The Atlas of Impunity: Methodology document

This document provides a more technical overview of our methodology in constructing the Atlas of Impunity and describes some of the statistical characteristics of the Atlas scores. A non-technical summary of our methodology can be found beginning on page 8 of the Atlas report.

Our work to measure impunity around the world proceeded in four phases. First, we reviewed existing literature from academics and civil society groups, assembled quantitative data on impunity, and worked with an independent advisory board to refine a definition. Second, we selected indicators in consultation with the advisory board with an eye to maximizing coverage and utilizing existing, reputable, and high-quality data.

Atlas of Impunity advisory council members	
David Miliband, *co-chair*	• President of International Rescue Committee (IRC), former UK foreign secretary
Monica Pinto, *co-chair*	• Argentine law professor, former UN special rapporteur on independence of lawyers and judges
Shirin Ebadi	• Iranian lawyer and activist; 2003 Nobel Peace Prize recipient
Oby Ezekwesili	• Former Nigerian minister (education, solid minerals); co-founder of Transparency International
Maina Kiai	• Kenyan lawyer; head of Human Rights Watch Alliances and Partnerships; former UN special rapporteur on freedom of peaceful assembly and association
DeRay Mckesson	• US activist and podcaster; co-founder of Campaign Zero to end police brutality and supporter of the Black Lives Matter movement
Ivo Daalder	• President of Chicago Council on Global Affairs; former US permanent representative to NATO
Anonymous expert (Asia)	
Anonymous expert (Middle East)	

Third, we normalized and combined the data into dimension scores and overall Atlas scores, imputing missing data and assigning rankings where the actual data were sufficiently complete. Fourth, we reviewed the data with the advisory board and Eurasia Group's research platform to ensure a high level of quality.

Definition of impunity

A review of academic, civil society, and other commonly used definitions of impunity can be found on page 8 of the Atlas report. For the purposes of this project, impunity is the abuse of power, enabled by a lack of accountability. It includes illegal acts such as war crimes, but it goes beyond a purely legalistic interpretation.

We apply our definition across five dimensions of national and international life, some of which have a more robust legal basis than others. These are unaccountable governance, abuse of human rights, economic exploitation, conflict and violence, and environmental degradation. Pages 10-14 of the Atlas report provide a detailed explanation of each dimension.

Indicators, dimensions, and scoring

In collaboration with the advisory board, we selected 67 indicators from 29 sources to measure the degree of impunity at the country level across what we see as the most important facets of each dimension. A full list of the indicators selected, grouped by dimension, can be found in the tables below.

Unaccountable governance

Source	Indicator
Economist Intelligence Unit (EIU) Democracy Index	▪ Electoral process
EIU Democracy Index	▪ Functioning of government
EIU Democracy Index	▪ Democracy and political culture
EIU Democracy Index	▪ Political participation
Reporters Without Borders World Press Freedom Index	▪ Global score
Fund for Peace (FFP) Fragile State Index	▪ External intervention
FFP Fragile State Index	▪ State legitimacy
World Justice Project (WJP) Rule of Law Index	▪ Regulatory enforcement
WJP Rule of Law Index	▪ Constraints on government power
WJP Rule of Law Index	▪ Criminal justice
WJP Rule of Law Index	▪ Civil justice
Varieties of Democracy	▪ Freedom from political killings
Varieties of Democracy	▪ Clientelism index
Varieties of Democracy	▪ Impartial public administration
Freedom House Freedom in the World (FIW)	▪ Total score

Conflict and violence

Source	Indicator
Armed Conflict Location & Event Data Project (ACLED)	▪ Number of battles
ACLED	▪ Number of riots
ACLED	▪ Total fatalities per capita (riots, battles, violence)
ACLED	▪ Violence against civilians (by nonstate actors)
ACLED	▪ Number of external battles
Institute for Economics and Peace Global Peace Index	▪ Total score
Georgetown University Women Peace and Security Index	▪ Community safety perception
Georgetown Women Peace and Security Index	▪ Intimate partner violence
Intentional Homicides	▪ Homicides per capita in 2018
FFP Fragile State Index	▪ Group grievance
WJP Rule of Law Index	▪ (Sub-score) People do not resort to violence to redress personal grievances
UN High Commissioner for Refugees Refugee Data Finder	▪ Refugees, asylum seekers, and internally displaced people per capita
Stockholm International Peace Research Institute (SIPRI) Arms Trade Imports	▪ Total imports trend
SIPRI Arms Trade Exports	▪ Total exports trend

Abuse of human rights

Source	Indicator
UN Human Rights Office	▪ States' consent to be bound by 18 human rights treaties
EIU Democracy Index	▪ Civil liberties
FFP Fragile State Index	▪ Human rights and rule of law
WJP Rule of Law Index	▪ Equal treatment and no discrimination
WJP Rule of Law Index	▪ Right to life and security
WJP Rule of Law Index	▪ Due process of the accused
Cato Institute Human Freedom Index	▪ Politically motivated disappearances
Cato Institute Human Freedom Index	▪ Freedom from torture
Political Terror Scale project	▪ Average of three main scores
Amnesty International Executions	▪ Recorded executions and death penalties by year
Freedom House FIW	▪ Ethnic cleansing
ACLED	▪ Violence against civilians (by states)
Georgetown Women Peace and Security Index	▪ Absence of legal discrimination

Economic exploitation

Source	Indicator
Heritage Foundation Economic Freedom Index	• Property rights
Heritage Foundation Economic Freedom Index	• Government integrity
Freedom House FIW	• Functioning of government
Tax Justice Network (TJN) Corporate Tax Haven Index	• Total score
Center for Labour Research Labour Rights Index	• Total score
Varieties of Democracy	• Social class equality in respect to civil liberties
UN Sustainable Development Goals (SDGs)	• Victims of modern slavery (per 1000)
UN SDGs	• Children involved in child labor (%)
UN SDGs	• Sustainable Development Initiative (SDI) goal 1: No poverty
UN SDGs	• SDI goal 2: Zero hunger
International Budget Partnership (IBP) Open Budget Survey	• Total score
Global Corruption Index	• Total score
TJN State of Tax Justice	• Total tax loss (% tax revenue)
TJN State of Tax Justice	• Harm done to other countries
World Bank Gini coefficient (most recent from period 2006-21; normalized)	• Gives all countries a normalized score of 0 unless they have a Gini of 0.4 or higher
World Bank Gini coefficient (most recent from period 2006-21; normalized)	• Countries with a Gini greater than or equal to 0.4 and less than 0.5 get 2.5. Countries with a Gini of 0.5 or greater score a 5

Environmental degradation

Source	Indicator
World Economic Forum (WEF) Global Competitiveness Report	• Environment-related treaties in force
UN SDGs	• Climate action goal
UN SDGs	• Life below water goal
UN SDGs	• Life on land goal
Yale University Environmental Protection Index	• Climate change indicator
Yale Environmental Protection Index	• Air quality indicator
Yale Environmental Protection Index	• Waste management indicator
Yale Environmental Protection Index	• Agriculture indicator
Yale Environmental Protection Index	• Acid rain indicator
York Ecological Footprint of Countries 2018	• Ecological footprint index

Where possible, we sought to prioritize high-quality, expert-generated social science indicators over national statistics. We did this because the latter are often unharmonized or otherwise not readily comparable. In some instances, government-produced national data may also be subject to political interference.

We also selected source datasets with an eye to maximizing country coverage, allowing us to rank 163 countries and produce indicative scores for another 34, for a total of 197 country-level assessments of impunity. All indicator collection, data normalization, missing value imputation, and Atlas calculation was completed in R 4.2.0, an open-source program for statistical analysis.

Components of the Atlas of Impunity

Dimension	Indicators	Score	
Unaccountable governance	15		
Abuse of human rights	13		
Economic exploitation	15	0-best–5-worst	**Headline impunity score** (Simple mean of dimension scores; 0=best possible 5= worst possible)
Conflict and violence	14		
Environmental degradation	10		

Source: Eurasia Group

Indicator weightings and headline impunity scores

To calculate country scores, we normalized each of the 67 indicators on a 0-5 scale, with the country exhibiting the greatest level of impunity scoring 5, and the country with the highest degree of accountability scoring 0.

When scaling the data at the indicator level, we sought to preserve the data's original distribution, meaning that each indicator's skewness remains close to that of the source. Indicators in each dimension were then aggregated by simple arithmetic mean, and the resulting dimension average was normalized again on a 0-5 scale for consistency and ease of comparison.

The five dimension scores were then averaged into an overall Atlas score, with each dimension receiving an equal weight of 20%. This implies that each dimension has equal conceptual importance in the Atlas, just as each indicator is counted equally in its contribution to its dimension score.

Although indicators make equal contributions to their dimension scores—and each dimension accounts for an equal 20% of the overall Atlas score—dimensions have between ten and 15 underlying indicators, meaning that individual indicators' respective contributions to the overall score vary.

For example, the environmental degradation dimension has ten underlying indicators, while unaccountable governance has 15, or 50% more. Holding all other indicators constant, a unit change in an environmental degradation indicator would affect the headline Atlas score by nearly twice as much as the same change in an indicator in the unaccountable governance dimension.

Indicator weights by dimension

Dimension	Number of indicators	Indicator weights
Unaccountable governance	15	0.013
Abuse of human rights	13	0.015
Economic exploitation	15	0.013
Conflict and violence	14	0.014
Environmental degradation	10	0.020

Stated more formally, indicators in dimension i^{th} contribute differently to the headline index according to the formula $w_i = \frac{0.2}{n_i}$ which w_i is the individual indicator weight and n_i is the number of indicators within the dimension i^{th}. The overall impunity score can then be written as follows.

$$impunity = \sum_{i=1}^{5} \sum_{j=1}^{n_i} \left(\frac{0.2}{n_i} * indicator_j \right)$$

Notes for interpretation

As noted in the full report, scores seek to capture a moment in time based on most recent available data, but there are lags in all source indicators. Most are published once per year. Our closing date for available data inputs was 1 July 2022. Just as the data cannot fully account for historical factors, and are certainly not meant to justify past actions, Atlas scores are not intended to be predictive and do not indicate the degree of impunity in a given country in the future.

The Atlas allows for no qualitative score adjustments by Eurasia Group analysts, the project's sponsors, or the advisory board. All implicit value judgements are therefore attributable only to indicator selection and any subjective criteria built into the source data, some of which do rely on expert assessments. Following the Atlas's publication, we plan to reconvene the advisory board prior to updating the data for subsequent editions. This will allow us to consider any needed data revisions, incorporating a variety of perspectives and a range of expertise.

Data skewness

While the majority of the indicators have normal or near-normal distributions, some are heavily skewed. This means that in future iterations of the Atlas, changes in the scores of countries with extreme values for these indicators will have a greater impact on the headline impunity scores than changes in score on the same indicator of other countries. While the Atlas cannot yet be treated as a time series, it will be important to monitor changes in these indicators in the future reports to evaluate their effect on overall country scores and rankings.

Indicator	Skewness
Number of battles (ACLED)	4.91
Number of external battles (ACLED)	5.97
Number of riots (ACLED)	6.46
Fatalities per capita (ACLED)	5.77
Violence against civilians by non-state actors (ACLED)	8.55
Violence against civilians (by states) (ACLED)	6.79

Indicator	Skewness
Refugees, asylum seekers, and internally displaced people per capita (UNHCR)	6.45
Arms trade imports trend (SIPRI)	5.23
Arms trade exports trend (SIPRI)	8.71
Recorded executions and death penalties by year (Amnesty International Executions)	8.45
Total tax loss (% of revenue) (State of Tax Justice)	6.68
Harm done to other countries (% of total harm) (State of Tax Justice)	5.76

Imputation of missing data

When combining data from multiple sources, appropriate treatment of missing data poses an important challenge. In our source datasets, countries were typically excluded for a variety of practical reasons, such as lack of UN recognition of a territory, or because of a domestic conflict that precluded statistical reporting. Datapoints generally are not missing at random and therefore require careful statistical consideration and an understanding of context.

In cases where datapoints were not available for a particular country, we used the method of Multiple Imputation by Chained Equations (MICE, performed using the miceRanger R package) to impute missing values. The MICE algorithm works by producing a series of linear regressions for each indicator, replacing missing datapoints with estimates based on the relationship between the observed values of each indicator and the other indicators in our dataset. The procedure was repeated multiple times to create multiple "complete" datasets, and the imputed values were "pooled" to generate an unbiased estimate of the missing values.

The algorithm is particularly useful given the number of moderate to strong correlations among the indicators present in the Atlas dataset. In our analysis, we impute missing data only if a country has 60% of actual Atlas data available or more.

Dimension	Indicators	Ranking	
Unaccountable governance	15		
Abuse of human rights	13	Ranked if country has ≥60% of indicators within dimensions	**Headline ranking** Country is ranked if it has ≥60% of total indicators across all 5 dimensions
Economic exploitation	15		
Conflict and violence	14		
Environmental degradation	10		

Source: Eurasia Group

For countries with less than 60% of total actual indicator data available (for example, Andorra, which has data for 14 indicators of 67), Atlas scores are calculated only on the basis of the indicator data we have and no imputation is performed. These countries receive no ranking in the headline Atlas, and their scores should be interpreted as indicative values in which we have less confidence than others based on more complete underlying data.

The same is true at the dimension level. For countries with less than 60% of actual data available in any given dimension of the Atlas (for example, Samoa, which has four indicators of 15 on the unaccountable governance dimension), we produce no dimension ranking. The dimension score is simply the mean of the indicator scores available, min-max normalized from 0-5 against the range of all other country scores. We also regard these figures with less confidence than the dimension scores of countries with more data, and these figures should be taken as indicative.

A few countries fall short of the 60% threshold for the total Atlas dataset but do have 60% of data in one or more dimensions (for example, Libya, which has ten of 13 indicators in the abuse of human rights dimension, but 38 of 67 indicators overall). Likewise, several countries have sufficient data for an overall Atlas ranking but fall short of the 60% threshold in one or more dimensions (for example, Comoros, which has 44 of 67 indicators overall, but only eight of 15 in the economic exploitation dimension).

In the former cases, indicator values are imputed in the dimensions where there is sufficient data, and a dimension ranking is assigned. However, the country's overall score should still be regarded as indicative, and the country does receive an overall ranking on the Atlas. In the latter cases, dimensions where too little data is available for imputation receive indicative scores, and no ranking is assigned. But the country is given an overall score and ranking on the headline Atlas, and we feel this is sufficiently robust for comparison with other countries.

Collinearity among indicators

It is important to note that there are strong pairwise correlations among indicators. Collinearity results when two or more indicators are closely associated. This makes it difficult to disentangle the individual effects of some indicators on a country's overall score on the Atlas. The presence of collinear variables does not affect the quality of the headline impunity score, but it does become an issue when we seek to attribute changes in headline score to a particular indicator quantitatively.

There are a few ways to overcome this problem, with two being most suitable. These are replacing the indicators that have strong correlations with their average or using Principal Component Analysis (PCA) to examine the combinations of indicators that could explain the greatest degree of variance in the Atlas dataset. Taking the first approach would jeopardize the completeness of the Atlas, so we instead include the results of a PCA.

The chart below presents the pairwise correlations of the dimensions of impunity and the overall Atlas score. As noted in the Atlas report, the headline score correlates strongly with abuse of human rights, economic exploitation, and unaccountable governance. Correlations among the five dimensions are strong to moderate, with the exception of environmental degradation.

Pairwise correlations among dimension scores and headline Atlas score

If we consider a 0.5 Pearson correlation value in both negative and positive directions as significant, among the 67 indicators, there are 392 significant pairwise correlations. With such a large number of variables and correlations, it is difficult to interpret and visualize the dataset properly. The PCA therefore helps to shed greater light on correlations within the data.

Applying PCA to dimension scores

PCA is a linear transformation technique used to reduce the dimensions of a dataset. In practice, this helps to simplify interpretation and visualization of the data. Our PCA transposes the Atlas dataset onto a new coordinate system so that the greatest degree of variance is explained by the first coordinate (or principle component, PC). Each subsequent coordinate (or PC) is orthogonal to the first and explains a lesser proportion of the variance.

Mathematically, each PC is a linear combination of all the indicators included in the Atlas. In a dataset where there are strong correlations among the variables, these variables will contribute strongly to the same PC, and the data should be summarized in just a few PCs.

Explanatory power of the principal components

	PC1	PC2	PC3	PC4	PC5
Standard deviation	1.870	0.939	0.640	0.412	0.293
Proportion of variance explained	0.700	0.176	0.073	0.034	0.017
Cumulative proportion of variance explained	0.700	0.876	0.949	0.983	1.000
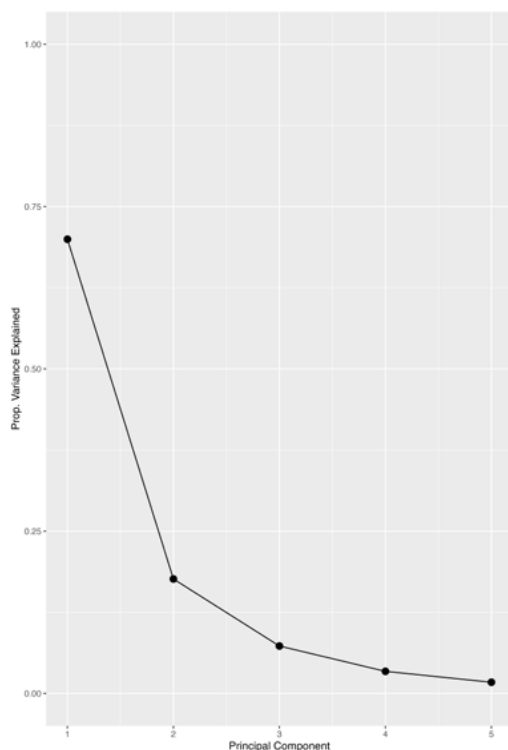
The number of PCs to be included in the analysis is subjective and including more will explain a greater degree of the variance. In the case of the Atlas, the first component alone explains 70% of the variance in the data, and the first two components together explain 88%.

Our analysis also includes a third PC, but as the chart above indicates, its contribution is relatively small compared to that of PC2. There is a satisfactory balance between dimensionality and proportion of variance explained by PCA, and in this case, it is sufficient to limit our analysis to the first two principle components.

The table below shows the loading vectors for each PC. The loading vectors in the first two PCs place approximately equal weight on abuse of human rights, economic exploitation, and unaccountable governance, and much less weight on environmental degradation. This is consistent with the Pearson correlation described above.

Loading vectors for each PC

	PC1	PC2	PC3	PC4	PC5
Conflict and violence (CV)	-0.43	-0.36	-0.78	-0.22	-0.16
Abuse of human rights (AHR)	-0.51	-0.07	0.02	0.59	0.63
Economic exploitation (EE)	-0.49	-0.05	0.45	-0.71	0.24

	PC1	PC2	PC3	PC4	PC5
Environmental degradation (ED)	-0.25	0.93	-0.26	-0.07	-0.02
Unaccountable governance (UG)	-0.51	-0.03	0.34	0.32	-0.72

Interpretation of each PC hinges on which variables correlate most strongly with each component. If we interpret a correlation value of 0.5 as significant, the first PC is strongly influenced by all dimensions except for environmental degradation and conflict and violence.

Thus, PC1 roughly corresponds to the overall rates of abuse of human rights, economic exploitation, and unaccountable governance. Given the negative association, PC1 can also be viewed as a measure of protection of human rights, economic equity, and accountable governance. PC2 mostly correlates with environmental degradation and can therefore be interpreted mainly as a measure of that.

PC3 places most of its weight on conflict and violence and much less on the other four dimensions of impunity; given its negative sign, it can also be interpreted as a measure of peace, or the absence of conflict and violence. The positive values for economic exploitation and unaccountable governance in PC3 are worth noting and are difficult to interpret intuitively.

Principle components by income and region

The charts below show the first two PCs for each of the five dimension scores. The position of country names are the transformed data points in the new projection plane with PC1 plotted on the x-axis and PC2 on the y-axis. The red arrows display the first two PC loading vectors, as in the table above.

To take an example, the environmental degradation loading vectors—labeled "ED_mean" in the chart area—on the first and second PCs are -0.25 and 0.93, respectively. This explains the different directionality of this composite indicator compared to the other four. The ellipses were drawn to cover approximately 67% of the data points.
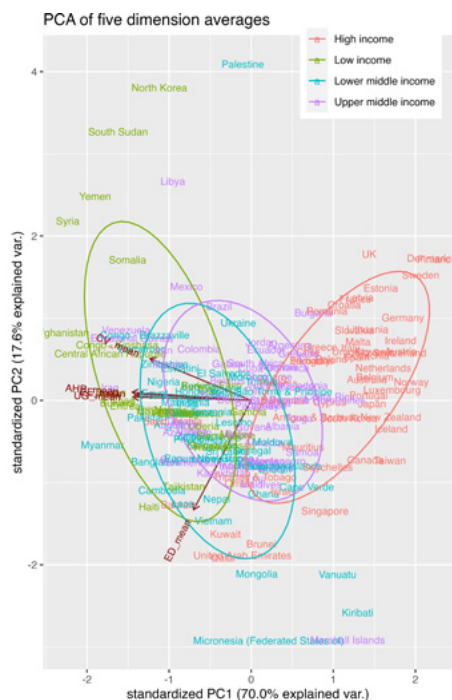
Grouping the data on the basis of GDP per capita shows a clear separation between high- and low-income groups. As noted in the full report, low-income countries tend to perform worse on the Atlas than others, all other things being equal, and generally fall on the left-hand side of the chart. Meanwhile, high-income countries lie mostly on the right-hand side and tend to perform better on the Atlas. Upper and lower middle-income countries fall between the two clusters, exhibiting no obvious pattern.

In contrast to income, grouping countries by geographic region does not separate countries clearly. European countries—which cluster to the top-right in the chart below and include most of the Atlas's best performers—do appear to distinguish themselves from others to an extent. But there is substantial overlap between the scores of countries in all other regions.

PCA of five dimension averages by Regions