

Measuring social outcomes

1990-2020



for

170 countries

SOCIAL PROGRESS INDEX
TIME SERIES

Methodology Summary

**SOCIAL
PROGRESS
IMPERATIVE**

Acknowledgements

Constructing the Social Progress Index Time Series was a tremendous effort which involved over two years of desk research, data collection, cleaning, calculations, results verifications, and data visualizations. This would not have been possible without the leadership of Michael Green and Luke Greeves, alongside the Board of Directors, and support from all our colleagues. We would like to thank Mohamed Htitch for his amazing research support, Balaaj Ahmad Mustafa for his excellent work on data visualizations, and Sophie Sutherland & the entire communications team for their editorial support and ensuring a smooth communications and design process.

Suggested Citation

Index and Data

Harmacek, J., and Krylova, P. (2023): Social Progress Index Time Series: Measuring Social Outcomes 1990-2020. Social Progress Imperative. Washington, DC.

Methodology

Harmacek, J., and Krylova, P. (2023): Social Progress Index Time Series: Methodology Summary. Social Progress Imperative. Washington, DC.

Contact

For methodological queries regarding the Index, please contact Jaromir Harmacek (jharmacek@socialprogress.org). For any other queries, please contact Sophie Sutherland (ssutherland@socialprogress.org) or visit our website www.socialprogress.org.

Social Progress Index Time Series

Methodology Summary

- Introduction 3
- Social Progress Principles 4
- Dimensions of Social Progress 5
- Components of Social Progress 6
- Indicator Selection 7
- Indicator Transformations 9
 - A. *Capped Indicators* 9
 - B. *Transformed Indicators* 9
- Determining the Country Sample 9
- Index Calculation 10
 - A. *Missing Values* 10
 - B. *Standardization* 10
 - C. *Component Scores* 11
 - D. *Dimension Scores* 11
 - E. *Index Scores* 12
 - F. *World Score Calculation, Regional Aggregations* 12
- Structural Integrity of the Index 13
- Conclusion 13
- Bibliography and Further Reading 14

Introduction

The Social Progress Index is a well-established measure, published annually since 2013, that is meant to catalyze improvement and drive action by presenting social outcome data in a useful and reliable way. Composed of multiple dimensions, the Social Progress Index can be used to benchmark success and provide a holistic, transparent, outcome-based measure of a country’s wellbeing based solely on social or environmental indicators. Policymakers, businesses, and countries’ citizens alike can use it to compare their country against others on different facets of social progress, allowing the identification of specific areas of strengths or weaknesses.

The Social Progress Index Time Series brings a new, unprecedented perspective: it measures social outcomes of countries from 1990 until 2020. It offers a unique tool that allows businesses, policymakers, and citizens all over the world to compare countries’ development over a longer time period in different areas of social progress.

The Social Progress Index Time Series combines 52 social and environmental outcome indicators, and fully ranks 170 countries globally. For these countries, all component and dimension scores are calculated for all years over the 1990-2020 period. Two more countries – that have gained their independence in the 2000s – have all scores available but only for the years of their sovereign existence. The Index also partially covers additional 24 countries, providing component and dimension scores when enough data are available. In all, the Social Progress Index Time Series measures at least some aspects of social progress across more than 99.9% of the world’s population.

This report describes the methodology used to calculate the Social Progress Index Time Series. We start by describing the principles that establish the conceptual architecture of the Index and provide an overview of the framework and then we detail the steps taken to select data and calculate the Index.

Social Progress Principles

We define ‘social progress’ as *the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential.* This definition, established in consultation with a group of academic and policy experts, drives the framework of the Social Progress Index. It alludes to three broad elements of social progress, which we refer to as dimensions: Basic Human Needs, Foundations of Wellbeing, and Opportunity. Under each dimension are four components whose underlying concepts relate to and are guided by questions we seek to answer with available data (see Figure 1). Each component is further defined by a set of outcome indicators that respond to the conceptual questions posed.

Figure 1 / Social Progress Index Component-Level Framework



Together, these interrelated elements combine to produce a given level of social progress. The Social Progress Index methodology allows measurement of each component and each dimension, yielding an overall score and ranking.

Our approach builds on a long line of work constructing country indexes to measure and assess various facets of economic and social performance. However, the Social Progress Index is distinct in its core methodological choices:

- A focus on non-economic dimensions of national performance.
- A measurement approach based on outcome indicators, rather than input measures.
- A holistic framework consisting of three broad dimensions of social progress, each of which is the sum of four equally weighted components.
- Calculation of each component as the weighted sum of a series of measures, with the weights determined through the principal component factor (PCF) method.

The Social Progress Index is explicitly focused on non-economic aspects of national performance. Unlike most other national measurement efforts, we treat social progress as distinct though associated with more traditional economic measures such as GDP per capita. In contrast, other indices such as the Human Development Index or OECD Better Life Index combine economic and social indicators. Our objective is to utilize a clear yet rigorous methodology that isolates the non-economic dimensions of social performance.

The Social Progress Index aims to be as outcome-based as possible. Both input and outcome-based indexes can help countries benchmark their progress, but in very different ways. Input indexes measure a country's policy choices or investments believed (or known) to lead to an important outcome, while outcome indexes directly measure the outcomes of these decisions or investments. Input indexes also require a degree of consensus about how inputs lead to outcomes, as well as a process to calibrate the relative importance of different input factors against outcome measures. In the field of social progress, this would mean a clear consensus and understanding of which inputs lead to better social outcomes—a field of research that is still growing and to which the Social Progress Index continues to contribute.

When there are multiple output measures or a lack of consensus on all the inputs that matter, or when data related to inputs are highly incomplete, an outcome-oriented index may be more appropriate (Fleurbaey and Blanchet, 2013). Following this logic, we designed the Social Progress Index as an outcome index. The Social Progress Index has been designed to aggregate and synthesize multiple outcome measures in a conceptually consistent and transparent way that will also be useful for decision-makers benchmarking progress. The Social Progress Imperative continues to explore the role of input measures and policies in determining a country's performance.

Dimensions of Social Progress

At the topmost level of the framework, we synthesize three distinct though related questions that, taken together offer insight into the level of social progress:

- 1) Does a country provide for its people's most essential needs?
- 2) Are the building blocks in place for individuals and communities to enhance and sustain wellbeing?
- 3) Is there opportunity for all individuals to reach their full potential?

Each of these questions describes a dimension of social progress, respectively: Basic Human Needs, Foundations of Wellbeing and Opportunity. The first dimension, Basic Human Needs, assesses a population's capacity to survive with adequate nourishment and basic medical care,

clean water, sanitation, adequate shelter, and personal safety. These needs are still not met in many developing countries and are often incomplete in some more prosperous countries.

Basic needs have been the predominant focus of research in development economics, but the second dimension of social progress, Foundations of Wellbeing, deserves equal attention. It highlights the extent to which a country's residents can gain a basic education, obtain information and communicate freely, benefit from a modern healthcare system, and live in a healthy environment conducive to a long life. Nearly all countries struggle with at least one of these aspects.

Finally, any discussion of social progress must also include whether a country's population have the freedom and opportunity to make their own choices and pursue higher education. Personal rights, personal freedom and choice, inclusiveness, and access to advanced education all contribute to the level of opportunity within a given society. This dimension of the Social Progress Index is perhaps the most controversial and most difficult to measure. Nonetheless, it is important to highlight that societies, high-income or low-income, developed or developing, still struggle to meet the moral imperative to guarantee the equality of opportunity for all citizens.

The multi-dimensional construction of the Social Progress Index should not be interpreted as a step-by-step movement toward progress from one dimension to the next. Rather, the three dimensions are interrelated and, in fact, statistically correlated. While we distinguish between these three aspects of social progress, many issues they encompass interact with one another to drive more meaningful change.

Components of Social Progress

Under each dimension are four components. Components, like dimensions, are categories of outcomes, rather than specific outcomes themselves. Each component highlights a separate aspect of the overall set of outcomes that make up a dimension, building on both academic and policy literature. For example, the Opportunity dimension includes the components Personal Rights, Personal Freedom and Choice, Inclusiveness, and Access to Advanced Education. Each of these components describes a related, but distinct aspect of what it means for a society to guarantee opportunity among its population. The Personal Rights and Access to Advanced Education components describe the extent to which individuals can pursue their own objectives to the best of their ability. Personal Freedom and Choice and Inclusiveness, on the other hand, describe the extent of limits on individuals. Together, the four components offer a conceptually coherent way of capturing how societies can empower (or limit) an individual's autonomy, freedom, and ability to progress.

The twelve components represent what we believe to be the most complete set of outcome categories given our current understanding of social progress from diverse literature and given the current availability of data. The Social Progress Imperative Advisory Board provided input into selecting the dimensions and the elaboration of the components within each dimension, along with an iterative review of relevant literature.

The framework was established in 2013, and we continue to ensure its relevance each year. We consult extensively with experts across disciplines on the twelve-component structure of the Social Progress Index on an ongoing basis, ensuring it continues to capture the principal aspects of human wellbeing and that the issues measured are comprehensive and apply to all societies, regardless of their country's level of economic development, political stature, or geography.

Indicator Selection

At the most granular level of the Social Progress Index framework, we identify multiple independent outcome measures – indicators – related to each component. Each set of indicators, grouped by component, defines, and measures the same aspect of social progress. The Social Progress Index Time Series includes 52 social and environmental indicators, with 3-6 indicators per component (see Figure 2.)

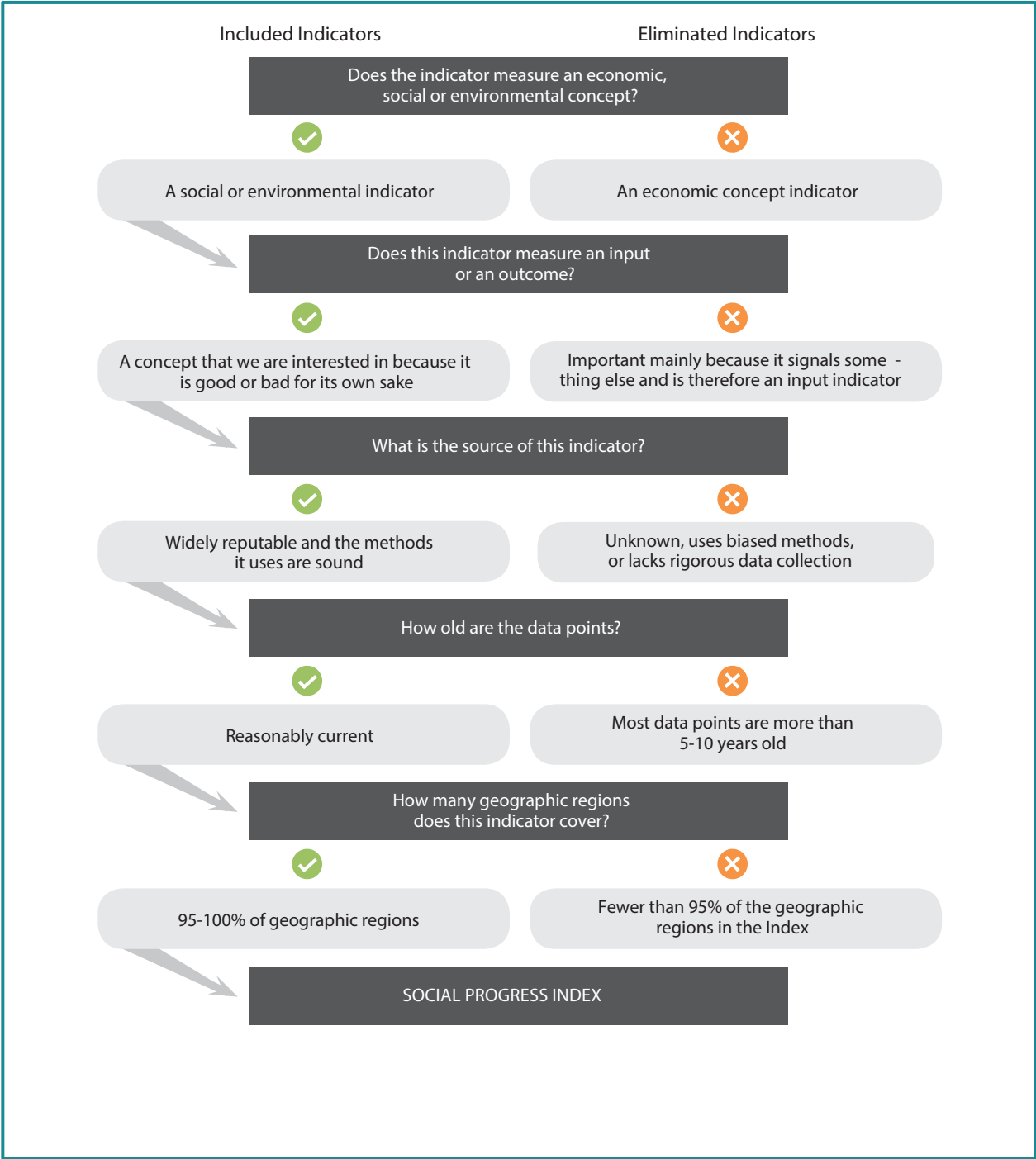
Figure 2 / Social Progress Index Time Series: Indicator-Level Framework

Basic Human Needs	Social Progress Index Time Series 1990-2020 Foundations of Wellbeing	Opportunity
<p>Nutrition and Basic Medical Care Deaths from infectious diseases Child mortality Child stunting Maternal mortality Nutritional deficiencies Diet low in fruits and vegetables</p> <p>Water and Sanitation Improved sanitation Improved water source No access to a handwashing facility Deaths from unsafe water, sanitation and hygiene</p> <p>Shelter Deaths from household air pollution Access to electricity Prevalence of cooking with coal/biomass</p> <p>Personal Safety Interpersonal violence Deaths from road injuries Political killings and torture Intimate partner violence against women Political violence</p>	<p>Access to Basic Knowledge Population with no education Equal access to quality education Gender parity in basic education Mean years of schooling</p> <p>Access to information and Communications Internet users Mobile and landline telephone subscriptions Alternative sources of information</p> <p>Health and Wellness Life expectancy at 60 Premature deaths from non-communicable diseases Equal access to quality healthcare Universal health coverage</p> <p>Environmental Quality Deaths from outdoor air pollution Deaths from lead exposure Particulate matter (2.5) pollution Species protection</p>	<p>Personal Rights Access to justice Freedom of religion Political rights Property rights for women Freedom of assembly Freedom of discussion</p> <p>Personal Freedom and Choice Satisfied demand for contraception Public sector corruption Early marriage Vulnerable employment Freedom of domestic movement</p> <p>Inclusiveness Equal protection of social groups Equal access to power Power distributed by sexual orientation Access to public services distributed by social group</p> <p>Access to Advanced Education Respect for academic freedom Population with advanced education Years of tertiary schooling Gender parity in advanced education</p>

We only include indicators that are measured well, with consistent methodology, by the same organization and across all (or essentially all) countries in our sample. We evaluate each indicator to ensure that the procedures used to produce the measure are sound and that it captures what it purports to capture. Data for each indicator must come from the same source to ensure consistency in measurement across countries. Data sources range from large international institutions like the United Nations or the World Bank to non-governmental academia-based organizations such as Varieties of Democracy or Institute of Health Metrics and Evaluation.

For each indicator, we evaluate the data sources available and consider tradeoffs between the quality and precision of a social indicator and the comprehensiveness of its country coverage. For the Social Progress Index Time Series, one of the most significant selection criteria was the time coverage. Figure 3 below depicts our decision tree for indicator selection. Geographic coverage tends to exclude many high-quality indicators from consideration because they only cover a subset of countries, such as OECD countries, or a particular region, such as the European Union.

Figure 3 / Indicator Selection Tree



Data for each selected indicator are collected based on the above-mentioned criteria and are aligned precisely to match the 1990-2020 period, with the exception of indicators from the Global Burden of Disease Covariates (Institute of Health Metrics and Evaluations), for which the entire time series is shifted forward by one year.

A final important criterion for indicator data is that they are publicly available. We strive for transparency both in terms of the data we use to inform the Social Progress Index, as well as our calculation methodology. All the raw indicator data we use to calculate the Social Progress Index Time Series can be accessed on our website at www.socialprogress.org.

Indicator Transformations

When comparing country-level data, we encounter issues that require us to transform the data for certain indicators. Our main two techniques are to either cap an indicator, setting a clear upper or lower boundary cut-off value, or to apply a square root transformation.

A. Capped Indicators

We impose a top and bottom boundary on a number of indicators: *Child mortality*, *Deaths from infectious diseases*, *Deaths from unsafe water, sanitation and hygiene*, *Deaths from household air pollution*, *Deaths from road injuries*, *Premature deaths from non-communicable diseases*, *Deaths from outdoor air pollution*, *Early marriage*, and *Life expectancy at 60*. In addition, several indicators are capped to meet the boundaries set by the indicator definitions: *Gender parity in basic education*, *Gender parity in advanced education*, *Mobile and landline telephone subscriptions*, *Years of tertiary schooling* and *Population with advanced education*.

B. Transformed Indicators

Two indicators, *Interpersonal violence* within Personal Safety, and *Deaths from lead exposure* within Environmental Quality are highly skewed when compared to the rest of the indicator data distribution. These two indicators are transformed using a square root transformation which is less radical than a log transformation, while still creating a sensible distribution.

Determining the Country Sample

The Social Progress Index Time Series provides full index scores over 1990-2020 for 170 countries¹, with additional two countries having full index scores for only parts of the period.² We have selected these countries by collecting all data available across all indicators and determining for which countries we can impute data, and for which countries we will have incomplete information to calculate a Social Progress Index score. Generally, a country cannot have more than one missing indicator per component to be included in the final Social Progress Index score rankings. In two cases, we make exceptions to this rule, particularly it pertains to Shelter and Access to Advanced Education.

Alongside the 170-172 ranked countries, we also include in our country sample two ‘partial’ countries.³ These countries have enough data to calculate between nine to eleven of the twelve components, but not enough data to calculate an overall Social Progress Index score. As with ranked countries, within those nine to eleven components for which enough data are available there cannot be more than one indicator missing per component.

¹ We refer to [World Population Review](#) regarding country recognition, while also taking into account the above mentioned data availability.

² Montenegro has full index scores for 2004-2020 while South Sudan for 2011-2020.

³ Seychelles and Taiwan, and also Montenegro in 1998-2003.

Finally, we exclude from our original calculation sample countries with limited data, but we use the weights generated from PCF (described below) to calculate scores for these countries when possible. These countries do not have enough data to calculate at least nine components, but they have enough data to calculate at least one component score. We include these countries in imputations prior calculation and during calculation. Raw indicator data and scores for these 22-23 countries are included in the published results.⁴

The Social Progress Index Time Series includes a full index score and ranks for the West Bank and Gaza. In order to do so, we implement an approach different to other countries, since some indicator sources provide data for the West Bank and Gaza, while several others provide data separately for the West Bank and for Gaza. In these cases, we calculate a population weighted average to obtain one data point for the whole entity, which is then used in the overall index calculation.

Index Calculation

The Social Progress Index Time Series calculation procedure consists of the following core steps. We first address missing values, then invert and standardize indicators so that they are comparable in scale. We then use Principal Component Factor (PCF) to aggregate indicators into a component score. Finally, we calculate dimension and overall Social Progress Index scores by averaging components and dimensions, respectively. Each of these steps is described in more detail below.

A. Missing Values

We ensure that all indicators included in the Social Progress Index Time Series are missing as few observations as possible to avoid jeopardizing the statistical quality of the Index. Missing values can stem from the lack of coverage by the data source, as well as incomplete reporting by the country to international organizations. In cases where an indicator is missing data points for a specific country and a time period, we assess our imputation methodology both before and during calculation. We impute missing data prior to calculation of the Index when a country lacks some, not all, indicator data within the examined period. During calculation, we impute data using regression predictions. Imputations used prior to calculation are included and marked in the published dataset; imputations generated during calculation are not.

B. Standardization

We convert indicators to the same scale in a three-step process. First, we set best- and worst- case scenarii to provide concrete boundaries on both ends of the scale that are based on theoretical or historical values. We then invert indicators when increasing values reflect lower social progress. Finally, we standardize the indicators into z-scores prior to applying PCF.

⁴ Kosovo belongs to this group of countries in 1999-2020 (otherwise not a single component could have been calculated for the country), Montenegro falls into this category in 1990-1997 (otherwise it is 'partial' or fully ranked), and South Sudan in 1990-2010 (it is fully ranked from 2011 onward).

C. Component Scores

To calculate component scores, we aggregate the set of indicators within each component into a factor using PCF and all 31 years of data.⁵ PCF combines indicators in a way that captures the maximum amount of variance in the data while reducing redundancy between indicators. It essentially assigns each indicator a weight, a method we select over equal weighting to ensure that indicators are meaningfully contributing to a component score, while accounting for similarities between them.

Within many of the twelve components, PCF generates similar weights for the indicators we include because we ensure a fair level of correlation between them (e.g., not too high or low) prior to finalizing our framework. However, for those cases in which indicators are less correlated with other indicators within their component, we consider PCF a good statistical approach for determining these indicators' contribution to the component scores while remaining objective.

The formula below reflects indicator aggregation into a principal component, where c =Social Progress Index component and i =indicator.

Formula 1

$$\text{Component value}_c = \sum_i (w_i * \text{indicator}_i)$$

Our choice of PCF as the basis for aggregation at the component level was also influenced by the quality and quantity of data available on social progress. For PCF to be valid, each indicator must be relatively free of measurement error (Dunteman, 1989). Thus, it should precisely measure what it was intended to measure and do so consistently across countries and over time. Our design principles and the data we use fulfill this requirement.

To convert each principal component into a component score on a scale of 0 to 100, we use a simple min-max formula, where X =component value and j =country.

Formula 2

$$\text{Component score}_c = \frac{(X_j - \text{Worst Case})}{(\text{Best Case} - \text{Worst Case})} * 100$$

As noted in the previous section, only countries that are ranked or qualify as 'partial' are included in the country sample that determines PCF-generated weights. For countries that do not have enough data to calculate at least nine components, we use the weights generated by the original country sample to calculate component scores when possible. If a country outside the ranked and partial country sample has enough data to calculate all four components within a dimension, we proceed to calculate dimension scores as well.

D. Dimension Scores

Each dimension is the arithmetic average of the four components that make up that dimension. Countries that do not have scores in all four components of a given dimension do not have a

⁵ Each statistical program has several ways to calculate PCF, leading to slight differences in estimations depending on both the command and program used. We use the following command in Stata: `factor [standardized indicator names], factor(1) pcf`

dimension score. The formula for calculating a dimension score is below, where d=dimension and c=component.

Formula 3
$$Dimension_d = \frac{1}{4} \sum_c Component\ score_c$$

E. Index Scores

The overall Social Progress Index score is calculated as the arithmetic average of the three dimensions. Countries that do not have scores in all three dimensions do not have a Social Progress Index score. The formula for calculating a Social Progress Index score is below, where d=dimension.

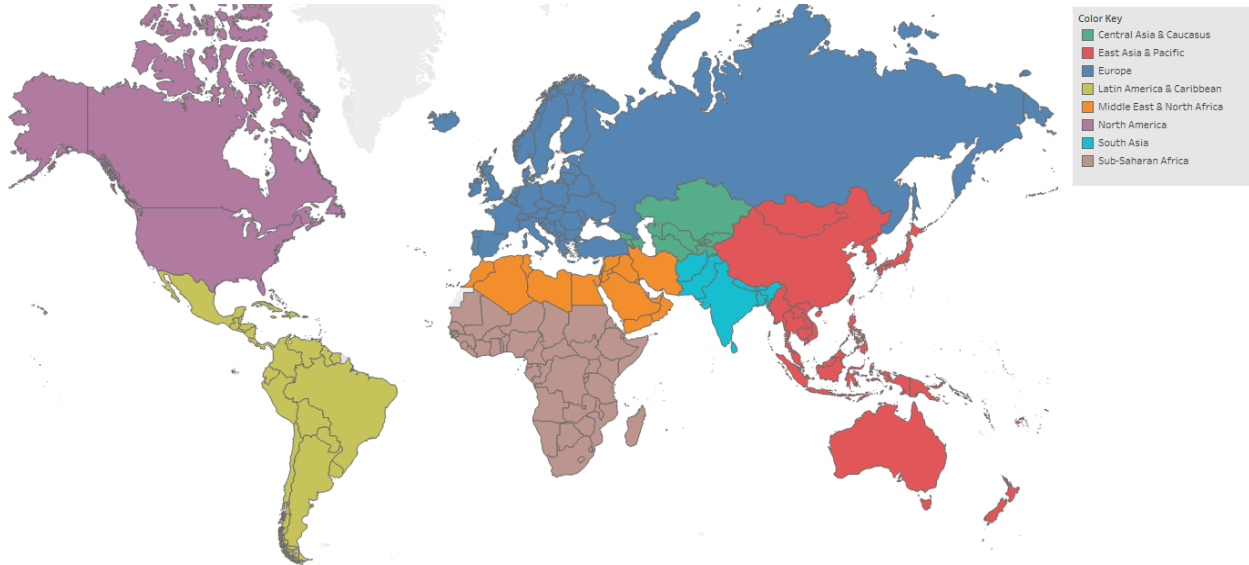
Formula 4
$$Social\ Progress\ Index\ score = \frac{1}{3} \sum_d Dimension_d$$

F. World Score Calculation, Regional Aggregations

In order to provide the most accurate assessment of world performance on social progress, we account for countries’ populations as well as the statistical interaction between indicators. Therefore, to calculate the world Social Progress Index score, we first aggregate indicators into population-weighted values using data of all ranked and partial countries. We then apply the PCF weights generated by the original ranked and partial country sample to derive component scores and proceed as noted above to calculate dimension and the overall Social Progress Index scores. It is important to note that this method is different than calculating population-weighted scores, and in essence treats the world as a country.

We use the same approach to calculate regional performances on social progress. We do so by aggregating indicators into population-weighted values using data of all ranked and partial countries belonging to the respective regions. The Social Progress Index regional classification is shown in Figure 4.

Figure 4 / Regional classification



Structural Integrity of the Index

Throughout the indicator assessment and calculation process, we conduct statistical tests to ensure the structural integrity of the Social Progress Index Time Series. Our goal is that no single indicator majorly affects a country's component, dimension, or overall score, and that the indicators within each component are statistically related and compatible. To achieve this, we look at correlations between indicators and between indicators and aggregated scores, Cronbach's alpha, and the Kaiser-Meyer-Olkin measure of sampling adequacy.

In understanding the correlations between indicators, we strive for indicators within components to show correlations of between $r=0.25$ to $r=0.92$ (absolute values). Indicators with correlations below 0.25 generally show little statistical relation to other indicators. Likewise, if two indicators are too highly correlated (i.e., $r>0.92$), we find that the indicators overlap too much in concept and become statistically redundant, which would place too much weight on the concepts they are capturing within the component; we generally remove one of these indicators as well. For the Social Progress Index Time Series, correlation coefficients range from 0.13 to 0.92. However, all correlations are statistically significant at the 1% level.

To evaluate the fit between indicators within each component, we calculate Cronbach's alpha after we transform the indicators and impute missing values. Cronbach's alpha provides a measure of internal consistency across indicators. An applied practitioner's rule of thumb is that the alpha value should be above 0.7 for any valid grouping of variables (Bland and Altman, 1997). All twelve components meet the 0.7 threshold.

Furthermore, we assess goodness of fit using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Generally, KMO scores should be above 0.5. In our data the mean KMO score is above 0.5 for all components, suggesting that the grouping of indicators chosen for the components of the Social Progress Index Time Series provides a good measure of the underlying construct.

Conclusion

The Social Progress Index Time Series provides a unique, unprecedented effort that measures social outcomes of countries globally from 1990 and 2020. It can be used as a tool to compare countries' development over a longer period of time in the Social Progress Index and its dimensions and components. The 0–100 scale gives countries a realistic benchmark rather than an abstract measure, which allows us to track absolute, not just relative, performance of countries over time within each component, dimension, and the overall model.

The Social Progress Index Time Series results are a starting point for many different avenues of research into the ways countries were successful over time and whether conclusions can be drawn about the overall relationships between social progress and economic growth. We plan to update the Index regularly to provide data that will support many research efforts leading to a greater understanding of the interplay between social progress, economic development, environmental sustainability and beyond.

Bibliography and Further Reading

- Bland, J. M., and D. G. Altman. "Cronbach's Alpha." *BMJ (Clinical Research Ed.)* 314, no. 7080 (1997): 572.
- Dunteman, George H. *Principal Components Analysis*. SAGE, 1989.
- Fleurbaey, M. and D. Blanchet. *Beyond GDP: Measuring Welfare and Assessing Sustainability*, Oxford University Press, 2013.

For further reading on social progress, development, and composite indices, we recommend:

- Bishop, Matthew, and Michael Green. *The Road from Ruin: How to Revive Capitalism and Put America Back on Top*. New York: Crown Business, 2011.
- Delgado, Mercedes, Christian Ketels, Michael E. Porter, and Scott Stern. *The Determinants of National Competitiveness*. Working Paper. National Bureau of Economic Research, July 2012. <http://www.nber.org/papers/w18249>.
- Fehder, Daniel, Michael E. Porter, and Scott Stern. "The Empirics of Social Progress: The Interplay between Subjective Well-Being and Societal Performance." *AEA Papers and Proceedings*, 108 (2018): 477-482.
- Furman, Jeffrey L., Michael E. Porter, and Scott Stern. "The Determinants of National Innovative Capacity." *Research Policy* 31, no. 6 (2002): 899–933.
- Gehl, Katherine M., and Michael E. Porter. "Why Competition in the Politics Industry is Failing America." Harvard Business School, 2017. <https://www.hbs.edu/competitiveness/Documents/why-competition-in-the-politics-industry-is-failing-america.pdf>
- Joint Research Centre-European Commission. Handbook on constructing composite indicators: methodology and user guide. OECD Publishing, 2008.
- Kuznets, Simon. "Economic Growth and Income Inequality." *The American Economic Review* 45, no. 1 (1955): 1-28.
- Porter, Michael E. *Competitive Advantage of Nations: Creating and Sustaining Superior Performance*. Simon and Schuster, 2011.
- Porter, Michael E. *Competition in Global Industries*. Harvard Business Press, 1986.
- Sen, Amartya Kumar. *Commodities and Capabilities*. North-Holland Publ., 1985.
- Sen, Amartya Kumar. *Development as Freedom*. Oxford University Press, 1999.
- Stevenson, Betsey, and Justin Wolfers. *Economic growth and subjective well-being: Reassessing the Easterlin paradox*. No. w14282. National Bureau of Economic Research, 2008.
- Stiglitz, Joseph, Amartya Sen, and Jean-Paul Fitoussi. "The measurement of economic performance and social progress revisited." *Reflections and overview. Commission on the Measurement of Economic Performance and Social Progress, Paris* (2009).