USAID
FROM THE AMERICAN PEOPLE

Composite Indicators:

An introduction to their development and use

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August 1, 2019

POLICY, PLANNING AND LEARNING

Agenda

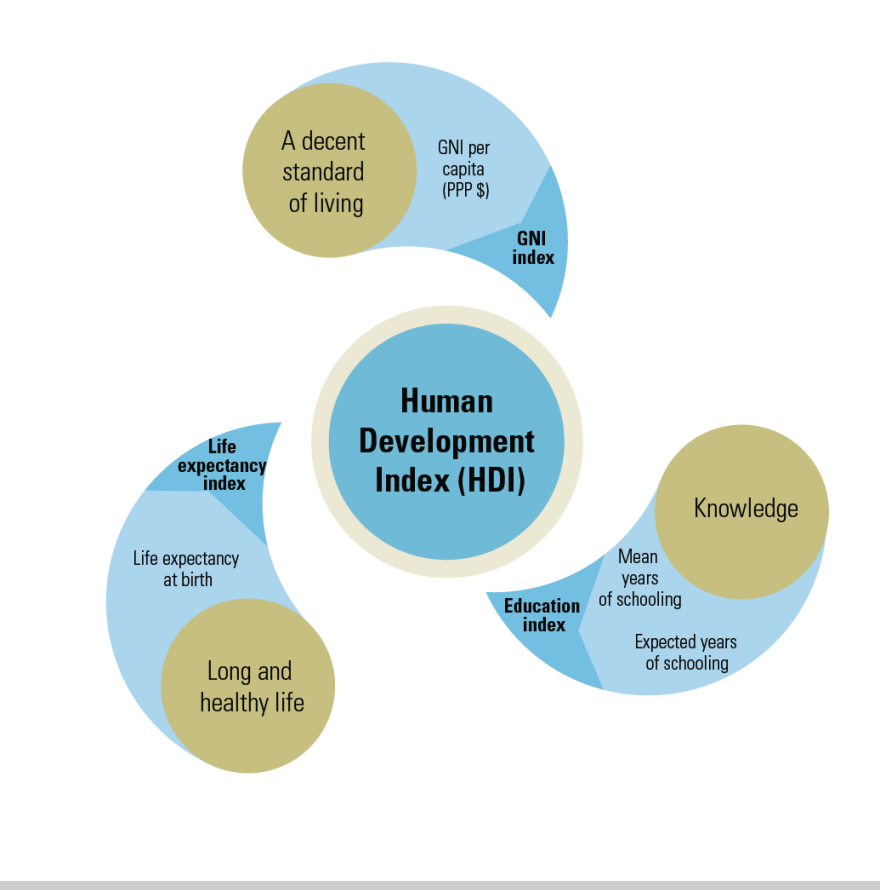
1. **Introduction to Composite Indicators**
    1. Definitions
    2. Strengths and limitations
    3. Use at USAID
2. **Composite Indicator Development**
    1. Conceptual Framework
    2. Indicator Selection
    3. Construction: Normalization, Weighting, and Aggregation
    4. Visualization
3. **Reviewing a Composite Indicator**
    1. Tradeoffs
4. **How to Learn More**
5. **Question Time**

Composite Indicator Definition

A **Composite Indicator (or Index)** combines two or more data sources into a single measure. They are often used for measuring results that are multidimensional in nature. Examples of commonly reported indices include the *Corruption Perceptions Index* and the *Women's Empowerment in Agriculture Index*.

- *Selecting Performance Indicators (USAID Monitoring Toolkit)*

Composite Indicator Example



Composite Indicator Strengths

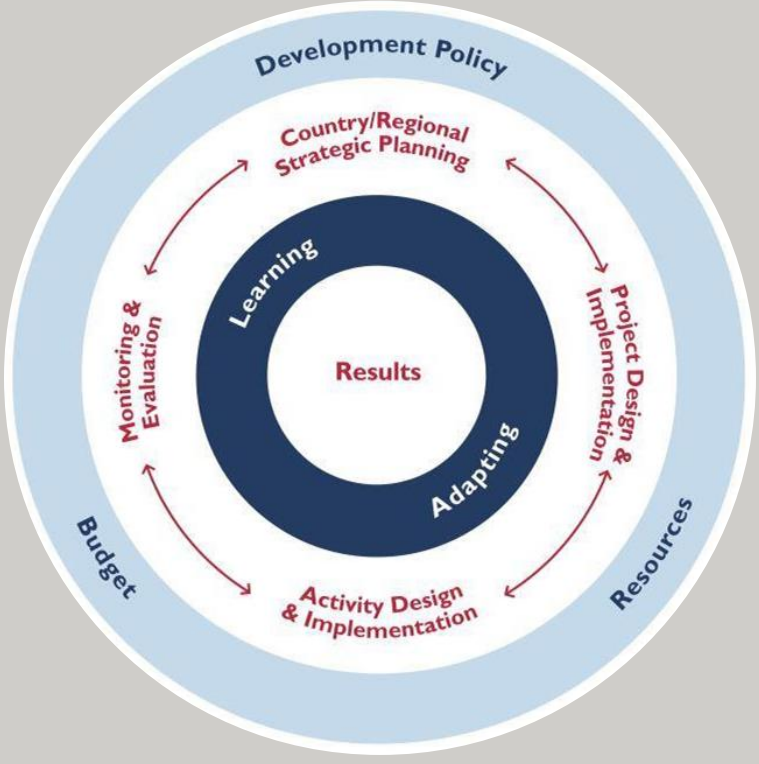
- Can summarize complex, multi-dimensional realities with a view to supporting decision-makers.
- Place complex issues of country, regional, municipal, or organizational performance at the center of the policy arena.
- Facilitate communication with general public (i.e. citizens, media, etc.) and promote accountability.
- Enable a wide range of users to compare complex dimensions effectively.

Composite Indicator Limitations and Pitfalls

- Can be a difficult and time intensive process to develop and use
- Aggregation may disguise important variation across cases and invite simplistic or inappropriate policy conclusions.
- Complexity of composite indicators may disguise poor measurement, weak conceptual framework, or biased intentions (e.g. to support a desired policy).

Composite Indicators at USAID

- The Self-Reliance Metrics
- USAID Program Cycle
- Standard Foreign Assistance Indicators

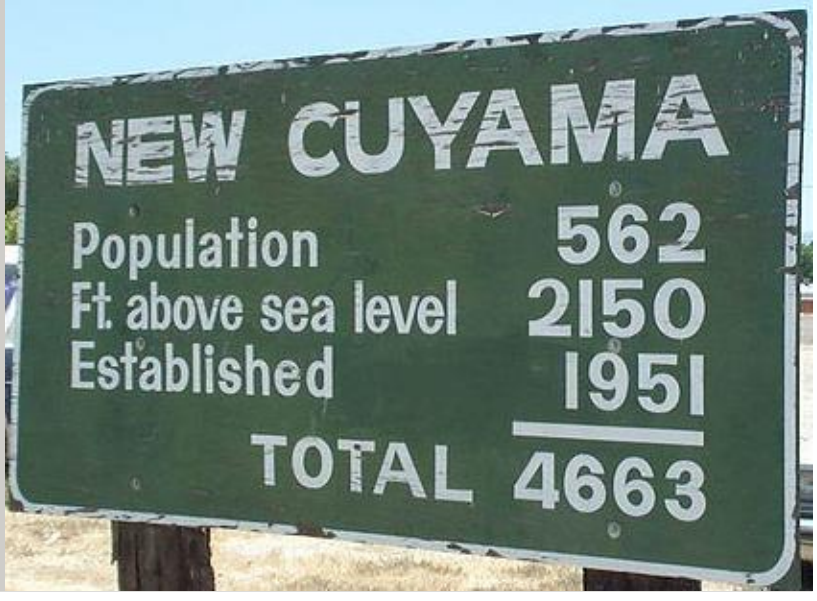


Composite Indicator Development

Conceptual Framework

The conceptual framework is the theoretical basis for the selection and combination of variables into a meaningful composite indicator

- Clarity of concept and purpose is essential
- Shaped by the developer's theories, empirical research, political philosophy, advocacy agenda, or some combination
- Development should (meaningfully) involve experts and affected stakeholders to maximize relevance and utility



Composite Indicator Development

Conceptual Framework Example — Economic Freedom Indices

Five Areas of Frasier Institute's Index of Economic Freedom

Area 1: Size of Government
As government spending, taxation, and the size of government-controlled enterprises increase, government decision-making is substituted for individual choice and economic freedom is reduced.

Area 2: Legal System and Property Rights
Protection of persons and their rightfully acquired property is a central element of both economic freedom and civil society. Indeed, it is the most important function of government.

Area 3: Sound Money
Inflation erodes the value of rightfully earned wages and savings. Sound money is thus essential to protect property rights. When inflation is not only high but also volatile, it becomes difficult for individuals to plan for the future and thus use economic freedom effectively.

Area 4: Freedom to Trade Internationally
Freedom to exchange—in its broadest sense, buying, selling, making contracts, and so on—is essential to economic freedom, which is reduced when freedom to exchange does not include businesses and individuals in other nations.

Area 5: Regulation
Governments not only use a number of tools to limit the right to exchange internationally, they may also develop onerous regulations that limit the right to exchange, gain credit, hire or work for whom you wish, or freely operate your business.

Four Pillars of Heritage Foundation's Index of Economic Freedom

Rule of law (property rights, judicial effectiveness, and government integrity);

Government size (tax burden, government spending, and fiscal health);

Regulatory efficiency (business freedom, labor freedom, and monetary freedom); and

Market openness (trade freedom, investment freedom, and financial freedom).

Composite Indicator Development

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FRASER INSTITUTE

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The Heritage Foundation

Composite Indicator Development

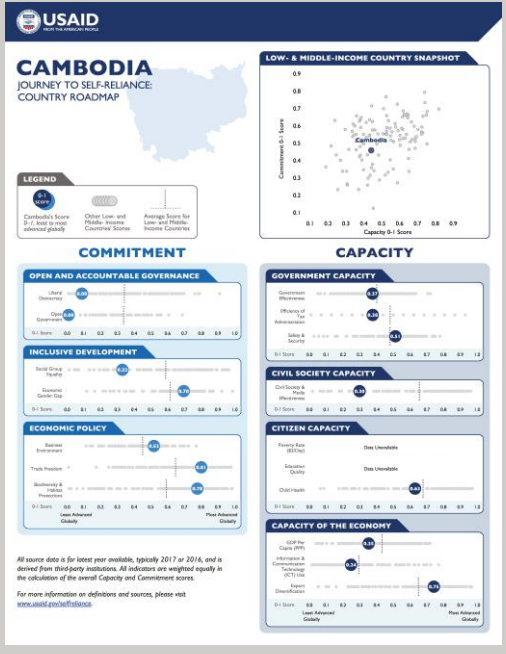
From Concept to Measurement – Indicator Selection

What to look for in an indicator candidate:

- *Analytical soundness*
- *Relevance to the phenomenon being measured*
- *Measureability*
- *Objectivity and reliability of source*
- *Comparability across subjects and over time*
- *Coverage across subjects and over time*
- *Relationship to other indicators in the framework*

Composite Indicator Development

Indicator Selection Example



Composite Indicator Development

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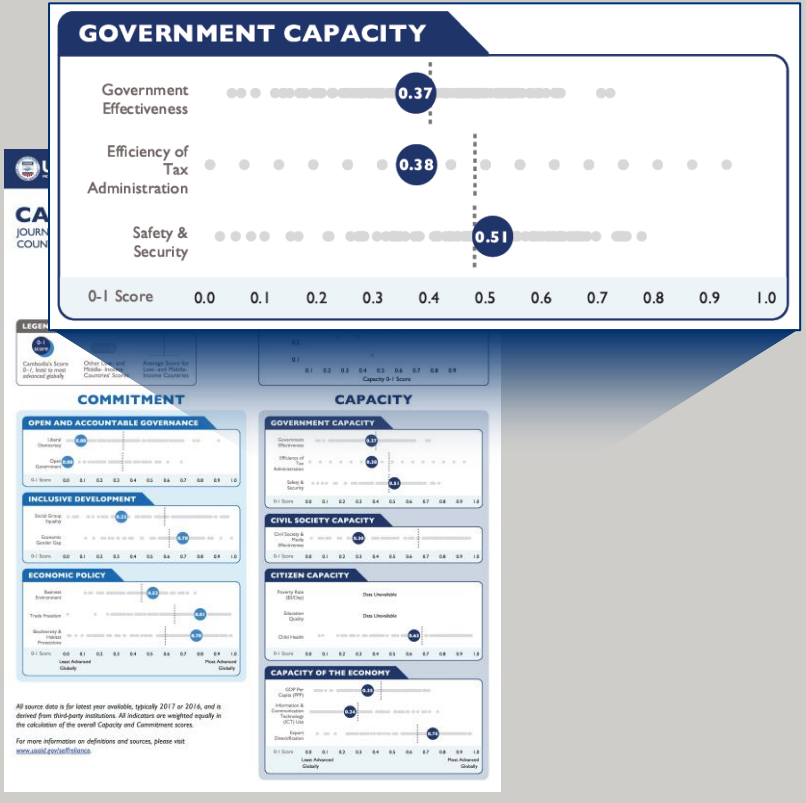

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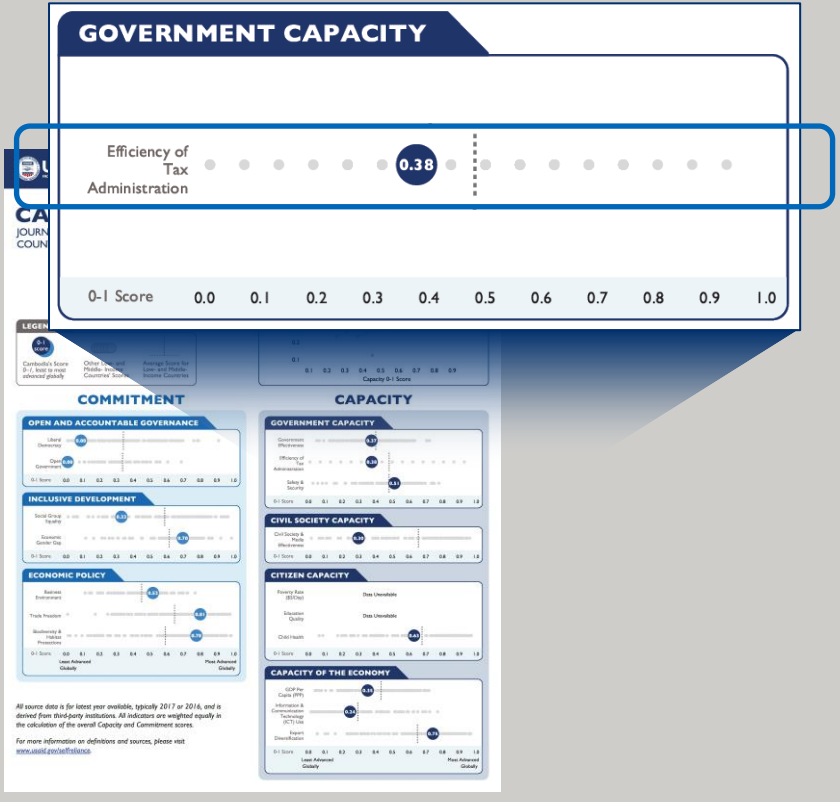

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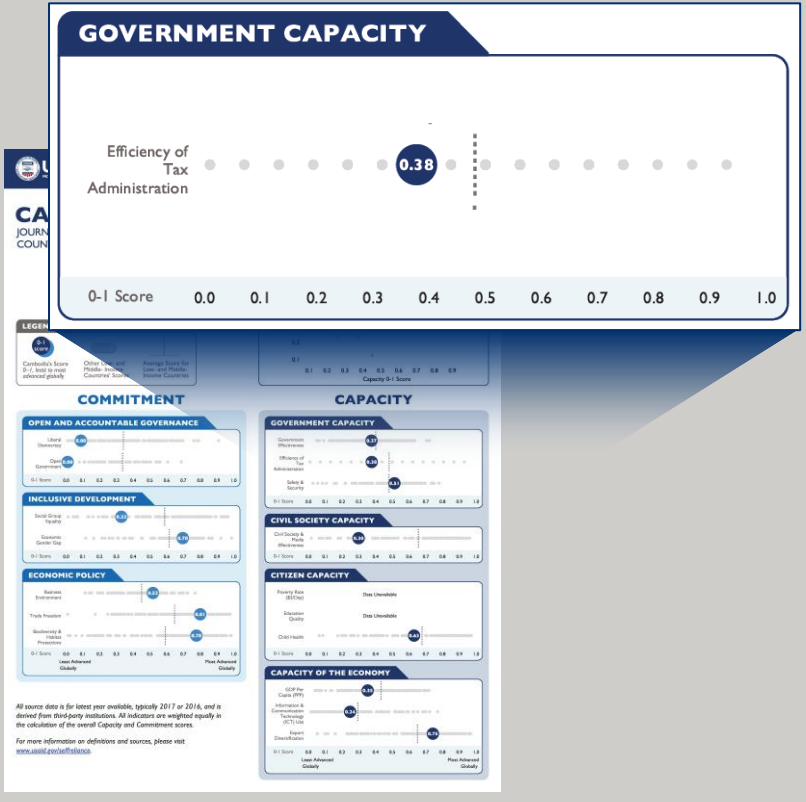
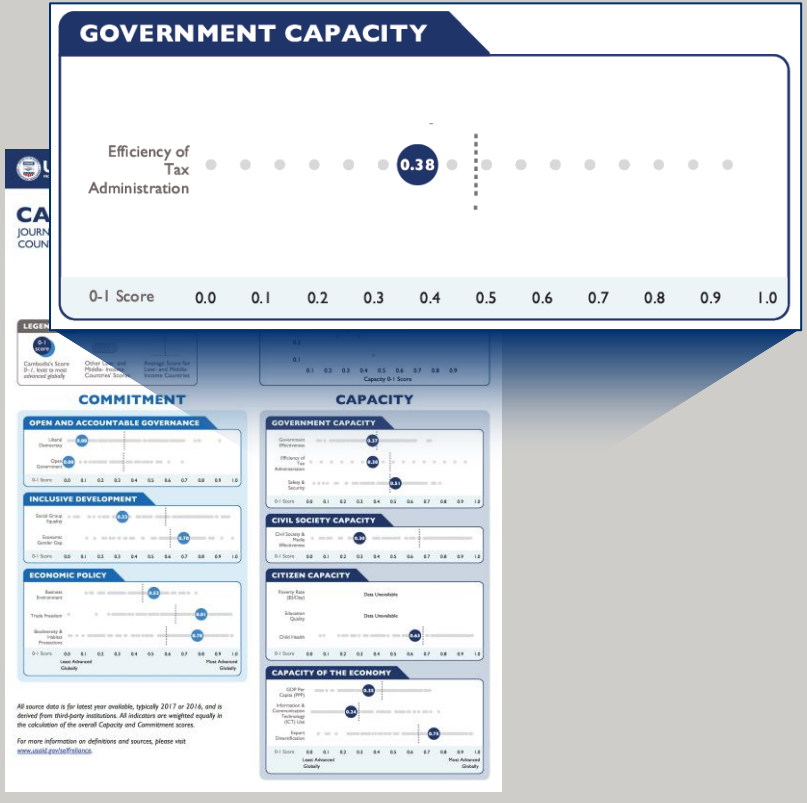


- Gov't Tax Revenue (% of GDP)
- WB Paying Taxes
- IPD Efficiency of Tax Admin.
- CPIA Efficiency of Revenue Mobilization
- USAID CTD Tax Effort

Composite Indicator Development

Indicator Selection Example



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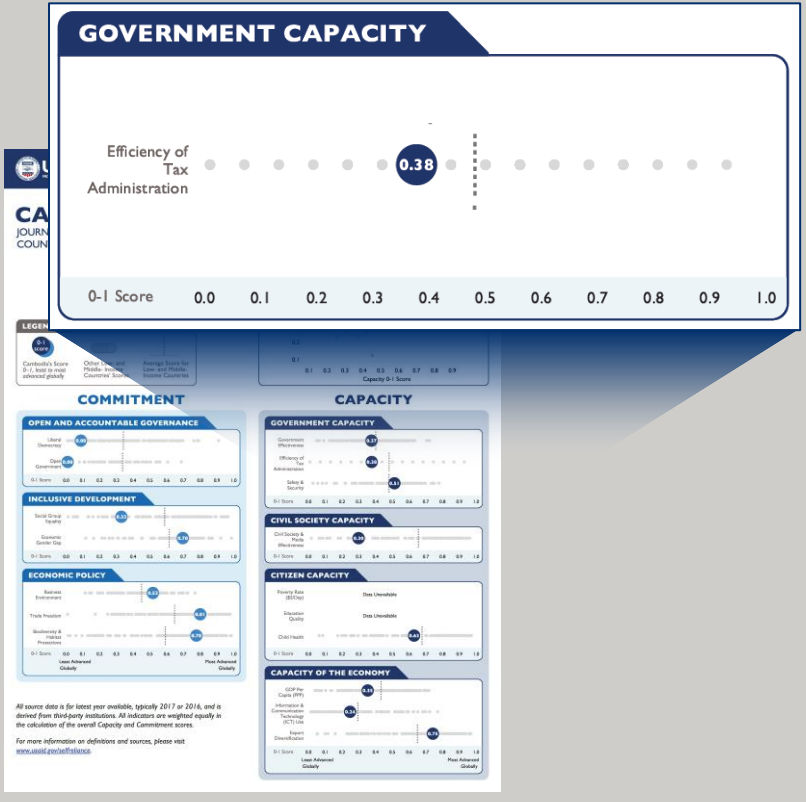

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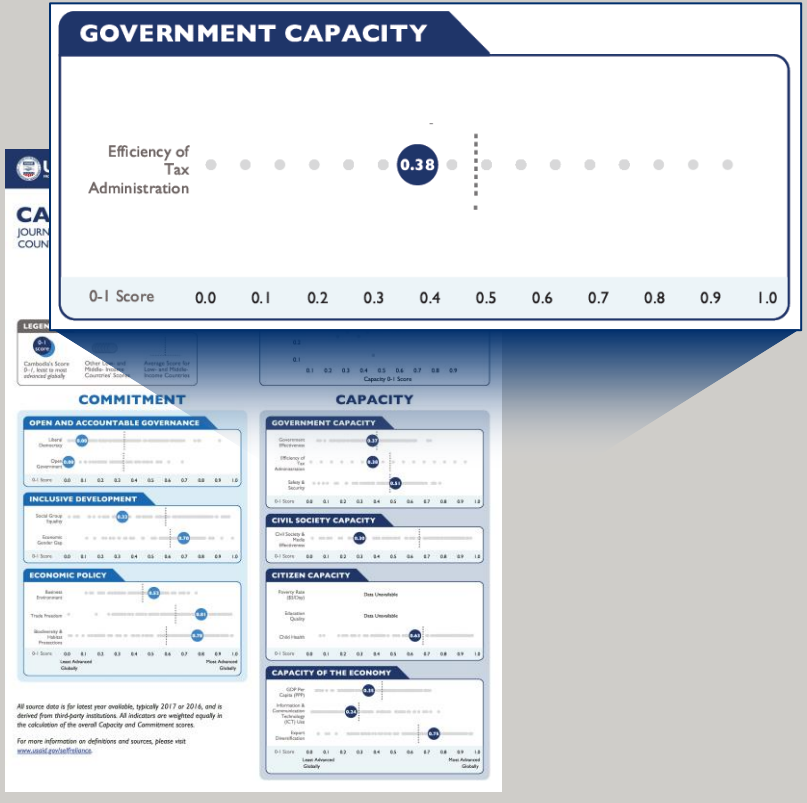

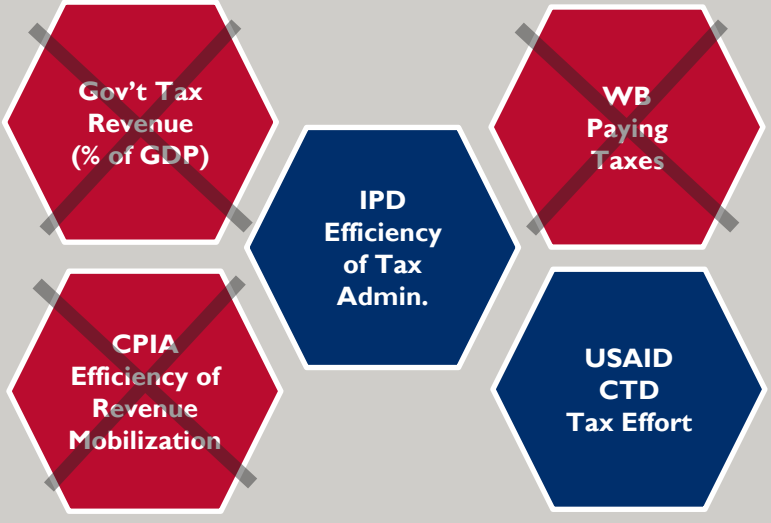

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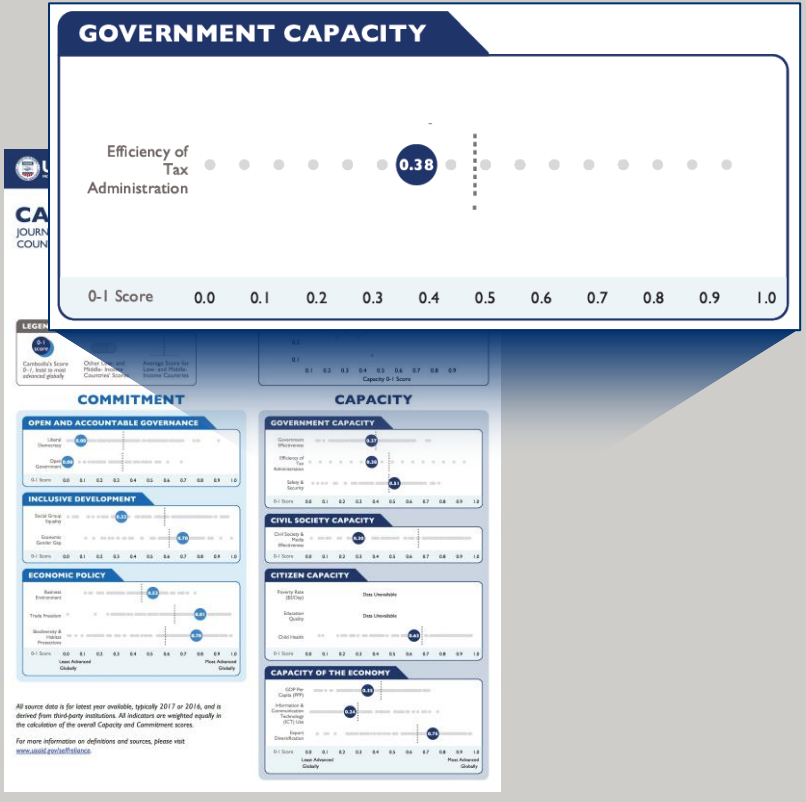

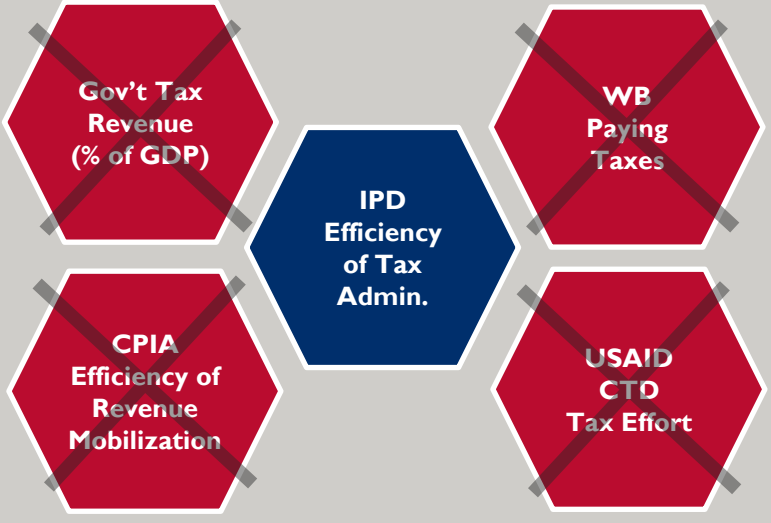

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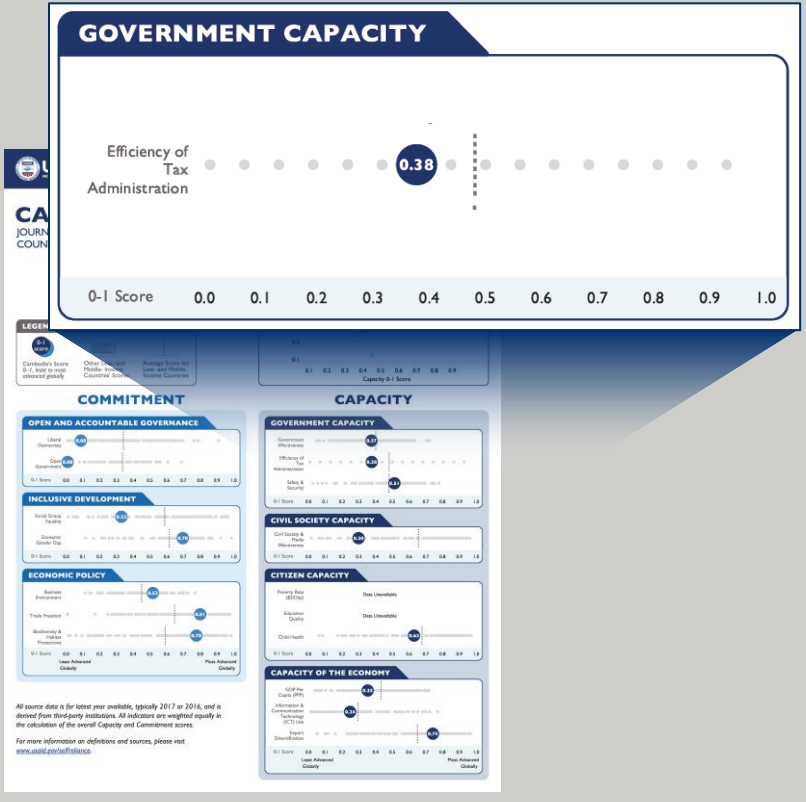

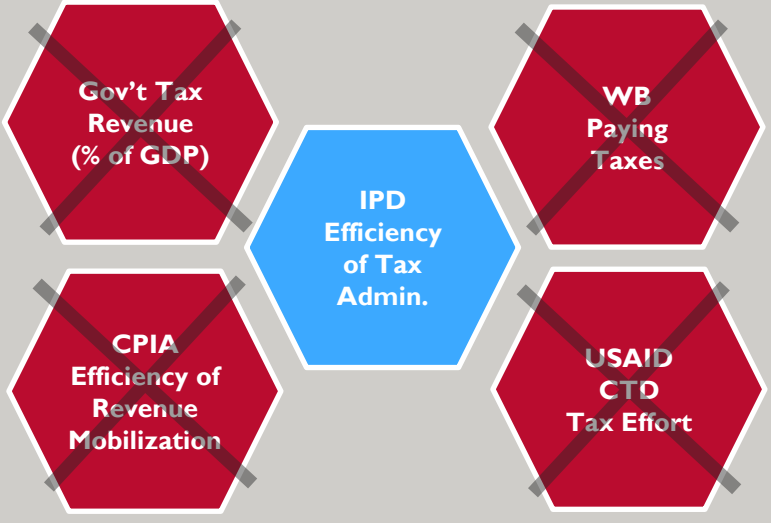

Composite Indicator Construction

Normalization

Normalization is the process of transforming the measurement units of each variable so that they are on the same scale.

Some common approaches:

1. ***Rank***

$$x' = Rank(x)$$

2. ***Min-Max method***

$$x' = \frac{x - min(x)}{max(x) - min(x)}$$

3. ***Standard scores (or Z-scores)***

$$x' = \frac{x - mean(x)}{Stand\_dev(x)}$$

Others: binary, categorical, distance from reference point, etc.

Composite Indicator Construction

Normalization

Regional Generosity Index

Region	Percent persons who volunteer time	Charitable donations per capita	Regional Generosity Index
North	5%	$203	
Northeast	28%	$87	
East	14%	$119	
Southeast	6%	$142	
South	32%	$195	
Southwest	12%	$53	
West	21%	$507	
Northwest	5%	$321	

Composite Indicator Construction

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Composite Indicator Construction

Normalization

Min-Max formula:

$$x' = \frac{x - min(x)}{max(x) - min(x)}$$

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Min-Max formula:

$$x' = \frac{x - min(x)}{max(x) - min(x)}$$

East - volunteer score:

$$\text{East} = \frac{\mathbf{14} - 5}{32 - 5}$$

$$\text{East} = .33$$

Composite Indicator Construction

Normalization

Regional Generosity Index

Region	Percent persons who volunteer time *(normalized)*	Charitable donations per capita	Regional Generosity Index
North	0.00	$203	
Northeast	0.85	$87	
East	**0.33**	**$119**	
Southeast	0.04	$142	
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$$\text{East} = .33$$

East - donations score:

$$\text{East} = \frac{\mathbf{119} - 53}{507 - 53}$$

$$\text{East} = .15$$

Composite Indicator Construction

Normalization

Regional Generosity Index

Region	Percent persons who volunteer time *(normalized)*	Charitable donations per capita *(normalized)*	Regional Generosity Index
North	0.00	0.33	
Northeast	0.85	0.07	
East	**0.33**	**0.15**	
Southeast	0.04	0.20	
South	1.00	0.31	
Southwest	0.26	0.00	
West	0.59	1.00	
Northwest	0.00	0.59	

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Composite Indicator Construction

Normalization + Weighting & Aggregation

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East - donations score:

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East – Generosity score:

$$\text{East} = \frac{.33 + .15}{2}$$

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Northwest	0.00	0.59	0.30

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Composite Indicator Construction

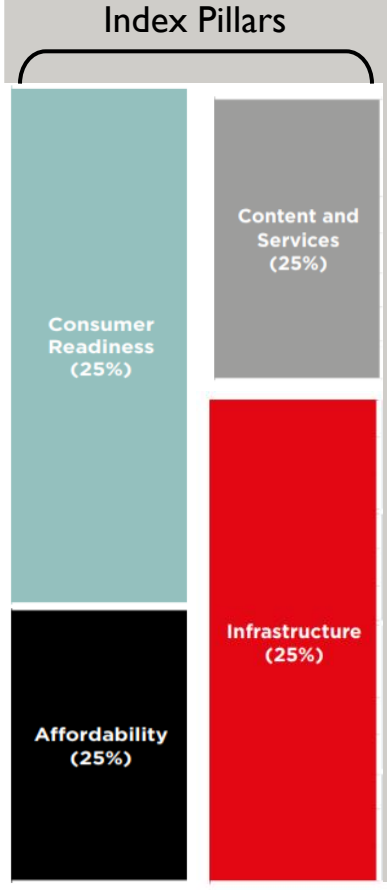
Weighting & Aggregation

Weighting is the process of assigning importance ("weight") to each variable in an index's conceptual framework to facilitate aggregation

- All weighting schemes are inherently value judgements
- Can be based on statistical models, participatory methods, or the author's discretion
- Equal weighting does not mean "no weights"
- If two variables overlap conceptually and correlate highly, there is high risk of "double-counting"
- Key to aggregate up to a level that is meaningful for users

Composite Indicator Construction

Weighting & Aggregation Example – GSMA Mobile Connectivity Index



Composite Indicator Construction

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Index Pillars	Sub-Pillars	Indicators
Content and Services (25%)	Local relevance (40%)	Generic Top-Level Domains (gTLDs) and Country Code Top-Level Domains (ccTLD) per person (20%)
		Online Service Index score for E-Government (20%)
		Mobile social media penetration (30%)
		Mobile apps developed per person (30%)
	Availability (40%)	Number of mobile apps available in national language(s) (50%)
		Accessibility of the most popular mobile apps (50%)
	Security (20%)	ITU Global Cybersecurity Index (100%)
Infrastructure (25%)	Network coverage (30%)	2G Coverage (20%)
		3G Coverage (40%)
		4G Coverage (40%)
	Network performance (30%)	Average mobile download speeds (33%)
		Average mobile upload speeds (33%)
		Average mobile latencies (33%)
	Other enabling infrastructure (20%)	Access to electricity (% of population) (30%)
		International internet bandwidth per internet user (30%)
		Secure Internet Servers per 1 million people (30%)
		Internet Exchange Points (IXPs) per 10 million people (10%)
	Spectrum (20%)	Digital dividend spectrum per operator (45%)
		Other sub-1GHz spectrum per operator (20%)
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Composite Indicator Construction

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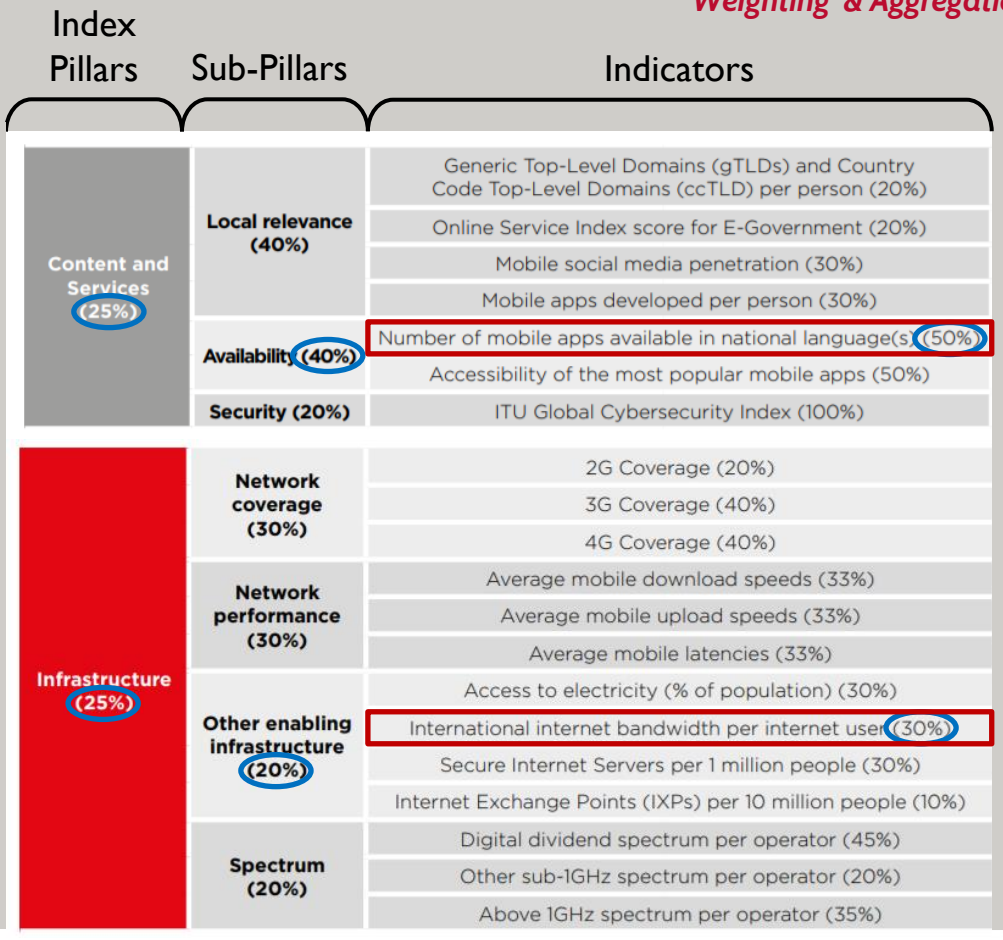
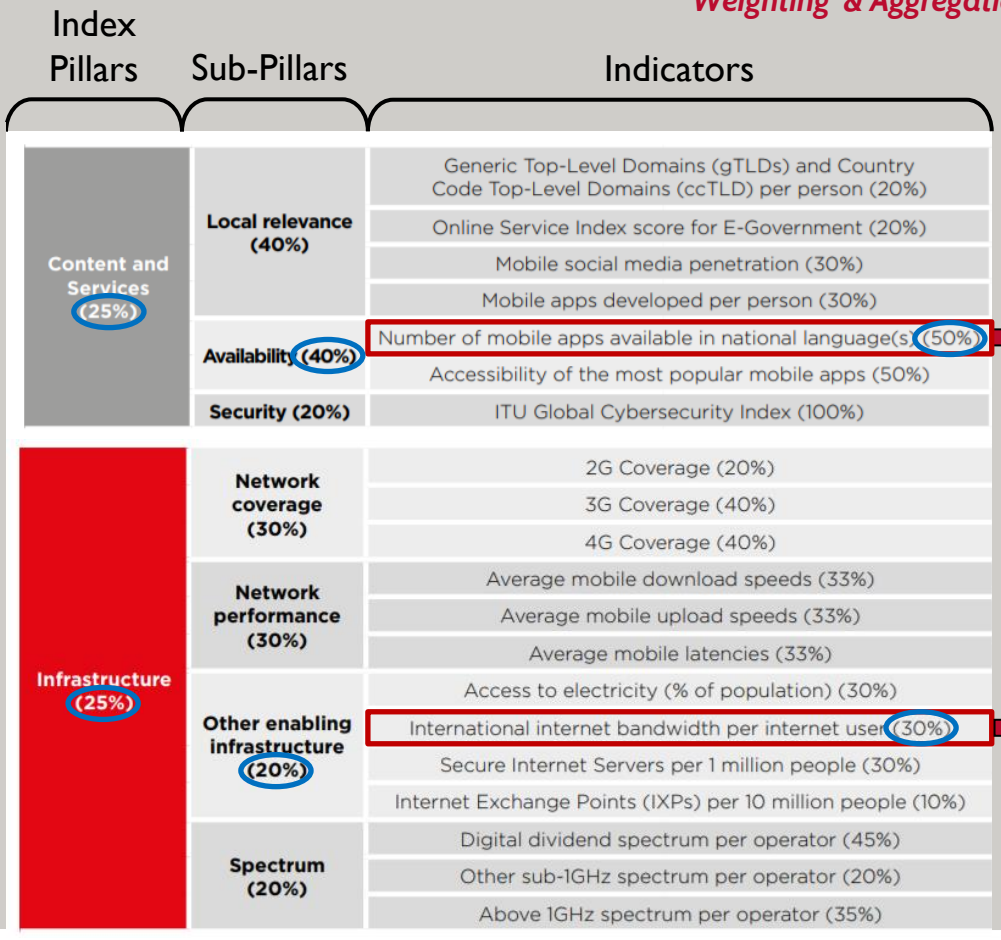


Composite Indicator Construction

Weighting & Aggregation Example – GSMA Mobile Connectivity Index



50% of 40% of 25% = **5% weight in overall Mobile Connectivity Index**

30% of 20% of 25% = **1.5% weight in overall Mobile Connectivity Index**

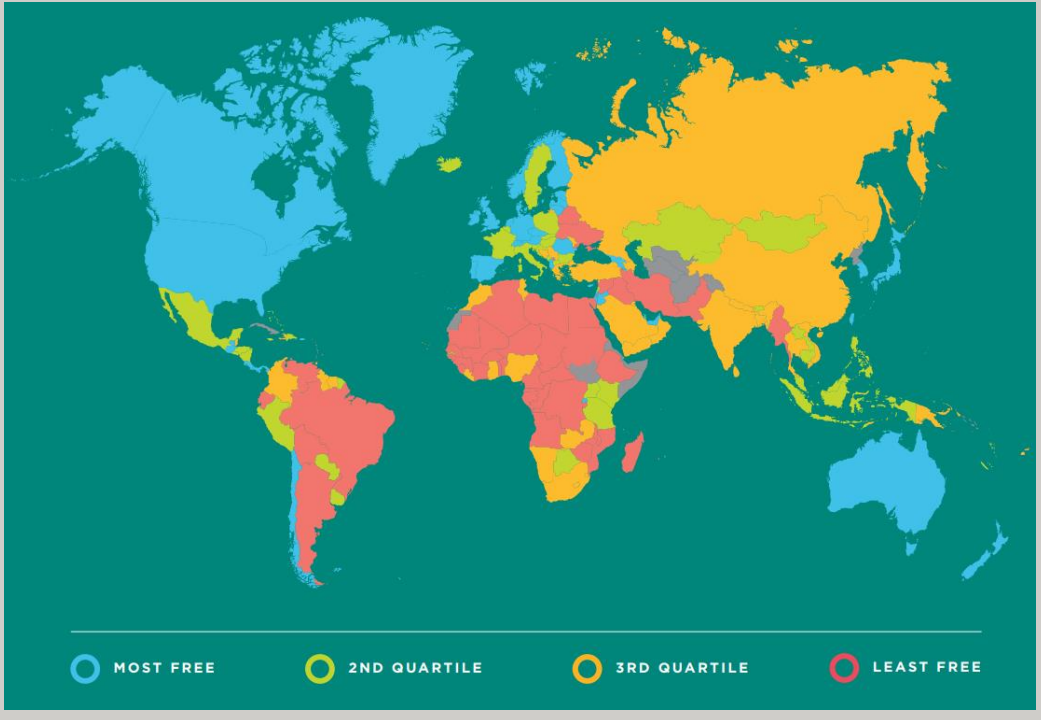
Composite Indicator Visualization

- Helps users interpret and analyze the results
- Communicates a story to decision-makers quickly and accurately (ideally)
- Can be used to reinforce the structure of the conceptual framework

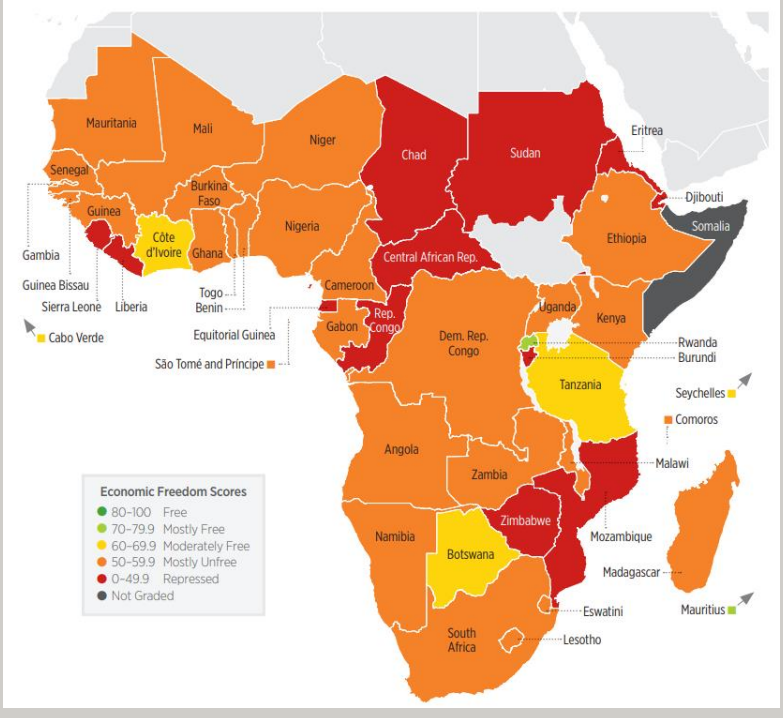
Composite Indicator Visualization

Example – Index of Economic Freedom Summary Results

Frasier Institute



Heritage Foundation

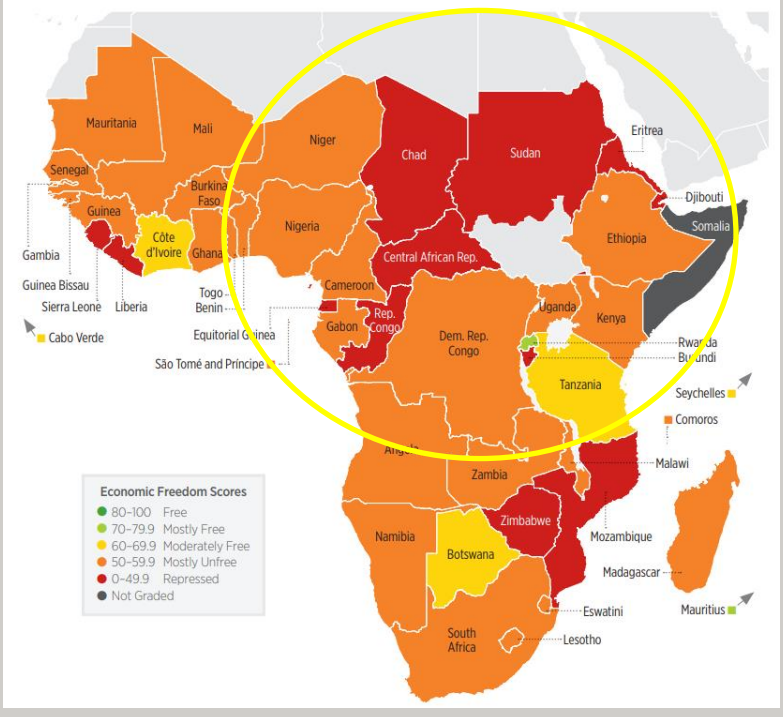


Composite Indicator Visualization

Example – Index of Economic Freedom Summary Results

Frasier Institute

Heritage Foundation

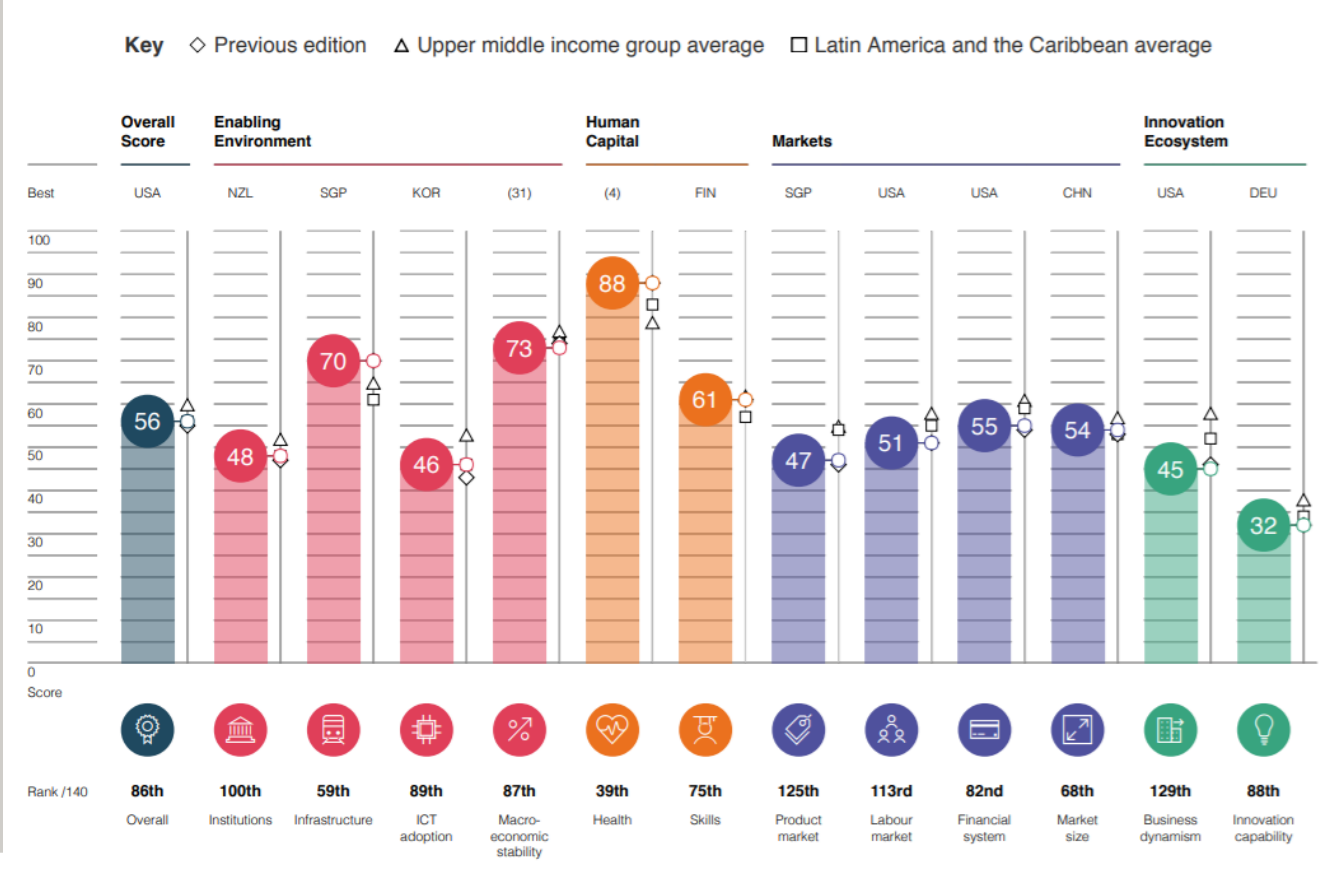


Composite Indicator Visualization

"Decomposition" Example

World Economic Forum

Global Competitiveness Index



Reviewing a Composite Indicator

The Composite Indicators Checklist

- The Big Picture
- Indicator Construction
- Trade-offs

The Composite Indicators Checklist (DRAFT)

This Review Template is to be used when developing or reviewing a composite indicator (Index). A composite indicator combines two or more data sources into a single measure. They are often used for measuring results that are multidimensional in nature.

Name of Composite Indicator:

Reviewed by: Date of Review:

Big Picture	**1. Credible Conceptual Framework** The conceptual framework is the theoretical basis for the selection and combination of variables into a meaningful composite indicator. Does the conceptual framework make sense? Is it supported by the academic literature?
	2. Interpretable Is it clear how one is supposed to interpret a unit change in the composite indicator? Are the examples of the minimum, mean, and maximum of the composite indicator meaningful?
	3. Added Value How does this composite compare to other measures of the concept it purports to measure or similar concepts? Are the differences meaningful and does this composite indicator add value over other existing measures?
	4. Utility Is there a use for the indicator? Is it clear if it is supposed to describe a phenomenon or predict a phenomenon?
Trade offs	**5. Simplicity vs Complexity** Does the measure strike the right balance between (1) capturing the complexity of the concept measured and (2) providing a measure that is simple enough to be accessible and easily understood?
	6. Relevance vs Continuity Does the measure strike the right balance between (1) keeping its design up to date with current thinking and newly available measures, and (2) ensuring continuity of the composite indicator to enable comparisons over time.
	7. Coverage vs Precision Does the measure strike the right balance between (1) including the best, most precise measures of the phenomenon, and (2) ensuring that included measures have a wide coverage across the units of analysis and over time.
	8. Costs vs Benefits of Aggregation Does the measure strike the right balance between (1) the overall costs required to develop and maintain the composite indicator, and (2) The benefits of creating a single measures of a multidimensional concept.
Construction	**9. Indicator Selection** Are the decisions regarding indicator selection documented? Are each of the individual indicators selected for inclusion in the composite indicator analytically sound, objective, reliable, and relevant?
	10. Missing Data Is the extent of missing data and how it was addressed documented? Are missing data handled appropriately?
	11. Normalization Is the method of normalization documented? Is a method of normalization chosen that is appropriate for the composite indicator?
	12. Weighting and Aggregation Are the method of weighting and aggregation documented? Are the methods of weighting and aggregations appropriate for the composite indicator?

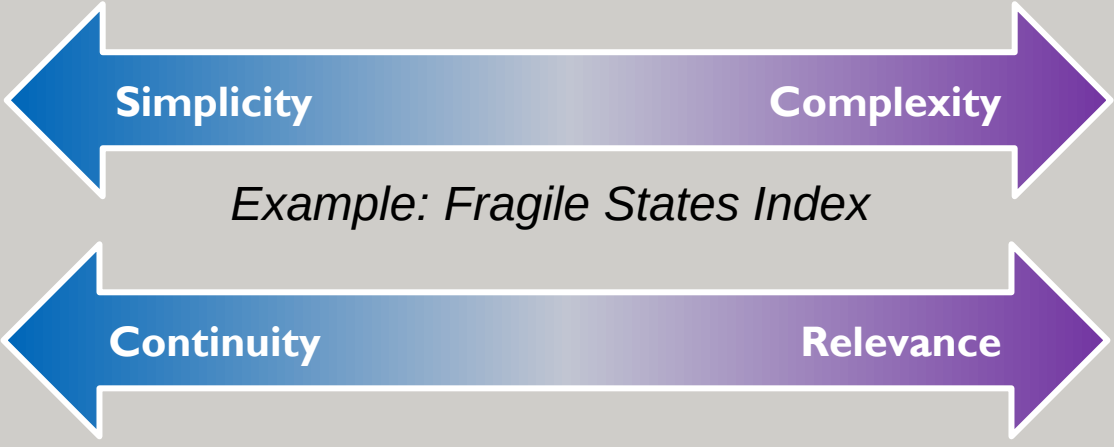
Composite Indicator Construction

Key Tradeoffs

Example: Fragile States Index

Composite Indicator Construction

Key Tradeoffs



Composite Indicator Construction

Key Tradeoffs

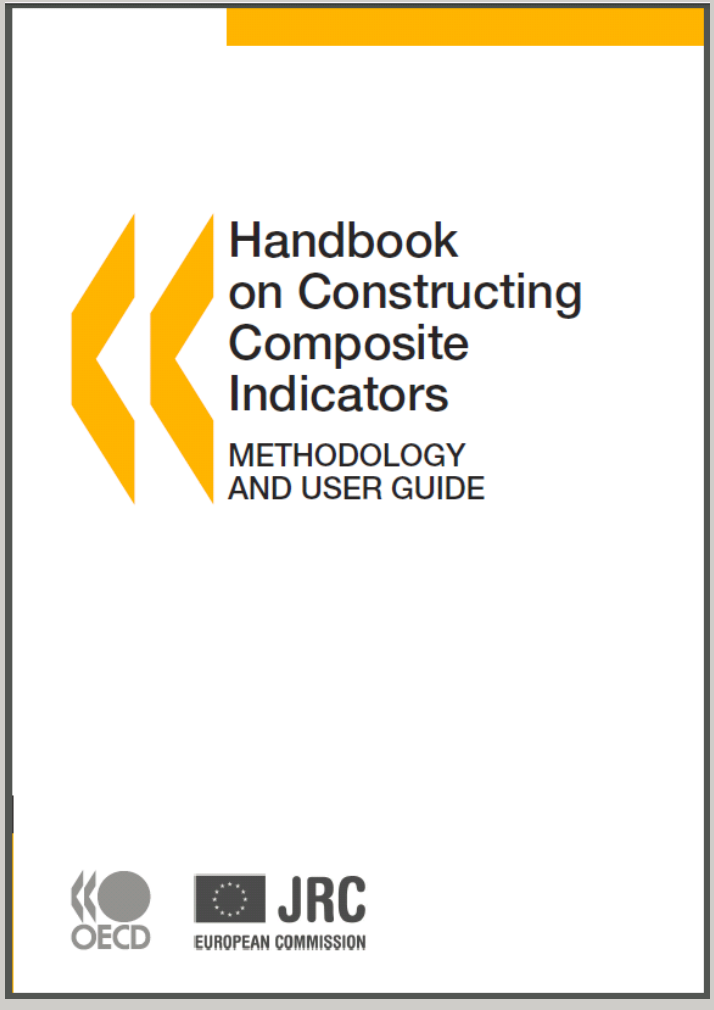
Example: Fragile States Index

Example: World Bank Doing Business Index

Example: World Justice Project Rule of Law Index

How to Learn more about Composite Indicators:

1. Download the OECD Handbook on Constructing Composite Indicators
2. Read the methodology section of your favorite (well-documented) composite indicator
3. Search for and read critiques of your favorite composite indicator
4. Check out some of the resources at the end of this slide deck.



Questions?

Composite Indicator Resources

Readings

- OECD Handbook on Constructing Composite Indicators
- Mashup Indices of Development by Martin Ravallion
- Building and Running an Effective Policy Index: Lessons from the Commitment to Development Index by David Roodman, Center for Global Development

Data Portals

- USAID International Data & Economic Analysis (IDEA) portal
- USAID Journey to Self-Reliance Secondary Metrics Compendium
- World Bank DataBank

Other Resources

- Data Viz Project