May 15, 2025 – ITU ICT Development Index (IDI) EGTI Sub-group

Purpose

Discuss the use of current values for thresholds and goalposts in the ICT Development Index (IDI) model as of 2023 regarding the use of both 95th percentiles and 95th percentiles - projected.

Proposed solution

The proposed solution is to only use 95th percentiles. In fact, in CRA Qatar's opinion, **95th percentiles - projected, are caps, not percentiles**.

Rationale for the proposal

In CRA Qatar's opinion this change will improve the coherence and logic of the IDI index, and it will also make the IDI align better with ITU's general concepts for indices.

Methodology of the IDI index

In the presentation and discussion of the IDI methodology, version 3[1], ITU summarizes the main concept of the index. You may refer to the Annex for a more comprehensive presentation with excerpts from the ITU document. Below the main concepts of outliers, goalposts and thresholds are presented with quotes from the ITU version 3.1 document.

Outliers

"An indicator is a useful benchmark if it can meaningfully distinguish performance across units (i.e., economies in the present case) and over time. From a statistical perspective, the range of values (the distance between the minimum and maximum) should not be too narrow, and the distribution not too skewed or peaked (a case when the bulk of the values is concentrated within a small range, with some outlying values further apart). The presence of outliers is particularly problematic in the context of composite indicators. Outlying values are not necessarily errors, but if present in component indicators of a composite indicator, they can significantly bias aggregation results. Outliers would not only become unrealistic or unintended targets but also imply that a significant portion of the data range will remain empty, while small, marginal differences between countries may be inflated or larger differences underestimated. They can also bias statistical

[1] https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx

coherence analysis. Identifying and treating outliers is therefore essential in the process of developing an index. Various methods exist to treat outliers, depending on the nature of the data, e.g., applying a log transformation or trimming the distribution by applying caps." (Page 20-21)

Goalposts and Thresholds

"*Depending on the indicator, the goalpost may be a policy target or aspiration, the maximum possible value, or a number derived from statistical analysis of the distribution (e.g., 90th or 95th percentile).*" (Page 23)

For an overview of the IDI 2023 version, refer to Table 2 below.

Table 2: Goalposts, thresholds, and outlier treatment

Indicator	Threshold	Goalpost	Additional treatment
Universal connectivity indicators			
Individuals using the Internet (%)	0%	95%	Not needed
Households with Internet access at home (%)	0%	95%	Not needed
Mobile-broadband subscriptions per 100 inhabitants	0	95th percentile	Not needed
Meaningful connectivity indicators			
Population covered by at least a 3G mobile network (%)	0%	100%	Not needed for the two coverage indicators combined
Population covered by at least a 4G/LTE mobile network (%)	0%	100%	
Mobile broadband Internet traffic per subscription (GB)	0	95th percentile, projected	Log transformation applied
Fixed broadband Internet traffic per subscription (GB)	0	95th percentile, projected	Log transformation applied
Mobile data and voice high-consumption basket price (% GNI p.c.)*	95th percentile	1%	Not needed
Fixed-broadband Internet basket price (as % GNI p.c.)*	95th percentile	1%	Not needed
Individuals owning a mobile phone (%)	0%	95%	Not needed

* The direction of the affordability indicators is reversed, hence a score of 100 is assigned for values *below* the goalpost and a score of zero for values *above* the threshold. See Table 4 for the actual value of the goalposts defined based on percentiles of the distribution. Gross national income per capita (GNI p.c.). Gigabyte (GB).

Source: **IDI 2023** https://www.itu.int/itu-d/reports/statistics/IDI2023/

If the goalpost is set at 95% or the 95th percentile, this means that a country with a value at or above 95% or the 95th percentile, will get a score of 100 (i.e. a normalized value).

ITU does not define threshold, but this is perceived as the lowest value for an indicator, i.e. the cut-off point for low values. In the IDI, the threshold is set as 0 or 0% for all indicators, except for affordability where it is a target that values shall be as low as possible. For affordability, the goalpost is set at 1% of GNI per capita, meaning that values at or below 1% score 100. The threshold is set as the 95th percentile, meaning that values at or above the 95th percentile score 0.

A goalpost is set as 95% or 100% if the highest possible value of the indicator is 100%. E.g. for population covered by at least a 3G or 4G mobile network, the maximum coverage is 100%.

A goalpost is set as the 95th percentile if the highest possible value of the indicator is indefinite. E.g. for the indicator Mobile Broadband subscriptions per 100 inhabitants, there is no finite upper value. The 95th percentile is defined as the point that is higher than 95% of the values. In the 2023 IDI index there were 169 economies in the data set. The 95th percentile should therefore as a rule of thumb be close to the nation with the 8th or 9th highest score (1-0.95)*169 = 8.45.

In CRA Qatar's opinion, the 95th percentile is a good way to calculate a goalpost. Let us illustrate why with the example of the indicator for Mobile Broadband penetration.

Mobile Broadband penetration

ITU earlier set a cap of 120 mobile broadband subscription per 100 population as equal to full penetration. However, for the IDI 2023, ITU opted to use the 95th percentile instead.

Another UN organization, UN DESA, publishes the E-Government Development Index (EGDI) biennially. The EGDI consists of 3 pillars that each weigh 33.3%. One of the pillars is the Telecom Infrastructure Index (TII) which comprises 4 indicators, all sourced from the ITU, and 3 of the 4 indicators are included in the IDI index. UN DESA still uses 120 as the cap for mobile penetration, so any indicator value at or above 120 is scored at 100.

At a conference in Doha, Qatar, in April 2025, ITU made a presentation with analysis and recommendations for the EGDI, TII pillar. One of the revisions that ITU suggested was using the 95th percentile instead of an arbitrary goalpost (cap). ITU supported the suggestion with these statements:

Advantages of using the 95th percentage instead of an arbitrary goalpost (ITU comments)

Data-driven and empirical

The 95th percentile is based on real-world data distribution, reflecting actual country performance. Avoids relying on theoretical or outdated thresholds that may not match current technological realities.

Adaptive to change

As ICT access and use improves globally, the 95th percentile automatically adjusts. This makes the index more responsive to technological progress and global trends – for example, increased broadband coverage.

Avoids ceiling effects

Arbitrary goalposts can become quickly outdated (e.g. 120 mobile penetration), causing countries to cluster at the top and lose meaningful differentiation. The 95th percentile keeps a spread among high-performing countries, improving the index's sensitivity.

Improves comparability and fairness

It ensures that indicators are normalized relative to global performance, not to a fixed or idealized standard. This is particularly important for comparing countries over time, as it accounts for global progress while still identifying leaders and laggards.

Encourages realistic and relevant benchmarking

Countries can benchmark themselves against top performers, not artificial targets. This supports evidence-based policy planning and goal setting.

In CRA Qatar's opinion, ITU's observations and statements are sensible, logical and insightful.

Let us relate ITU's comments from 2025 with ITU's statements in the IDI 2023 methodology document version 3.1:

"*The values for the indicator Mobile broadband penetration (i911mw) range from 2.6 to a maximum of 285 subscriptions per 100 inhabitants. Apart from eight countries, values are less than 150 subscriptions per 100 inhabitants. Setting a cap is justified from a statistical as well as a conceptual*

standpoint to set a more realistically achievable target and allow for a more meaningful cross-country comparison." Page 23.

ITU proceeds to set the goalpost for mobile penetration at the 95th percentile, which is in accordance with the 2025 statements. CRA Qatar agrees to this approach.

Traffic per subscription

In the IDI 2023 methodology document version 3.1, ITU comments on the traffic indicators for mobile and fixed broadband per subscription as below when **identifying** outliers:

" *Outliers were detected for both Internet traffic indicators. The distribution of Mobile broadband traffic per subscription (i136mwi_subs) values is highly skewed, and while the median is 62.9, around 5 per cent of the countries reported values between 265 to 681 GB per subscription. Such a skewed distribution warrants capping the indicator. A goalpost must be forward looking, considering that Internet traffic is growing by 20 per cent annually.*

Fixed broadband traffic per subscription (i135tfb_subs) values are more evenly spread compared to mobile broadband traffic per subscription. However, a few outlying values require treatment before including it in the aggregation for a composite indicator. The median value is 2,030 GB/user, and 95 per cent of the observations are below 5,250 GB/user. Like the previous indicator, setting a cap should take into consideration the fact that traffic is expected to increase for the next four years." (Page 23)

Regarding **treatment** of the outliers, ITU comments as follows:
"*For the two traffic indicators, goalposts are statistically driven. To avoid setting unrealistic targets, the goalposts are set at the 95th percentile of the observed values. According to the 2021 data, these values are 254 and 5'083 GB per subscription per year for mobile and fixed broadband, respectively. Considering the double-digit annual growth of global median traffic, the caps are set respectively at 500 and 10'000 GB*." (Page 24)

In CRA's opinion, ITU's comments on outlier treatment are illogical. ITU first states what the 95th percentiles are. Then, apparently from out of nowhere, ITU proceeds to state that the caps should be set at 500 and 10,000 GB to take future traffic growth into account.

ITU then proceeds to call the goalposts 95th percentiles - projected. In CRA's opinion, this terminology is misleading. In fact, ITU sets an arbitrary cap, as the goalposts will be static, i.e. have the same value for the next 4 years. The basis for calculating the cap may be a projection of

current traffic volumes, but this still does not change the fact that the goalposts are caps, not 95th percentiles. 95th percentiles are dynamic and change according to changes in the observations.

Accordingly, the methodology for setting the goalposts for the traffic indicators conflicts with ITU's 2025 statements, e.g. the arbitrary cap stays static instead of dynamic and does not reflect actual country performance. By setting these arbitrary and very high caps, ITU distorts the score for the countries in the index. This is illustrated below by calculations conducted by CRA Qatar, see next page.

Economy	Mobile broadband Internet traffic per subscription (GB) Value	Source	broadband Internet traffic per subscription (GB)		95 perctl 500	95 perctl 280.5
Suriname	681.2	Telecom	100.0		100.0	100.0
Kuwait	657.8	Commun	100.0		100.0	100.0
Brunei Darussalam	610.0	Authorit	100.0		100.0	100.0
Latvia	461.8	Ministry	98.7		98.7	100.0
Finland	398.9	Finnish	96.4		96.4	100.0
Austria	349.0	Austrian	94.2		94.2	100.0
Saudi Arabia	335.5	Commun	93.6		93.6	100.0
Bahrain	294.5	Telecom	91.5		91.5	100.0
Lithuania	263.4	Commun	89.7		89.7	98.9

Table comparing scores by using 95th percentile and cap of 500 GB for Mobile Broadband Calculated by CRA Qatar. Based on 2023 IDI.

When using the arbitrary cap of 500 GB, only 3 countries score 100 compared to 8 when using the 95th percentile of 280.5. Also, the distribution of scores becomes wider. In CRA's opinion, this results in misleading scores for this indicator.

Economy	broadband Internet traffic per subscription Value	Sour ce	Fixed broadband Internet traffic per subscription (GB)		10000	5,267.5
Qatar	10,484.5	Comr	100.0		100.0	100.0
Kuwait	8,205.6	Comr	97.9		97.9	100.0
Saudi Arabia	6,346.5	Comr	95.1		95.1	100.0
Dominican Rep.	6,091.5	Instit	94.6		94.6	100.0
Indonesia	5,925.3	Minis	94.3		94.3	100.0
Jamaica	5,489.7	Offic	93.5		93.5	100.0
Chile	5,228.3	Subs	93.0		93.0	99.9
United Arab Emirates	5,183.2	Telec	92.9		92.9	99.8
Poland	5,147.1	Offic	92.8		92.8	99.7

Table comparing scores by using 95th percentile and cap of 10,000 GB for Fixed Broadband Calculated by CRA Qatar. Based on 2023 IDI.

When using the arbitrary cap of 10,000 GB, only 1 country scores 100 compared to 6 when using the 95th percentile of 5,267.5. The 95th percentile was calculated by Excel, and in theory it could equal around 5,183 instead of 5,267 to produce 8 countries exceeding the 95th percentile - but this is a minor difference. Also, again the distribution of scores becomes wider. In CRA's opinion, this results in misleading scores for this indicator.

Conclusion

ITU has made convincing arguments for using 95th percentiles as goalposts instead of arbitrary caps. In the IDI 2023, ITU uses the 95th percentile as goalpost for mobile penetration, and as threshold for mobile and fixed broadband affordability. However, ITU uses a static and arbitrary cap as goalpost for mobile and fixed data traffic, even though ITU in the IDI methodology version 3.1 calculated the 95th percentiles. This is in conflict with ITU statements from 2025 concerning the UN DESDA EGDI, TII pillar where ITU recommends using 95th percentiles instead of arbitrary caps.

This means that ITU uses goalposts in an incoherent manner in the IDI 2023 and in conflict with ITU's own recommendations from 2025.

CRA Qatar therefore suggests that the IDI uses 95th percentiles for the mobile and fixed traffic indicators instead of arbitrary caps when revising the IDI from 2027.

ANNEX

Excerpts from the IDI methodology, version 3.1[2]

Statistical assessment of the retained indicators

As discussed above, the retained indicators meet the selection criteria (availability, reliability, relevance, etc.). In addition, an indicator must have certain statistical properties both on its own and vis-à-vis the other indicators of the index to add relevant information to the overall index score. The following sections discuss and build on the results of several statistical analyses that aim to determine how each selected indicator fits in the index.

Specifically, the analyses aim to:

- identify the presence of outliers and recommend treatment methods;
- identify potential constraints in the explanatory power of indicators; and
- explore the statistical association between a set of indicators and the latent structure of the dataset.

The analyses entail an in-depth look at the data, making use of two statistical tools: first, exploring each variable separately and describing them through their descriptive statistics (such as mean, median, min, max, among others), followed by a correlation analysis to explore the statistical relationships between indicator pairs and groups.

The assessments are conducted along the subsequent steps (outlier detection and treatment, normalization, weighting, and aggregation) and provide additional information to help better interpret and understand the strengths and weaknesses of the indicators selected on a conceptual basis. The assessments are an integral part of the iterative process of indicator selection and confirmation that ultimately aims at ensuring that the framework is both conceptually and statistically coherent.

4 Identifying and treating outliers and missing data (step 4)

All indicators retained for inclusion contain missing values and, in some cases, outlying values. In this step, we ensure that IDI scores can be computed based on a statistically robust dataset. This involves identifying and treating outliers and setting goalposts when needed and defining the strategy for treating missing values.

[18] A benefit of an index without ranking is to allow for partial assessment of countries: a country that would normally be excluded for not meeting the overall data availability criterion, could still be assessed on selected components of the index for which sufficient data exists, even though it would not get an overall index score. Without ranking, the inclusion of this country in selected components would be without consequence for other countries. This alternative to outright exclusion would allow to increase the number of countries studied and may incentivise countries to improve data availability.

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[2] https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx

Identifying outliers

An indicator is a useful benchmark if it can meaningfully distinguish performance across units (i.e., economies in the present case) and over time. From a statistical perspective, the range of values (the distance between the minimum and maximum) should not be too narrow, and the distribution not too skewed or peaked (a case when the bulk of the values is concentrated within a small range, with some outlying values further apart). The presence of outliers is particularly problematic in the context of composite indicators. Outlying values are not necessarily errors, but if present in component indicators of a composite indicator, they can significantly bias aggregation results. Outliers would not only become unrealistic or unintended targets, but also imply that a significant portion of the data range will remain empty, while small, marginal differences between countries may be inflated or larger differences underestimated. They can also bias statistical coherence analysis. Identifying and treating outliers is therefore essential in the process of developing an index.[19] Various methods exist to treat outliers, depending on the nature of the data, e.g., applying a log transformation or trimming the distribution by applying caps.

Table 6 reports key descriptive statistics including the number of observations (i.e., economies) for the reference period 2020-2021 and information on range and distribution (minimum and maximum values, mean, standard deviation, median and the 25th and 75th percentile – the range between which half of the observations can be found), as well as skewness and kurtosis coefficients (measures of difference from normal distribution).

[19] There is no single definition for outliers (Aguinis et al, 2013), it depends on the nature of the indicators and the measurement purpose. As a rule of thumb, composite indicator development practitioners typically identify outliers when the absolute skewness (a measure of distribution asymmetry) exceeds 2.0 and kurtosis (a measure of the weight of the tails relative to the centre of the distribution) exceeds 3.5, or if kurtosis alone exceeds 10 (see European Commission, 2019).

Table 6: Descriptive statistics for the retained indicators

	Code	Indicator	N	N/ 196	Min	Max	Mean	St.dev.	25th pctile	Median	75th pctile	Skew.	Kurt.
Universal connectivity													
1	yHH7	Proportion of individuals who used the Internet (from any location) in the last 3 months	97	49%	6.1	100.0	79.6	18.9	75.3	82.9	91.4	-1.9	4.1
2	xHH6	Proportion of households with Internet access at home	97	49%	11.9	100.0	80.2	19.7	75.5	87.2	93.0	-1.7	2.2
3	i911mw	Active mobile-broadband subscriptions per 100 inhabitants	174	89%	0.7	285.1	84.1	44.4	53.7	86.5	108.4	0.9	2.8
Meaningful connectivity – infrastructure													
4	i271G	% of the population covered by at least a 3G mobile network	175	89%	15.0	100.0	91.5	15.3	91.3	98.2	99.9	-2.9	9.1
5	i271GA	% of the population covered by at least a 4G/LTE mobile network.	173	88%	0.0	100.0	82.5	25.7	79.0	95.9	99.1	-1.7	1.7
6	i136mwi_subs	Mobile broadband Internet traffic per mobile broadband subscriptions (GB)	147	75%	0.0	681.2	90.6	106.4	26.2	61.9	117.0	3.0	11.9
7	i135tfb_subs	Fixed broadband Internet traffic per fixed broadband subscriptions (GB)	116	59%	0.0	10484.5	2224.3	1785.9	893.0	2039.6	3172.5	1.3	3.5
Meaningful connectivity – affordability													
8	i271mb_high_ts_GNI	Mobile data and voice high-consumption basket price (as % of GNI per capita)	185	94%	0.1	56.9	6.8	9.4	1.1	3.0	8.3	2.5	7.0
9	i154_FBB_ts_GNI	Fixed-broadband Internet basket price (as % of GNI per capita)	175	89%	0.3	164.2	10.0	18.6	1.4	3.5	11.0	4.9	32.3
Meaningful connectivity – device													
10	xHH18	Percentage of individuals owning a mobile phone	59	30%	41.2	100.0	85.6	15.2	75.4	91.3	97.5	-1.2	0.8

Note: Statistics are based on data for 2021 or, where unavailable, 2020, based on data availability as of 25 September 2023.

The descriptive statistics reveal two issues in the dataset: the presence of outliers and the concentration of variation within a very limited range.

- The values for the indicator *Mobile broadband penetration (i911mw)* range from 2.6 to a maximum of 285 subscriptions per 100 inhabitants. Apart from eight countries, values are less than 150 subscriptions per 100 inhabitants. Setting a cap is justified from a statistical as well as a conceptual standpoint to set a more realistically achievable target and allow for a more meaningful cross-country comparison.
- Considering the *mobile broadband coverage* indicators, the *percentage of population covered by at least a 3G mobile network* (i271G) has limited discriminatory power (differences between country performance are often in the decimal digits). Apart from a few outliers in the low range, three-fourth of the observations are found between 92 and 100 per cent. Country performance is somewhat more dispersed for the other indicator, *percentage of population covered by at least a 4G/LTE mobile network* (i271GA). Outlier treatment is not warranted if the two indicators are combined in an aggregate 'coverage' indicator.
- Outliers were detected for both Internet traffic indicators. The distribution of *Mobile broadband traffic per subscription* (i136mwi_subs) values is highly skewed, and while the median is 62.9, around 5 per cent of the countries reported values between 265 to 681 GB per subscription. Such a skewed distribution warrants capping the indicator. A goalpost must be forward looking, considering that Internet traffic is growing by 20 per cent annually.
- *Fixed broadband traffic per subscription* (i135tfb_subs) values are more evenly spread compared to mobile broadband traffic per subscription. However, a few outlying values require treatment before including it in the aggregation for a composite indicator. The median value is 2,030 GB/user, and 95 per cent of the observations are below 5,250 GB/user. Like the previous indicator, setting a cap should take into consideration the fact that traffic is expected to increase for the next four years.
- Both affordability indicators have a very skewed distribution, with a median of 2.9 for mobile and 3.5 per cent of GNI per capita, and 95 per cent of the observations less than 26 and 42 per cent of GNI per capita for mobile and fixed broadband, respectively. However, outliers reach up to 57 and 164 per cent of GNI per capita, respectively. Trimming the distribution is advisable to increase variance across countries, especially because this is an indicator where, contrary to others, the best performer country has the lowest values, thus the direction will have to be reversed at the normalization step.

Treating outliers

Outlier treatment should take into consideration any thresholds and goalposts defined for indicators on a conceptual basis. Such limits may effectively cap the distribution for concerned indicators to acceptable ranges making other adjustments, such as winsorization, unnecessary.[20] Therefore, the data distributions will be re-examined after defining goalposts and thresholds.

Goalposts and thresholds

Depending on the indicator, the goalpost may be a policy target or aspiration, the maximum possible value, or a number derived from statistical analysis of the distribution (e.g., 90th or 95th percentile). Table 7 also shows indicative thresholds and goalposts for the proposed indicators.

A few observations:

- When setting goalposts for the universality indicators, the concept of universality must be interpreted loosely. For individual usage, it is neither expected nor desirable that all children use the Internet. Indeed, approaches to bringing children online varies across geographies. When picking the goalpost, one must also consider that, among the population, some individuals do not want to use the Internet, even if they have access to it and can afford it. For these reasons, the goalpost for Internet users

[20] Earlier version of this document considered two separate steps for outlier treatment and setting goalposts and thresholds. A streamlined approach is followed here, as this requires less intervention.

should be set at a value slightly below the 100% mark. The expert group discussion agreed that the goalpost is set at 95%. This means that a country with a share of 95% or more will get a score (i.e., a normalised value) of 100 on this indicator. The same approach would apply to the indicator "Individuals owning a mobile phone", part of the meaningful connectivity enabler "Device". While universality is the objective, the goalpost should be set at a lower value, because some people may not want to own a device. The same logics applies to the indicator "Households with Internet access", reflecting the reality that some households may not want to have access at home and accounting for possible measurement errors.

- For the two traffic indicators, goalposts are statistically driven. To avoid setting unrealistic targets, the goalposts are set at the 95th percentile of the observed values. According to the 2021 data, these values are 254 and 5'083 GB per subscription per year for mobile and fixed broadband, respectively. Considering the double-digit annual growth of global median traffic, the caps are set respectively at 500 and 10'000 GB.
- In the case of the affordability indicators, where a higher cost corresponds to a worse outcome, the goalpost is lower than the threshold. While initially the goalpost for the affordability indicators corresponded to the 2 per cent policy target of the Broadband Commission, many participants argued for a lower value to better distinguish country performance and motivate further affordability improvements over time. Consequently, the revised goalpost is set at 1 per cent of GNI per capita.

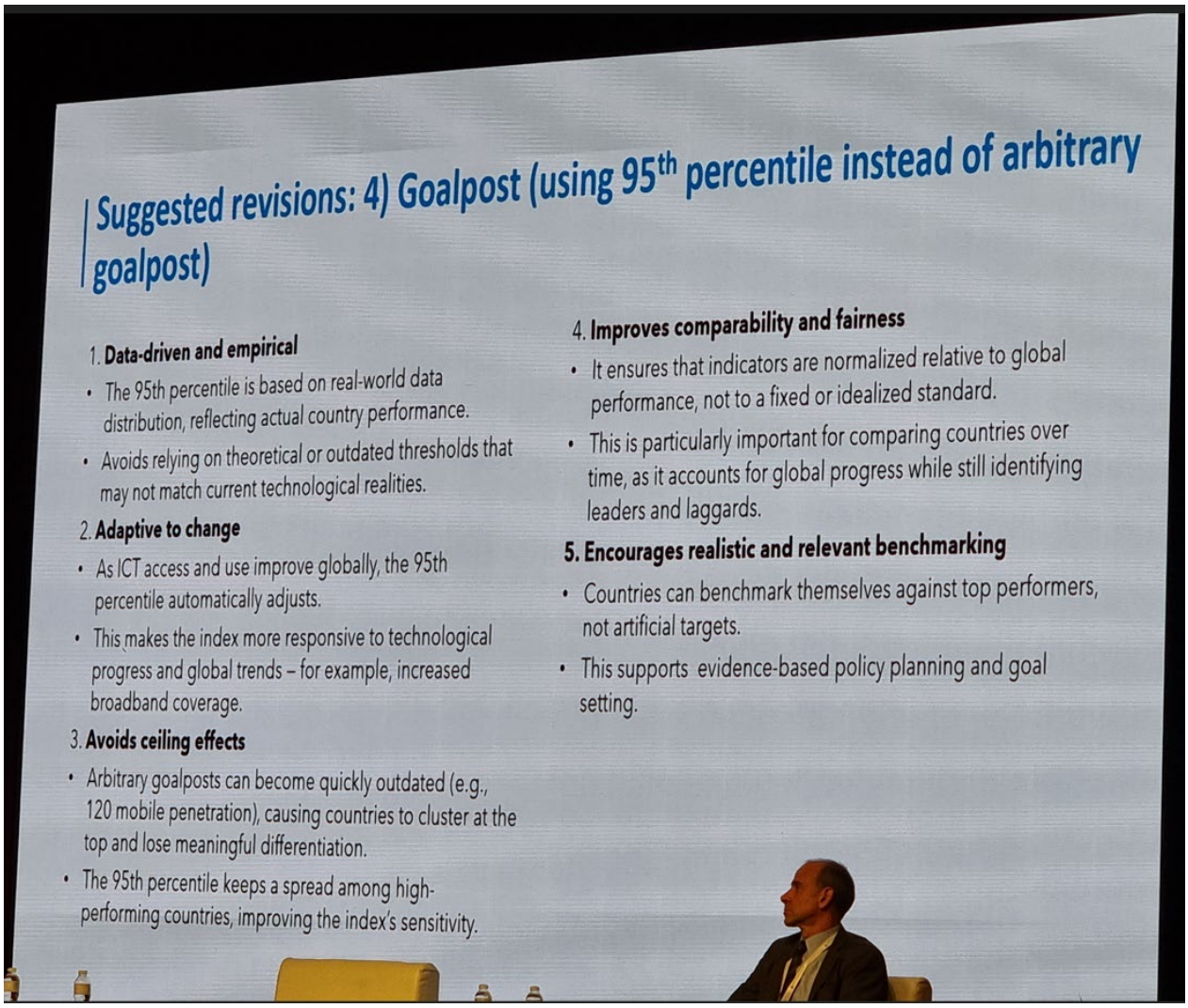
As indicated in the right column of Table 7, applying the goalposts and thresholds adjusts the distribution in a way that no additional outlier treatment is necessary for all but the two traffic indicators. These two indicators display logarithmic distributions, so the appropriate adjustment is applying a logarithmic transformation on the data.[21]

Table 7: Goalposts, thresholds, and outlier treatment

Indicator	Indicative threshold	Indicative goalpost	Additional treatment
Proportion of individuals who used the Internet	0%	95%	Not needed
Proportion of households with Internet access at home	0%	95%	Not needed
Active mobile-broadband subscriptions per 100 inhabitants	0%	95th percentile	Not needed
% of the population covered by at least a 3G mobile network	0%	100%	Not needed if the two coverage indicators are combined
% of the population covered by at least a 4G/LTE mobile network.	0%	100%	
Mobile broadband Internet traffic per mobile broadband subscriptions (GB)	Min. value	95th percentile, projected	apply log transformation
Fixed broadband Internet traffic per fixed broadband subscriptions (GB)	Min. value	95th percentile, projected	apply log transformation
Mobile data and voice high-consumption basket price (as % of GNI per capita) *	95th percentile	1%	Not needed
Fixed-broadband Internet basket price (as % of GNI per capita) *	95th percentile	1%	Not needed
Percentage of individuals owning a mobile phone**	0%	95%	Not needed

* The direction of the affordability indicators is reversed, hence score of 100 will be assigned to values *below* the goalpost. Scores of 0 will be assigned to values *above* the threshold.

[21] As standard practice, to retain valid 0's, the values are adjusted by a constant of 1 (a negligible value) before calculating the natural logarithm.



UN DESA EGDI, TII pillar, conference in Doha, April 2025