | 0.45 | 0.18 | 0.28 | 0.26 | 0.29 | 0.29 | 0.20 | 0.20 | 0.25 | 0.22 | 0.11 | 0.37 | 0.35 | 0.24 | 0.12 | 0.29 | 0.30 | 0.30 | 0.30 |
| I12 | 0.67 | 0.52 | 0.40 | 0.44 | 0.14 | 0.67 | 0.60 | 0.39 | 0.36 | 0.10 | 0.59 | 1.00 | 0.57 | 0.77 | 0.74 | 0.69 | 0.48 | 0.22 | 0.15 | 0.22 | 0.30 | 0.23 | 0.11 | 0.27 | 0.26 | 0.27 | 0.39 | 0.30 | 0.22 | 0.30 | 0.19 | 0.32 | 0.22 | 0.23 | 0.21 | 0.12 | 0.22 | 0.19 | 0.16 | 0.21 | 0.16 | 0.03 | 0.25 | 0.27 | 0.28 | 0.17 | 0.26 | 0.29 | 0.29 | 0.21 |
| I13 | 0.68 | 0.58 | 0.39 | 0.48 | 0.27 | 0.68 | 0.57 | 0.44 | 0.46 | 0.23 | 0.66 | 0.57 | 1.00 | 0.50 | 0.57 | 0.50 | 0.40 | 0.28 | 0.11 | 0.27 | 0.35 | 0.23 | 0.13 | 0.42 | 0.41 | 0.42 | 0.37 | 0.35 | 0.35 | 0.22 | 0.17 | 0.41 | 0.26 | 0.30 | 0.22 | 0.23 | 0.31 | 0.29 | 0.21 | 0.27 | 0.23 | 0.15 | 0.34 | 0.33 | 0.26 | 0.18 | 0.33 | 0.30 | 0.30 | 0.26 |
| I14 | 0.68 | 0.53 | 0.41 | 0.46 | 0.09 | 0.62 | 0.58 | 0.32 | 0.34 | 0.00 | 0.58 | 0.77 | 0.50 | 1.00 | 0.81 | 0.68 | 0.47 | 0.19 | 0.15 | 0.24 | 0.29 | 0.14 | 0.07 | 0.17 | 0.24 | 0.29 | 0.37 | 0.28 | 0.23 | 0.24 | 0.11 | 0.27 | 0.14 | 0.11 | 0.16 | 0.09 | 0.13 | 0.19 | 0.06 | 0.15 | 0.11 | 0.10 | 0.26 | 0.23 | 0.22 | 0.09 | 0.16 | 0.23 | 0.26 | 0.25 |
| I15 | 0.67 | 0.53 | 0.46 | 0.46 | 0.19 | 0.66 | 0.60 | 0.43 | 0.45 | 0.05 | 0.68 | 0.74 | 0.57 | 0.81 | 1.00 | 0.63 | 0.50 | 0.23 | 0.19 | 0.28 | 0.34 | 0.22 | 0.07 | 0.25 | 0.26 | 0.36 | 0.37 | 0.24 | 0.14 | 0.22 | 0.10 | 0.35 | 0.16 | 0.17 | 0.19 | 0.19 | 0.20 | 0.26 | 0.09 | 0.20 | 0.16 | 0.13 | 0.27 | 0.24 | 0.26 | 0.15 | 0.23 | 0.27 | 0.27 | 0.29 |
| I16 | 0.64 | 0.45 | 0.34 | 0.43 | 0.16 | 0.56 | 0.57 | 0.33 | 0.34 | 0.04 | 0.61 | 0.69 | 0.50 | 0.68 | 0.63 | 1.00 | 0.39 | 0.22 | 0.09 | 0.26 | 0.36 | 0.21 | 0.01 | 0.23 | 0.30 | 0.27 | 0.37 | 0.33 | 0.23 | 0.25 | 0.08 | 0.29 | 0.20 | 0.23 | 0.12 | 0.15 | 0.17 | 0.17 | 0.13 | 0.19 | 0.20 | 0.04 | 0.31 | 0.25 | 0.26 | 0.12 | 0.20 | 0.21 | 0.25 | 0.23 |
| I17 | 0.44 | 0.39 | 0.27 | 0.37 | 0.23 | 0.45 | 0.38 | 0.34 | 0.31 | 0.20 | 0.46 | 0.48 | 0.40 | 0.47 | 0.50 | 0.39 | 1.00 | 0.45 | 0.08 | 0.16 | 0.13 | 0.31 | 0.20 | 0.27 | 0.20 | 0.31 | 0.28 | 0.15 | 0.16 | 0.32 | 0.37 | 0.35 | 0.30 | 0.33 | 0.32 | 0.21 | 0.32 | 0.19 | 0.31 | 0.27 | 0.34 | 0.17 | 0.22 | 0.30 | 0.22 | 0.14 | 0.34 | 0.28 | 0.31 | 0.29 |
| I18 | 0.23 | 0.22 | 0.20 | 0.22 | 0.20 | 0.29 | 0.27 | 0.31 | 0.25 | 0.31 | 0.30 | 0.22 | 0.28 | 0.19 | 0.23 | 0.22 | 0.45 | 1.00 | 0.23 | 0.18 | 0.07 | 0.26 | 0.01 | 0.22 | 0.18 | 0.28 | 0.23 | 0.12 | 0.11 | 0.26 | 0.23 | 0.30 | 0.24 | 0.29 | 0.24 | 0.29 | 0.28 | 0.19 | 0.27 | 0.22 | 0.27 | 0.12 | 0.18 | 0.24 | 0.17 | 0.12 | 0.30 | 0.18 | 0.24 | 0.18 |
| I19 | 0.08 | 0.13 | 0.12 | 0.12 | 0.12 | 0.13 | 0.05 | 0.22 | 0.19 | 0.15 | 0.21 | 0.15 | 0.11 | 0.15 | 0.19 | 0.09 | 0.08 | 0.23 | 1.00 | 0.36 | 0.13 | 0.16 | 0.07 | 0.09 | 0.09 | 0.21 | 0.14 | 0.06 | 0.06 | 0.17 | 0.00 | 0.13 | 0.05 | 0.20 | 0.00 | 0.20 | 0.11 | 0.07 | 0.06 | 0.04 | 0.07 | 0.02 | 0.17 | 0.14 | 0.06 | -0.04 | 0.08 | 0.04 | 0.07 | 0.06 |
| I20 | 0.24 | 0.30 | 0.20 | 0.25 | 0.03 | 0.30 | 0.24 | 0.30 | 0.30 | 0.11 | 0.32 | 0.22 | 0.27 | 0.24 | 0.28 | 0.26 | 0.16 | 0.18 | 0.36 | 1.00 | 0.29 | 0.10 | 0.02 | 0.16 | 0.21 | 0.35 | 0.19 | 0.09 | 0.11 | 0.06 | 0.04 | 0.19 | -0.02 | 0.08 | 0.13 | 0.12 | 0.14 | 0.10 | 0.03 | 0.18 | 0.07 | 0.02 | 0.21 | 0.16 | 0.15 | 0.04 | 0.12 | 0.14 | 0.17 | 0.15 |
| I21 | 0.35 | 0.28 | 0.28 | 0.28 | 0.18 | 0.36 | 0.35 | 0.31 | 0.33 | -0.04 | 0.39 | 0.30 | 0.35 | 0.29 | 0.34 | 0.36 | 0.13 | 0.07 | 0.13 | 0.29 | 1.00 | 0.22 | -0.01 | 0.18 | 0.22 | 0.33 | 0.26 | 0.26 | 0.28 | 0.12 | 0.02 | 0.28 | 0.07 | 0.15 | 0.05 | 0.19 | 0.09 | 0.18 | 0.05 | 0.13 | 0.09 | 0.06 | 0.26 | 0.21 | 0.20 | 0.10 | 0.16 | 0.19 | 0.16 | 0.16 |
| I22 | 0.21 | 0.32 | 0.23 | 0.16 | 0.31 | 0.30 | 0.26 | 0.35 | 0.30 | 0.17 | 0.26 | 0.23 | 0.23 | 0.14 | 0.22 | 0.21 | 0.31 | 0.26 | 0.16 | 0.10 | 0.22 | 1.00 | 0.29 | 0.38 | 0.30 | 0.23 | 0.36 | 0.21 | 0.19 | 0.34 | 0.35 | 0.31 | 0.35 | 0.38 | 0.26 | 0.28 | 0.34 | 0.19 | 0.25 | 0.23 | 0.33 | 0.15 | 0.32 | 0.29 | 0.28 | 0.22 | 0.32 | 0.26 | 0.21 | 0.14 |
| I23 | 0.07 | 0.11 | 0.21 | 0.05 | 0.16 | 0.16 | 0.15 | 0.22 | 0.21 | 0.27 | 0.10 | 0.11 | 0.13 | 0.07 | 0.07 | 0.01 | 0.20 | 0.01 | 0.07 | 0.02 | -0.01 | 0.29 | 1.00 | 0.16 | 0.19 | 0.16 | 0.16 | 0.21 | 0.25 | 0.30 | 0.33 | 0.18 | 0.32 | 0.29 | 0.20 | 0.19 | 0.35 | 0.16 | 0.27 | 0.27 | 0.28 | 0.16 | 0.26 | 0.36 | 0.19 | 0.14 | 0.32 | 0.23 | 0.19 | 0.12 |
| I24 | 0.33 | 0.31 | 0.22 | 0.26 | 0.21 | 0.38 | 0.33 | 0.40 | 0.38 | 0.24 | 0.27 | 0.27 | 0.42 | 0.17 | 0.25 | 0.23 | 0.27 | 0.22 | 0.09 | 0.16 | 0.18 | 0.38 | 0.16 | 1.00 | 0.53 | 0.29 | 0.35 | 0.28 | 0.31 | 0.42 | 0.34 | 0.39 | 0.40 | 0.43 | 0.24 | 0.32 | 0.33 | 0.26 | 0.32 | 0.35 | 0.34 | 0.20 | 0.51 | 0.42 | 0.27 | 0.16 | 0.42 | 0.26 | 0.23 | 0.18 |
| I25 | 0.39 | 0.38 | 0.27 | 0.29 | 0.24 | 0.45 | 0.37 | 0.36 | 0.38 | 0.23 | 0.35 | 0.26 | 0.41 | 0.24 | 0.26 | 0.30 | 0.20 | 0.18 | 0.09 | 0.21 | 0.22 | 0.30 | 0.19 | 0.53 | 1.00 | 0.22 | 0.38 | 0.32 | 0.35 | 0.36 | 0.28 | 0.30 | 0.37 | 0.33 | 0.11 | 0.25 | 0.29 | 0.29 | 0.23 | 0.30 | 0.29 | 0.20 | 0.49 | 0.39 | 0.24 | 0.15 | 0.32 | 0.23 | 0.28 | 0.28 |
| I26 | 0.34 | 0.28 | 0.24 | 0.27 | 0.25 | 0.37 | 0.34 | 0.52 | 0.48 | 0.16 | 0.50 | 0.27 | 0.42 | 0.29 | 0.36 | 0.27 | 0.31 | 0.28 | 0.21 | 0.35 | 0.33 | 0.23 | 0.16 | 0.29 | 0.22 | 1.00 | 0.25 | 0.22 | 0.22 | 0.15 | 0.06 | 0.48 | 0.12 | 0.20 | 0.25 | 0.35 | 0.22 | 0.18 | 0.14 | 0.24 | 0.19 | 0.16 | 0.33 | 0.32 | 0.21 | | | | | |

Annex III. Nominal ranks with 90% confidence intervals

Table 1 out of 2. Countries with nominal ranks from 1 to 96

| Countries | Rank | Interval | Countries | Rank | Interval | Countries | Rank | Interval |
|------------------------|------|-------------|---------------------|------|------------|-------------------------------|------|------------|
| Italy | 1 | [1,2] | Czech Republic | 33.5 | [31.95,42] | Tanzania | 63.5 | [57,68] |
| Hungary | 2.5 | [1,3] | Sweden | 33.5 | [31,40] | Jordan | 66 | [57,68] |
| Ireland | 2.5 | [1,3] | Bahamas | 35 | [33,38] | Burkina Faso | 67 | [64,70] |
| Norway | 4 | [4,7] | Brazil | 38 | [34,42] | Hong Kong, China | 68 | [65,73] |
| Lithuania | 6 | [4,7] | Moldova | 38 | [36,41] | Albania | 70 | [65,73] |
| Malta | 6 | [5,8] | Morocco | 38 | [34,42] | Luxembourg | 70 | [68,74] |
| United Kingdom | 6 | [5,7] | Poland | 38 | [34,43] | United Arab Emirates | 70 | [65,82] |
| Australia | 9 | [7,16] | United States | 38 | [34,44] | Venezuela | 72 | [69,84] |
| Dominican Rep. | 9 | [8,11] | Slovakia | 41 | [36,46] | Comoros | 73.5 | [69,75] |
| Turkey | 9 | [7,12] | Ghana | 42.5 | [36,47] | Rwanda | 73.5 | [71,80] |
| Belgium | 13 | [10,15] | Pakistan | 42.5 | [36,48] | Honduras | 75.5 | [69,79] |
| Croatia | 13 | [10.5,15.5] | Denmark | 44 | [39,48] | Iran | 75.5 | [69,87] |
| France | 13 | [9,16] | Kenya | 45 | [39,52] | Korea (Rep. of) | 77 | [73,80] |
| Montenegro | 13 | [10.5,15.5] | Bahrain | 46 | [43,49] | Ukraine | 78 | [72,80] |
| Portugal | 13 | [10,16] | Estonia | 49 | [44,53] | Cabo Verde | 79.5 | [74,81.05] |
| Germany | 17 | [13,21] | Malawi | 49 | [43,57] | Thailand | 79.5 | [75,83] |
| Slovenia | 17 | [15,19] | Malaysia | 49 | [44,52] | Egypt | 81.5 | [76,84] |
| Switzerland | 17 | [15,19] | Peru | 49 | [42,63] | Mauritius | 81.5 | [74,91] |
| Bosnia and Herzegovina | 19.5 | [16,21] | FYR Macedonia | 49 | [40,61] | New Zealand | 83 | [75,87] |
| Netherlands | 19.5 | [18,21] | Argentina | 54 | [50,61] | Mali | 84 | [79,86] |
| Georgia | 21.5 | [20,25] | Iceland | 54 | [50,58] | S. Vincent and the Grenadines | 85.5 | [82,88] |
| Serbia | 21.5 | [19,24] | Panama | 54 | [49,62] | Senegal | 85.5 | [80,90] |
| Finland | 24 | [22,26] | Spain | 54 | [48,66] | Dem. Rep. of the Congo | 87 | [83,89] |
| Romania | 24 | [22,25] | Uganda | 54 | [50,57] | Chile | 88.5 | [86,92] |
| Saudi Arabia | 24 | [20,28] | Cyprus | 57 | [49,63] | Colombia | 88.5 | [83,90] |
| Bulgaria | 26.5 | [25,28] | Armenia | 59 | [54,64] | Jamaica | 90 | [87,94] |
| Singapore | 26.5 | [23,29] | Canada | 59 | [49,68] | Liechtenstein | 91.5 | [85,92] |
| Greece | 28 | [26,28] | Ecuador | 59 | [54,63] | Nigeria | 91.5 | [86,92] |
| Latvia | 29 | [28,31] | Trinidad and Tobago | 61 | [55,62] | Congo (Rep. of the) | 93 | [92,96] |
| Oman | 30 | [29,31] | Botswana | 63.5 | [56,68] | India | 94 | [93,96] |
| Mexico | 31 | [29,32] | Costa Rica | 63.5 | [54,66] | Sao Tome and Principe | 95 | [93,99] |
| Austria | 32 | [32,35] | Saint Lucia | 63.5 | [56,66] | Bangladesh | 96 | [94,103] |

Source: European Commission, Joint Research Centre, 2019

Table 2 out of 2. Countries with nominal ranks from 97 to 193

| Countries | Rank | Interval | Countries | Rank | Interval | Countries | Rank | Interval |
|--------------|-------|-------------|----------------------|-------|-----------|-----------------------|-------|-----------|
| Tunisia | 97 | [93,95,107] | Samoa | 130 | [126,132] | Guatemala | 162 | [156,162] |
| Kyrgyzstan | 98 | [95,103] | Viet Nam | 131 | [126,135] | Nauru | 163 | [163,167] |
| Grenada | 100.5 | [96,104] | Cambodia | 132 | [127,135] | Equatorial Guinea | 164 | [161,165] |
| Nicaragua | 100.5 | [95,118] | Benin | 133 | [129,136] | Tonga | 165 | [163,173] |
| Niger | 100.5 | [96,104] | Angola | 134 | [131,139] | China | 166 | [159,167] |
| Zimbabwe | 100.5 | [97,106] | Burundi | 135.5 | [132,143] | Kiribati | 167 | [165,173] |
| Gambia | 103 | [99,109] | Cameroon | 135.5 | [133,139] | Guinea-Bissau | 168.5 | [165,169] |
| El Salvador | 104 | [99,114] | Myanmar | 137 | [133,148] | Saint Kitts and Nevis | 168.5 | [167,172] |
| Afghanistan | 105 | [99,107] | Fiji | 139 | [131,143] | Belarus | 170 | [165,171] |
| Dominica | 107 | [101,113] | Gabon | 139 | [134,140] | Palestine | 171 | [168,172] |
| Indonesia | 107 | [101,112] | Kuwait | 139 | [136,148] | Russian Federation | 172.5 | [169,173] |
| Japan | 107 | [97,123] | Belize | 141 | [136,153] | Timor-Leste | 172.5 | [170,177] |
| Sudan | 109.5 | [104,113] | Sri Lanka | 142 | [138,149] | Antigua and Barbuda | 174 | [169,174] |
| Zambia | 109.5 | [107,116] | Guyana | 143.5 | [140,146] | Lao P.D.R. | 175 | [175,182] |
| Israel | 111 | [103,126] | Seychelles | 143.5 | [135,153] | Monaco | 176 | [176,183] |
| Liberia | 112.5 | [105,120] | Côte d'Ivoire | 145.5 | [138,146] | Solomon Islands | 177 | [175,178] |
| South Africa | 112.5 | [104,117] | Paraguay | 145.5 | [140,148] | Bolivia | 178 | [174,178] |
| Vanuatu | 114 | [108,123] | Algeria | 147 | [141,148] | Cuba | 179 | [176,180] |
| Mauritania | 115 | [107,116] | Brunei Darussalam | 148 | [138,148] | Lebanon | 180 | [179,183] |
| Namibia | 116 | [108,123] | Suriname | 149 | [147,152] | Ethiopia | 181 | [178,181] |
| Azerbaijan | 117 | [109,126] | Eswatini | 150 | [148,158] | Eritrea | 182 | [179,182] |
| Mongolia | 118.5 | [115,122] | Haiti | 151.5 | [149,155] | Andorra | 183.5 | [183,187] |
| Qatar | 118.5 | [110,121] | Papua New Guinea | 151.5 | [151,155] | San Marino | 183.5 | [183,187] |
| Madagascar | 120 | [113,121] | Chad | 153 | [147,154] | Uzbekistan | 185 | [180,185] |
| Bhutan | 121 | [115,123] | Central African Rep. | 154 | [150,156] | Marshall Islands | 186 | [184,186] |
| Togo | 122 | [116,128] | Iraq | 155 | [150,167] | Tajikistan | 187 | [185,187] |
| Barbados | 123 | [116,126] | Mozambique | 156 | [146,157] | Yemen | 188 | [188,188] |
| Guinea | 124 | [119,128] | Sierra Leone | 157 | [156,160] | Tuvalu | 189 | [189,190] |
| Nepal | 125 | [120,134] | Syrian Arab Republic | 158 | [157,163] | Micronesia | 190 | [189,191] |
| Lesotho | 126 | [120,127] | South Sudan | 159 | [155,160] | Turkmenistan | 191 | [190,192] |
| Philippines | 128 | [123,131] | Kazakhstan | 160 | [156,162] | Djibouti | 192.5 | [191,193] |
| Somalia | 128 | [124,138] | Maldives | 161 | [160,163] | Libya | 192.5 | [192,193] |
| Uruguay | 128 | [124,130] | | | | | | |

Source: European Commission, Joint Research Centre, 2019

Annex IV. Values of the normalised pillars by country in 2018

| Country | Sum of pillars (default) | | | | | Weighted mean of Pillars | | | | |
|------------------------|--------------------------|------|----|------|---------------|--------------------------|------|------|------|---------------|
| | P1 | P2 | P3 | P4 | Overall Score | P1 | P2 | P3 | P4 | Overall Score |
| Afghanistan | 15 | 20 | 19 | 19.3 | 73.3 | 75 | 90.9 | 63.3 | 69 | 73.3 |
| Albania | 18 | 16 | 25 | 24 | 83 | 90 | 72.7 | 83.3 | 85.7 | 83 |
| Algeria | 18 | 16 | 16 | 11.5 | 61.5 | 90 | 72.7 | 53.3 | 41.1 | 61.5 |
| Andorra | 6 | 8 | 8 | 0 | 22 | 30 | 36.4 | 26.7 | 0 | 22 |
| Angola | 14 | 20 | 20 | 10.7 | 64.7 | 70 | 90.9 | 66.7 | 38.1 | 64.7 |
| Antigua and Barbuda | 8 | 11.5 | 8 | 13.3 | 40.8 | 40 | 52.3 | 26.7 | 47.6 | 40.8 |
| Argentina | 17 | 20 | 21 | 28 | 86 | 85 | 90.9 | 70 | 100 | 86 |
| Armenia | 19 | 19.5 | 20 | 27 | 85.5 | 95 | 88.6 | 66.7 | 96.4 | 85.5 |
| Australia | 19 | 21.5 | 26 | 28 | 94.5 | 95 | 97.7 | 86.7 | 100 | 94.5 |
| Austria | 18 | 16.5 | 28 | 27 | 89.5 | 90 | 75 | 93.3 | 96.4 | 89.5 |
| Azerbaijan | 8 | 13.5 | 24 | 25 | 70.5 | 40 | 61.4 | 80 | 89.3 | 70.5 |
| Bahamas | 19 | 18.5 | 26 | 25.3 | 88.8 | 95 | 84.1 | 86.7 | 90.5 | 88.8 |
| Bahrain | 17 | 18 | 26 | 26.3 | 87.3 | 85 | 81.8 | 86.7 | 94 | 87.3 |
| Bangladesh | 17 | 20 | 15 | 22.7 | 74.7 | 85 | 90.9 | 50 | 81 | 74.7 |
| Barbados | 17 | 12.5 | 18 | 21 | 68.5 | 85 | 56.8 | 60 | 75 | 68.5 |
| Belarus | 6 | 11.5 | 11 | 16 | 44.5 | 30 | 52.3 | 36.7 | 57.1 | 44.5 |
| Belgium | 18 | 19 | 30 | 27 | 94 | 90 | 86.4 | 100 | 96.4 | 94 |
| Belize | 17 | 18.5 | 20 | 7.3 | 62.8 | 85 | 84.1 | 66.7 | 26.2 | 62.8 |
| Benin | 16 | 16 | 21 | 12 | 65 | 80 | 72.7 | 70 | 42.9 | 65 |
| Bhutan | 15 | 20 | 16 | 18.3 | 69.3 | 75 | 90.9 | 53.3 | 65.5 | 69.3 |
| Bolivia | 9 | 9 | 8 | 8.5 | 34.5 | 45 | 40.9 | 26.7 | 30.4 | 34.5 |
| Bosnia and Herzegovina | 19 | 21 | 27 | 26 | 93 | 95 | 95.5 | 90 | 92.9 | 93 |
| Botswana | 18 | 22 | 19 | 26 | 85 | 90 | 100 | 63.3 | 92.9 | 85 |
| Brazil | 16 | 18.5 | 26 | 28 | 88.5 | 80 | 84.1 | 86.7 | 100 | 88.5 |
| Brunei Darussalam | 15 | 17 | 17 | 12.3 | 61.3 | 75 | 77.3 | 56.7 | 44 | 61.3 |
| Bulgaria | 19 | 16.5 | 28 | 28 | 91.5 | 95 | 75 | 93.3 | 100 | 91.5 |
| Burkina Faso | 19 | 19 | 20 | 26 | 84 | 95 | 86.4 | 66.7 | 92.9 | 84 |
| Burundi | 11 | 18 | 12 | 23 | 64 | 55 | 81.8 | 40 | 82.1 | 64 |
| Cabo Verde | 17 | 20 | 23 | 21.3 | 81.3 | 85 | 90.9 | 76.7 | 76.2 | 81.3 |
| Cambodia | 13 | 17 | 14 | 21.3 | 65.3 | 65 | 77.3 | 46.7 | 76.2 | 65.3 |
| Cameroon | 17 | 18 | 16 | 13 | 64 | 85 | 81.8 | 53.3 | 46.4 | 64 |
| Canada | 19 | 16.5 | 30 | 20 | 85.5 | 95 | 75 | 100 | 71.4 | 85.5 |
| Central African Rep. | 14 | 18 | 9 | 17 | 58 | 70 | 81.8 | 30 | 60.7 | 58 |
| Chad | 15 | 16 | 13 | 14.3 | 58.3 | 75 | 72.7 | 43.3 | 51.2 | 58.3 |
| Chile | 14 | 20 | 18 | 27 | 79 | 70 | 90.9 | 60 | 96.4 | 79 |
| China | 7 | 11 | 16 | 15 | 49 | 35 | 50 | 53.3 | 53.6 | 49 |
| Colombia | 15 | 15 | 22 | 27 | 79 | 75 | 68.2 | 73.3 | 96.4 | 79 |
| Comoros | 17 | 19 | 24 | 22.3 | 82.3 | 85 | 86.4 | 80 | 79.8 | 82.3 |
| Congo (Rep. of the) | 17 | 17 | 22 | 19.7 | 75.7 | 85 | 77.3 | 73.3 | 70.2 | 75.7 |
| Costa Rica | 19 | 16 | 26 | 24 | 85 | 95 | 72.7 | 86.7 | 85.7 | 85 |
| Côte d'Ivoire | 17 | 15.5 | 14 | 15.3 | 61.8 | 85 | 70.5 | 46.7 | 54.8 | 61.8 |
| Croatia | 19 | 19 | 28 | 28 | 94 | 95 | 86.4 | 93.3 | 100 | 94 |
| Cuba | 2 | 12 | 14 | 5 | 33 | 10 | 54.5 | 46.7 | 17.9 | 33 |
| Cyprus | 18 | 16 | 28 | 23.7 | 85.7 | 90 | 72.7 | 93.3 | 84.5 | 85.7 |
| Czech Republic | 17 | 17 | 30 | 25 | 89 | 85 | 77.3 | 100 | 89.3 | 89 |
| Dem. Rep. of the Congo | 14 | 20 | 20 | 25.3 | 79.3 | 70 | 90.9 | 66.7 | 90.5 | 79.3 |
| Denmark | 18 | 18 | 28 | 23.7 | 87.7 | 90 | 81.8 | 93.3 | 84.5 | 87.7 |
| Djibouti | 0 | 2.5 | 2 | 0 | 4.5 | 0 | 11.4 | 6.7 | 0 | 4.5 |
| Dominica | 11 | 15.5 | 20 | 26 | 72.5 | 55 | 70.5 | 66.7 | 92.9 | 72.5 |
| Dominican Rep. | 19 | 19.5 | 28 | 28 | 94.5 | 95 | 88.6 | 93.3 | 100 | 94.5 |
| Ecuador | 20 | 18.5 | 21 | 26 | 85.5 | 100 | 84.1 | 70 | 92.9 | 85.5 |
| Egypt | 15 | 20.5 | 21 | 24.3 | 80.8 | 75 | 93.2 | 70 | 86.9 | 80.8 |
| El Salvador | 19 | 14.5 | 14 | 26 | 73.5 | 95 | 65.9 | 46.7 | 92.9 | 73.5 |
| Equatorial Guinea | 13 | 15 | 13 | 9.3 | 50.3 | 65 | 68.2 | 43.3 | 33.3 | 50.3 |
| Eritrea | 8 | 11 | 4 | 2 | 25 | 40 | 50 | 13.3 | 7.1 | 25 |
| Estonia | 14 | 20 | 26 | 27 | 87 | 70 | 90.9 | 86.7 | 96.4 | 87 |
| Eswatini | 19 | 19 | 14 | 7.3 | 59.3 | 95 | 86.4 | 46.7 | 26.2 | 59.3 |

| | | | | | | | | | | |
|------------------|----|------|----|------|------|-----|------|------|------|------|
| Ethiopia | 7 | 12 | 8 | 2 | 29 | 35 | 54.5 | 26.7 | 7.1 | 29 |
| Fiji | 13 | 14 | 19 | 17 | 63 | 65 | 63.6 | 63.3 | 60.7 | 63 |
| Finland | 18 | 17 | 30 | 27 | 92 | 90 | 77.3 | 100 | 96.4 | 92 |
| France | 18 | 20 | 30 | 26 | 94 | 90 | 90.9 | 100 | 92.9 | 94 |
| Gabon | 15 | 17 | 16 | 15 | 63 | 75 | 77.3 | 53.3 | 53.6 | 63 |
| Gambia | 20 | 19 | 16 | 18.7 | 73.7 | 100 | 86.4 | 53.3 | 66.7 | 73.7 |
| Georgia | 18 | 16.5 | 30 | 28 | 92.5 | 90 | 75 | 100 | 100 | 92.5 |
| Germany | 16 | 20.5 | 30 | 27 | 93.5 | 80 | 93.2 | 100 | 96.4 | 93.5 |
| Ghana | 18 | 21 | 22 | 27 | 88 | 90 | 95.5 | 73.3 | 96.4 | 88 |
| Greece | 20 | 17 | 28 | 26.3 | 91.3 | 100 | 77.3 | 93.3 | 94 | 91.3 |
| Grenada | 14 | 17 | 20 | 23 | 74 | 70 | 77.3 | 66.7 | 82.1 | 74 |
| Guatemala | 12 | 12.5 | 10 | 18.7 | 53.2 | 60 | 56.8 | 33.3 | 66.7 | 53.2 |
| Guinea | 16 | 18 | 22 | 12.3 | 68.3 | 80 | 81.8 | 73.3 | 44 | 68.3 |
| Guinea-Bissau | 10 | 10 | 8 | 18 | 46 | 50 | 45.5 | 26.7 | 64.3 | 46 |
| Guyana | 18 | 18 | 15 | 11 | 62 | 90 | 81.8 | 50 | 39.3 | 62 |
| Haiti | 14 | 19.5 | 10 | 15 | 58.5 | 70 | 88.6 | 33.3 | 53.6 | 58.5 |
| Honduras | 17 | 19 | 26 | 20 | 82 | 85 | 86.4 | 86.7 | 71.4 | 82 |
| Hong Kong, China | 18 | 18.5 | 20 | 27.3 | 83.8 | 90 | 84.1 | 66.7 | 97.6 | 83.8 |
| Hungary | 19 | 22 | 28 | 28 | 97 | 95 | 100 | 93.3 | 100 | 97 |
| Iceland | 18 | 18 | 22 | 28 | 86 | 90 | 81.8 | 73.3 | 100 | 86 |
| India | 18 | 14.5 | 20 | 23 | 75.5 | 90 | 65.9 | 66.7 | 82.1 | 75.5 |
| Indonesia | 16 | 13.5 | 18 | 25 | 72.5 | 80 | 61.4 | 60 | 89.3 | 72.5 |
| Iran | 19 | 19 | 28 | 16 | 82 | 95 | 86.4 | 93.3 | 57.1 | 82 |
| Iraq | 17 | 21.5 | 16 | 3.3 | 57.8 | 85 | 97.7 | 53.3 | 11.9 | 57.8 |
| Ireland | 20 | 19 | 30 | 28 | 97 | 100 | 86.4 | 100 | 100 | 97 |
| Israel | 8 | 11.5 | 28 | 24 | 71.5 | 40 | 52.3 | 93.3 | 85.7 | 71.5 |
| Italy | 18 | 22 | 30 | 27.3 | 97.3 | 90 | 100 | 100 | 97.6 | 97.3 |
| Jamaica | 19 | 12.5 | 19 | 28 | 78.5 | 95 | 56.8 | 63.3 | 100 | 78.5 |
| Japan | 8 | 11.5 | 26 | 27 | 72.5 | 40 | 52.3 | 86.7 | 96.4 | 72.5 |
| Jordan | 19 | 20 | 24 | 21.5 | 84.5 | 95 | 90.9 | 80 | 76.8 | 84.5 |
| Kazakhstan | 6 | 10 | 14 | 24 | 54 | 30 | 45.5 | 46.7 | 85.7 | 54 |
| Kenya | 18 | 21.5 | 21 | 27 | 87.5 | 90 | 97.7 | 70 | 96.4 | 87.5 |
| Kiribati | 13 | 18.5 | 4 | 12 | 47.5 | 65 | 84.1 | 13.3 | 42.9 | 47.5 |
| Korea (Rep. of) | 18 | 22 | 20 | 21.7 | 81.7 | 90 | 100 | 66.7 | 77.4 | 81.7 |
| Kuwait | 20 | 19 | 12 | 12 | 63 | 100 | 86.4 | 40 | 42.9 | 63 |
| Kyrgyzstan | 16 | 16.5 | 16 | 26 | 74.5 | 80 | 75 | 53.3 | 92.9 | 74.5 |
| Lao P.D.R. | 0 | 12 | 17 | 7.7 | 36.7 | 0 | 54.5 | 56.7 | 27.4 | 36.7 |
| Latvia | 18 | 16.5 | 30 | 26 | 90.5 | 90 | 75 | 100 | 92.9 | 90.5 |
| Lebanon | 8 | 18 | 5 | 0.7 | 31.7 | 40 | 81.8 | 16.7 | 2.4 | 31.7 |
| Lesotho | 16 | 17.5 | 16 | 18.3 | 67.8 | 80 | 79.5 | 53.3 | 65.5 | 67.8 |
| Liberia | 17 | 20 | 22 | 12.3 | 71.3 | 85 | 90.9 | 73.3 | 44 | 71.3 |
| Libya | 2 | 2.5 | 0 | 0 | 4.5 | 10 | 11.4 | 0 | 0 | 4.5 |
| Liechtenstein | 14 | 14 | 24 | 26.3 | 78.3 | 70 | 63.6 | 80 | 94 | 78.3 |
| Lithuania | 19 | 21 | 28 | 27 | 95 | 95 | 95.5 | 93.3 | 96.4 | 95 |
| Luxembourg | 18 | 17 | 22 | 26 | 83 | 90 | 77.3 | 73.3 | 92.9 | 83 |
| Madagascar | 17 | 17.5 | 18 | 17 | 69.5 | 85 | 79.5 | 60 | 60.7 | 69.5 |
| Malawi | 18 | 22 | 20 | 27 | 87 | 90 | 100 | 66.7 | 96.4 | 87 |
| Malaysia | 18 | 22 | 24 | 23 | 87 | 90 | 100 | 80 | 82.1 | 87 |
| Maldives | 13 | 20 | 12 | 8.3 | 53.3 | 65 | 90.9 | 40 | 29.8 | 53.3 |
| Mali | 18 | 18 | 18 | 26.3 | 80.3 | 90 | 81.8 | 60 | 94 | 80.3 |
| Malta | 19 | 20 | 28 | 28 | 95 | 95 | 90.9 | 93.3 | 100 | 95 |
| Marshall Islands | 2 | 6.5 | 4 | 3 | 15.5 | 10 | 29.5 | 13.3 | 10.7 | 15.5 |
| Mauritania | 17 | 19 | 18 | 17 | 71 | 85 | 86.4 | 60 | 60.7 | 71 |
| Mauritius | 18 | 20.5 | 15 | 27.3 | 80.8 | 90 | 93.2 | 50 | 97.6 | 80.8 |
| Mexico | 19 | 17 | 26 | 28 | 90 | 95 | 77.3 | 86.7 | 100 | 90 |
| Micronesia | 0 | 4 | 4 | 0 | 8 | 0 | 18.2 | 13.3 | 0 | 8 |
| Moldova | 19 | 17.5 | 26 | 26 | 88.5 | 95 | 79.5 | 86.7 | 92.9 | 88.5 |
| Monaco | 0 | 15 | 8 | 12 | 35 | 0 | 68.2 | 26.7 | 42.9 | 35 |
| Mongolia | 18 | 19 | 18 | 14.7 | 69.7 | 90 | 86.4 | 60 | 52.4 | 69.7 |
| Montenegro | 19 | 19 | 28 | 28 | 94 | 95 | 86.4 | 93.3 | 100 | 94 |
| Morocco | 18 | 19.5 | 24 | 27 | 88.5 | 90 | 88.6 | 80 | 96.4 | 88.5 |

| | | | | | | | | | | |
|----------------------------------|----|------|----|------|------|-----|------|------|------|------|
| Mozambique | 16 | 10.5 | 16 | 15.2 | 57.7 | 80 | 47.7 | 53.3 | 54.2 | 57.7 |
| Myanmar | 6 | 17 | 17 | 23.7 | 63.7 | 30 | 77.3 | 56.7 | 84.5 | 63.7 |
| Namibia | 19 | 17 | 22 | 12.7 | 70.7 | 95 | 77.3 | 73.3 | 45.2 | 70.7 |
| Nauru | 10 | 11.5 | 6 | 23 | 50.5 | 50 | 52.3 | 20 | 82.1 | 50.5 |
| Nepal | 18 | 17 | 11 | 22 | 68 | 90 | 77.3 | 36.7 | 78.6 | 68 |
| Netherlands | 19 | 18 | 28 | 28 | 93 | 95 | 81.8 | 93.3 | 100 | 93 |
| New Zealand | 17 | 13.5 | 22 | 28 | 80.5 | 85 | 61.4 | 73.3 | 100 | 80.5 |
| Nicaragua | 18 | 18 | 12 | 26 | 74 | 90 | 81.8 | 40 | 92.9 | 74 |
| Niger | 15 | 20 | 20 | 19 | 74 | 75 | 90.9 | 66.7 | 67.9 | 74 |
| Nigeria | 17 | 20 | 20 | 21.3 | 78.3 | 85 | 90.9 | 66.7 | 76.2 | 78.3 |
| Norway | 20 | 18.5 | 30 | 27 | 95.5 | 100 | 84.1 | 100 | 96.4 | 95.5 |
| Oman | 17 | 19 | 28 | 26.3 | 90.3 | 85 | 86.4 | 93.3 | 94 | 90.3 |
| Pakistan | 20 | 19 | 22 | 27 | 88 | 100 | 86.4 | 73.3 | 96.4 | 88 |
| Palestine | 4 | 11.5 | 13 | 13.7 | 42.2 | 20 | 52.3 | 43.3 | 48.8 | 42.2 |
| Panama | 19 | 21 | 20 | 26 | 86 | 95 | 95.5 | 66.7 | 92.9 | 86 |
| Papua New Guinea | 16 | 19.5 | 12 | 11 | 58.5 | 80 | 88.6 | 40 | 39.3 | 58.5 |
| Paraguay | 18 | 15.5 | 12 | 16.3 | 61.8 | 90 | 70.5 | 40 | 58.3 | 61.8 |
| Peru | 18 | 13 | 28 | 28 | 87 | 90 | 59.1 | 93.3 | 100 | 87 |
| Philippines | 16 | 12 | 17 | 22 | 67 | 80 | 54.5 | 56.7 | 78.6 | 67 |
| Poland | 16 | 17.5 | 28 | 27 | 88.5 | 80 | 79.5 | 93.3 | 96.4 | 88.5 |
| Portugal | 19 | 18 | 30 | 27 | 94 | 95 | 81.8 | 100 | 96.4 | 94 |
| Qatar | 14 | 18 | 21 | 16.7 | 69.7 | 70 | 81.8 | 70 | 59.5 | 69.7 |
| Romania | 18 | 19 | 28 | 27 | 92 | 90 | 86.4 | 93.3 | 96.4 | 92 |
| Russian Federation | 4 | 11 | 13 | 14 | 42 | 20 | 50 | 43.3 | 50 | 42 |
| Rwanda | 20 | 20 | 18 | 24.3 | 82.3 | 100 | 90.9 | 60 | 86.9 | 82.3 |
| Saint Kitts and Nevis | 5 | 15 | 6 | 20 | 46 | 25 | 68.2 | 20 | 71.4 | 46 |
| Saint Lucia | 16 | 18 | 24 | 27 | 85 | 80 | 81.8 | 80 | 96.4 | 85 |
| Saint Vincent and the Grenadines | 17 | 18 | 18 | 27 | 80 | 85 | 81.8 | 60 | 96.4 | 80 |
| Samoa | 14 | 17 | 22 | 13.3 | 66.3 | 70 | 77.3 | 73.3 | 47.6 | 66.3 |
| San Marino | 0 | 4 | 2 | 16 | 22 | 0 | 18.2 | 6.7 | 57.1 | 22 |
| Sao Tome and Principe | 16 | 17 | 21 | 21 | 75 | 80 | 77.3 | 70 | 75 | 75 |
| Saudi Arabia | 19 | 22 | 29 | 22 | 92 | 95 | 100 | 96.7 | 78.6 | 92 |
| Senegal | 19 | 19 | 24 | 18 | 80 | 95 | 86.4 | 80 | 64.3 | 80 |
| Serbia | 20 | 19.5 | 26 | 27 | 92.5 | 100 | 88.6 | 86.7 | 96.4 | 92.5 |
| Seychelles | 6 | 12 | 16 | 28 | 62 | 30 | 54.5 | 53.3 | 100 | 62 |
| Sierra Leone | 16 | 19 | 14 | 7 | 56 | 80 | 86.4 | 46.7 | 25 | 56 |
| Singapore | 17 | 21.5 | 26 | 27 | 91.5 | 85 | 97.7 | 86.7 | 96.4 | 91.5 |
| Slovakia | 15 | 18.5 | 28 | 26.7 | 88.2 | 75 | 84.1 | 93.3 | 95.2 | 88.2 |
| Slovenia | 20 | 18.5 | 28 | 27 | 93.5 | 100 | 84.1 | 93.3 | 96.4 | 93.5 |
| Solomon Islands | 9 | 14 | 8 | 3.7 | 34.7 | 45 | 63.6 | 26.7 | 13.1 | 34.7 |
| Somalia | 14 | 19 | 10 | 24 | 67 | 70 | 86.4 | 33.3 | 85.7 | 67 |
| South Africa | 17 | 17 | 24 | 13.3 | 71.3 | 85 | 77.3 | 80 | 47.6 | 71.3 |
| South Sudan | 12 | 17 | 12 | 13.7 | 54.7 | 60 | 77.3 | 40 | 48.8 | 54.7 |
| Spain | 16 | 14 | 28 | 28 | 86 | 80 | 63.6 | 93.3 | 100 | 86 |
| Sri Lanka | 18 | 20 | 15 | 9.3 | 62.3 | 90 | 90.9 | 50 | 33.3 | 62.3 |
| Sudan | 15 | 20 | 18 | 18.7 | 71.7 | 75 | 90.9 | 60 | 66.7 | 71.7 |
| Suriname | 15 | 17 | 18 | 9.7 | 59.7 | 75 | 77.3 | 60 | 34.5 | 59.7 |
| Sweden | 19 | 20 | 24 | 26 | 89 | 95 | 90.9 | 80 | 92.9 | 89 |
| Switzerland | 18 | 18.5 | 30 | 27 | 93.5 | 90 | 84.1 | 100 | 96.4 | 93.5 |
| Syrian Arab Republic | 19 | 15 | 15 | 6.3 | 55.3 | 95 | 68.2 | 50 | 22.6 | 55.3 |
| Tajikistan | 2 | 6 | 2 | 4 | 14 | 10 | 27.3 | 6.7 | 14.3 | 14 |
| Tanzania | 20 | 21 | 19 | 25 | 85 | 100 | 95.5 | 63.3 | 89.3 | 85 |
| Thailand | 20 | 19.5 | 22 | 19.8 | 81.3 | 100 | 88.6 | 73.3 | 70.8 | 81.3 |
| FYR Macedonia | 18 | 20 | 30 | 19 | 87 | 90 | 90.9 | 100 | 67.9 | 87 |
| Timor-Leste | 13 | 21 | 3 | 5 | 42 | 65 | 95.5 | 10 | 17.9 | 42 |
| Togo | 15 | 22 | 20 | 12 | 69 | 75 | 100 | 66.7 | 42.9 | 69 |
| Tonga | 1 | 11 | 15 | 22.7 | 49.7 | 5 | 50 | 50 | 81 | 49.7 |
| Trinidad and Tobago | 18 | 19 | 22 | 26.3 | 85.3 | 90 | 86.4 | 73.3 | 94 | 85.3 |
| Tunisia | 19 | 16 | 25 | 14.7 | 74.7 | 95 | 72.7 | 83.3 | 52.4 | 74.7 |
| Turkey | 19 | 19.5 | 30 | 26 | 94.5 | 95 | 88.6 | 100 | 92.9 | 94.5 |
| Turkmenistan | 0 | 6 | 0 | 1.7 | 7.7 | 0 | 27.3 | 0 | 6 | 7.7 |

| | | | | | | | | | | |
|----------------------|----|------|----|------|------|-----|------|------|------|------|
| Tuvalu | 0 | 4.5 | 0 | 5 | 9.5 | 0 | 20.5 | 0 | 17.9 | 9.5 |
| Uganda | 17 | 20 | 22 | 27 | 86 | 85 | 90.9 | 73.3 | 96.4 | 86 |
| Ukraine | 17 | 17.5 | 23 | 24 | 81.5 | 85 | 79.5 | 76.7 | 85.7 | 81.5 |
| United Arab Emirates | 19 | 21 | 27 | 16 | 83 | 95 | 95.5 | 90 | 57.1 | 83 |
| United Kingdom | 20 | 20 | 28 | 27 | 95 | 100 | 90.9 | 93.3 | 96.4 | 95 |
| United States | 19 | 17.5 | 28 | 24 | 88.5 | 95 | 79.5 | 93.3 | 85.7 | 88.5 |
| Uruguay | 17 | 17 | 20 | 13 | 67 | 85 | 77.3 | 66.7 | 46.4 | 67 |
| Uzbekistan | 7 | 6.5 | 2 | 6.3 | 21.8 | 35 | 29.5 | 6.7 | 22.6 | 21.8 |
| Vanuatu | 17 | 14.5 | 14 | 25.7 | 71.2 | 85 | 65.9 | 46.7 | 91.7 | 71.2 |
| Venezuela | 20 | 21.5 | 16 | 25 | 82.5 | 100 | 97.7 | 53.3 | 89.3 | 82.5 |
| Viet Nam | 10 | 19 | 24 | 13 | 66 | 50 | 86.4 | 80 | 46.4 | 66 |
| Yemen | 0 | 3 | 4 | 4 | 11 | 0 | 13.6 | 13.3 | 14.3 | 11 |
| Zambia | 19 | 18 | 15 | 19.7 | 71.7 | 95 | 81.8 | 50 | 70.2 | 71.7 |
| Zimbabwe | 20 | 19 | 18 | 17 | 74 | 100 | 86.4 | 60 | 60.7 | 74 |

Source: European Commission, Joint Research Centre, 2019

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