Environmental Performance Index

2026 Technical Appendix

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2026 Environmental Performance Index

Technical Appendix

This technical appendix is a companion document to the 2026 Environmental Performance Index (EPI) report. It contains additional details about the methods used in the 2026 EPI. Along with the files available online, which include tabular data used in the EPI analyses, the purpose of this technical appendix is to provide all information necessary for replicating the EPI results or re-running the analysis using different choices and assumptions.

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1. Definitions

Throughout this appendix, *TLA* is used to refer to the **t**hree **l**etter **a**bbreviations of the input data sources and resulting indicators, issue categories, and policy objectives.

This section provides a guide to common terms used in the EPI.

- *As-received data* – datasets in the condition they arrived when obtained by the EPI Team, prior to any cleaning steps, *e.g.*, reshaping, unit conversions, matching country names, *etc*.
- *Raw data* – variables in their natural units, cleaned and formatted with standard EPI country names, missing value codes, and variable names.
- *Metrics* – operationalizations of environmental conditions, either as-received from external data sources or after calculations by the EPI team.
- *Indicators* – metrics that have been *scored*, or *rescaled*, 0–100 using our distance-to-target technique.
- *Transformation* – Taking the natural logarithm of a dataset. Other methodologies may call this step *normalization*, an ambiguous term that can also refer to the process of denominating by a common variable.[1]
- *Maritime zone* – In a break from previous versions, the 2026 EPI strives for a more precise language to talk about what our metrics measure. We use *maritime zone* to refer to the combined marine areas of coastal countries, consisting of archipelagic waters, internal waters, territorial seas, and Exclusive Economic Zone(s) (EEZ).
- *Exclusive Economic Zone – EEZ* has a formal definition under the United Nations Convention on the Law of the Sea, denoting the maritime area extending from a country's territorial sea to, at most, 200 nautical miles from its coastal baseline. EEZs do not include internal waters, archipelagic waters, or territorial seas.

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[1] In turn, *denominating* is sometimes called *standardization*, another ambiguous term that can also refer to the process of producing *z*-scores, which are often normally distribution. The language of composite indexing is plagued by recursive ambiguity.

2. Indicators, Hierarchy, and Weights

The 2026 EPI is organized into three policy objectives, 12 issue categories, and 47 indicators.

Table 1. Policy objectives and their weights [%] in the 2026 EPI

TLA	Policy Objective	Weight Within EPI
ECO	Ecosystem Vitality	45
HLT	Environmental Health	25
PCC	Climate Change	30

Table 2. Issue categories and their weights [%] in the 2026 EPI

Policy Objective	TLA	Issue Category	Weight Within Policy Objective	Weight Within EPI
Ecosystem Vitality	BHD	Biodiversity & Habitat	55	24.75
	FOR	Forests	10	4.50
	GRS	Grasslands	10	4.50
	FSH	Fisheries	5	2.25
	APO	Air Pollution	10	4.50
	AGR	Agriculture	5	2.25
	WRS	Water Resources	5	2.25
Environmental Health	AIR	Air Quality	60	15.00
	H2O	Sanitation & Drinking Water	20	5.00
	HMT	Heavy Metals	15	3.75
	WMG	Waste Management	5	1.25
Climate Change	CCH	Climate Change Mitigation	100	30.00

Table 3. Indicators and their weights [%] in the 2026 EPI

TLA	Indicator	Weight Within Issue Category	Weight Within EPI
Biodiversity & Habitat			
MHP	Marine Habitat protection	15	3.71
MKP	Marine KBA protection	15	3.71
MPE	Marine protection stringency	3	0.74
TBN	Terrestrial biome protection	12	2.97
TKP	Terrestrial KBA protection	12	2.97
PAR	Protected Area Representativeness Index	12	2.97
PAC	Protected Area Connectedness Index	12	2.97
SPI	Species Protection Index	12	2.97
SHI	Species Habitat Index	1	0.25
RLI	Red List Index	2	0.50
BHI	Biodiversity Habitat Index	2	0.50
BER	Bioclimatic Ecosystem Resilience Index	2	0.50
Forests			
TCL	Tree cover loss	65	2.93
KFL	Tree cover loss within KBAs	35	1.58
Grasslands			
GEL	Grassland conversion	55	2.48
KGL	Grassland conversion within KBAs	45	2.03
Fisheries			
FCD	Fish catch discarded	25	0.56
BTO	Bottom trawling in the global ocean	25	0.56
BTZ	Bottom trawling in domestic waters	25	0.56
RMS	Regional Marine Trophic Index	25	0.56
Air Pollution			
NXA	NO_X emission trend	50	2.25
SDA	SO_2 emission trend	50	2.25
Water Resources			
WWT	Wastewater treatment	100	2.25

Table 3. Indicators and their weights [%] in the 2026 EPI (*continued*)

TLA	Indicator	Weight Within Issue Category	Weight Within EPI
Agriculture			
SNM	Sustainable Nitrogen Management Index	50	1.13
PSU	Phosphorus surplus	40	0.90
RCY	Relative crop yield	5	0.11
PRS	Pesticide pollution risk	5	0.11
Air Quality			
PMD	Ambient $PM_{2.5}$ exposure	45	6.75
HFD	Household solid fuels	45	6.75
OZD	Ozone exposure	3	0.45
NOD	NO_2 exposure	1	0.15
COE	CO exposure	2	0.30
SOE	SO_2 exposure	2	0.30
VOE	VOC exposure	2	0.30
Sanitation & Drinking Water			
UWD	Unsafe drinking water	60	3.00
USD	Unsafe sanitation	40	2.00
Heavy Metals			
PBD	Lead exposure	100	3.75
Waste Management			
SMW	Sustainably managed solid waste	100	1.25
Climate Change Mitigation			
CDA	CO_2 emission trend	33	9.90
CHA	CH_4 emission trend	8	2.40
NDA	N_2O emission trend	3	0.90
FGA	F-gases emission trend	6	1.80
BCA	Black carbon emission trend	3	0.90
GTP	GHG emissions: trend *vs. per capita*	20	6.00
GTI	GHG emissions: trend *vs. per* GDP	20	6.00
GHO	Projected GHG emissions in 2050	5	1.50
LUF	Carbon flux from land use change	2	0.60

3. Indicator Descriptions and Calculations

The EPI team receives data from our data sources and partners in a variety of formats. All datasets require some level of preparation, *e.g.*, correction of country identifiers, reshaping, unit adjustments, and renaming columns. After these cleaning steps, datasets contain either a) metrics that fully capture the construct we wish to measure or b) variables that will be used to calculate the metrics behind our indicators. This section describes indicators, their operationalization, and, if necessary, the calculations for the final metrics. Section 4 provides details about how the EPI team downloaded or obtained the datasets.

3.1 Off the shelf

Some of the indicators used in the 2026 EPI require no further calculations before entering our process for constructing the composite index. These metrics are ready "off the shelf."

BER Bioclimatic Ecosystem Resilience Index

The Bioclimatic Ecosystem Resilience Index (BERI) measures the capacity of natural ecosystems to retain species diversity in the face of climate change, as a function of ecosystem area, connectivity, and integrity. This metric is calculated by CSIRO based on land use maps and species occurrence data.

BHI Biodiversity Habitat Index

The Biodiversity Habitat Index (BHI) estimates the effects of habitat loss, degradation, and fragmentation on the expected retention of terrestrial biodiversity. CSIRO calculates the BHI from remote sensing data and other studies of ecological diversity.

HFD Household solid fuels

This indicator measures the amount of deaths and disease resulting from exposure to household air pollution from solid fuels. Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

NOD NO_2 exposure

This indicator measures the amount of deaths and disease resulting from exposure to nitrogen dioxide (NO_2). Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

OZD Ozone exposure

This indicator measures the amount of deaths and disease resulting from exposure to tropospheric ozone. Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

PBD Lead exposure

This indicator measures the amount of deaths and disease resulting from exposure to lead. Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

PMD Ambient $PM_{2.5}$ exposure

This indicator measures the amount of deaths and disease resulting from exposure to ambient particulate matter less than 2.5 micrometers in size ($PM_{2.5}$). Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

PAC Protected Area Connectedness Index

The Protected Areas Connectedness Index measures how well the connections between terrestrial protected areas and Other Effective Area-Based Conservation Measures (OECMs) allow ecosystems to function across broad landscapes. This metric is calculated by CSIRO using high-resolution remote sensing data and biological records of species' locations.

PAR Protected Area Representativeness Index

The Protected Areas Representativeness Index measures how well terrestrial protected areas and Other Effective Area-Based Conservation Measures (OECMs) represent the ecological diversity of a country. This metric is calculated by CSIRO using high-resolution remote sensing data and biological records of species' locations.

PRS Pesticide pollution risk

This indicator summarizes the risk to biodiversity from pesticide pollution and is calculated as the geometric mean of a country's pesticide risk scores.

The 2026 EPI's *Pesticide Pollution Risk* indicator is derived from updated pesticide risk scores computed with the methods described in Tang *et al*. (2021) but based on a new version of the PESTCHEMGRIDS dataset[2] which incorporates more recent data on pesticide application rates, more pesticide active ingredients, and is available at a finer spatial resolution.

RLI Red List Index

The Red List Index tracks the overall extinction risk for species in a country, weighting species by the fraction of their range occurring within the country or region.

SHI Species Habitat Index

The Species Habitat Index (SHI) measures the proportion of suitable habitats for a country's species that remain intact, relative to a baseline set in the year 2001. While the SHI can be calculated for single species, Map of Life aggregates these metrics into a single score, with each species weighted according to the proportion of their global range that is found within the country. This weighting scheme encourages countries to take special care to ensure the protection of rare or endemic species. The SHI serves as a proxy for potential population losses and the extinction risk to individual species.

[2] Maggi F. and Tang F.H.M. (2024). PESTCHEMGRIDS v2.01 (beta version). Figshare. Dataset. doi: 10.6084/m9.figshare.25854769.v2

SPI Species Protection Index

The Species Protection Index (SPI) measures how well a country's terrestrial protected areas overlap with the ranges of its vertebrate, invertebrate, and plant species. Map of Life calculates this index using remote sensing data, global biodiversity informatics, and integrative models to map suitable habitat for over 30,000 terrestrial species at high resolutions.

USD Unsafe sanitation

This indicator measures the amount of deaths and disease resulting from exposure to unsafe sanitation. Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

UWD Unsafe drinking water

This indicator measures the amount of deaths and disease resulting from exposure to unsafe drinking water. Estimates from the Institute for Health Metrics and Evaluation's Global Burden of Disease study report the age-standardized disability-adjusted life-year lost per 100,000 persons (DALY rate).

3.2 Calculations

The EPI team also calculates custom metrics for the 2026 EPI, translating, combining, and denominating variables to increase interpretability and comparability across time and countries. This section describes our metrics, the methods by which we calculated them, and the methods for imputing missing values.

BCA Black carbon emission trend

We measure the average annual growth rate of black carbon emissions over the years 2014 to 2023 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
BLC	Black carbon emissions	Gg
GDP	Gross Domestic Product	2021$
BCR	Correlation coefficient	—
BCB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between black carbon emissions and GDP over a ten-year period,

$$BCR = corr(BLC, GDP)$$

Second, we regress logged black carbon emissions over ten years to find a slope,

$$ln(BLC) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in black carbon emissions,

$$BCB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$BCA = \begin{cases} BCB \times (1 + BCR) \; if \; BCB \geq 0 \; and \; BCR < 0 \\ BCB \times (1 - BCR) \; if \; BCB < 0 \; and \; BCR > 0 \\ BCB \; otherwise \end{cases}$$

BTO Bottom trawling in the global ocean

The proportion of a country's total catch across the global ocean caught by bottom trawling and dredging. This indicator measures how much countries use bottom trawling, either in their own waters, those of other countries, or in the high seas.

Variable		Units
FCO	Catch in the global ocean	tonnes
y	An index of years: {1950–2019}	
f	An index of "fishing entities," *i.e.*, countries	
h	An index of catch type: {1 = discards, 2 = landings}	
g	An index of gear types [42 total]	
[g]	An index of a subset of gear types: {1 = bottom trawling, 2 = dredge, 3 = beam trawl, 4 = otter trawl, 5 = shrimp trawl}	

$$BTO_{yf} = \frac{\sum_h \sum_{[g]=1}^{5} FCO_{yfh[g]}}{\sum_h \sum_g FCO_{yfhg}}$$

To account for anomalies in the data, we also perform a correction for countries where there was a sharp increase in catch where the gear type was "unknown" in 2019,

$$if\ {}^{BTO_{y=2019}}\!/_{BTO_{y=2018}} < 0.5, then\ replace\ BTO_{y=2019}\ with\ the\ value\ of\ BTO_{y=2018}$$

This adjustment affects India, Indonesia, Peru, São Tomé & Príncipe, and St. Vincent & the Grenadines.

BTZ Bottom trawling in domestic waters

The proportion of the total catch caught using bottom trawling and dredging. This metric counts all seafood caught within a country's maritime zone(s), regardless of the flag of the vessel doing the fishing – and so measures both whether countries are practicing trawling themselves or allow other countries to trawl within waters under their jurisdiction.

Variable		Units
FCZ	Catch in maritime zones	tonnes
y	An index of years: {1950–2019}	
m	An index of maritime zones	
c	An index of countries	
g	An index of gear types [42 total]	
[g]	An index of a subset of gear types: {1 = bottom trawling, 2 = dredge, 3 = beam trawl, 4 = otter trawl, 5 = shrimp trawl}	

The data for each maritime zone are aggregated to their respective countries,

$$BTZ_{yc} = \frac{\sum_{m \cap c} \sum_{[g]=1}^{5} FCZ_{ymc[g]}}{\sum_{m \cap c} \sum_{g} FCZ_{ymcg}}$$

To account for anomalies in the data, we also perform a correction for countries where there was a sharp increase in catch where the gear type was "unknown" in 2019,

$$if \ {}^{BTZ_{y=2019}}\!\big/_{BTZ_{y=2018}} < 0.5, then\ replace\ BTZ_{y=2019}\ with\ the\ value\ of\ BTZ_{y=2018}$$

This adjustment affects India, Indonesia, Peru, and Maldives.

CDA CO_2 emission trend

We measure the average annual growth rate of carbon dioxide (CO_2) emissions over the years 2015 to 2024 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
CDO	CO_2 emissions	Gg
GDP	Gross Domestic Product	2021$
CDR	Correlation coefficient	—
CDB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between CO_2 emissions and GDP over a ten-year period,

$$CDR = corr(CDO, GDP)$$

Second, we regress logged CO_2 emissions over ten years to find a slope,

$$ln(CDO) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in black carbon emissions,

$$CDB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$CDA = \begin{cases} CDB \times (1 + CDR) \; if \; CDB \geq 0 \; and \; CDR < 0 \\ CDB \times (1 - CDR) \; if \; CDB < 0 \; and \; CDR > 0 \\ CDB \; otherwise \end{cases}$$

CHA CH_4 emission trend

We measure the average annual growth rate of methane (CH_4) emissions over the years 2015 to 2024 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
CH4	CH_4 emissions	Gg
GDP	Gross Domestic Product	2021$
CHR	Correlation coefficient	—
CHB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between CH_4 emissions and GDP over a ten-year period,

$$CHR = corr(CH4, GDP)$$

Second, we regress logged methane emissions over ten years to find a slope,

$$ln(CH4) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in black carbon emissions,

$$CHB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$CHA = \begin{cases} CHB \times (1 + CHR) \; if \; CHB \geq 0 \; and \; CHR < 0 \\ CHB \times (1 - CHR) \; if \; CHB < 0 \; and \; CHR > 0 \\ CHB \; otherwise \end{cases}$$

COE Carbon monoxide exposure

This indicator measures a country's ambient ground-level concentration of carbon monoxide (CO), weighted by population to better capture the exposure levels in geographic areas with a higher human population density.

Geospatial files		Units
COE	CO concentration	kg/kg
GPP	Gridded population of the world	persons
NEB	Country boundaries	—

First, the gridded population data only exist every five years over the period 2000–2020. Missing values over this period come from linear interpolation, and we use 2020 values for the years 2021–2024.

Second, we convert CO concentrations from kg/kg to ppm.

Third, we resample and overlay the CO concentration and gridded population raster to generate population-weighted exposure.

Fourth, we overlay the country boundary shapefiles for each country to calculate the average carbon monoxide exposure experienced by the population.

FCD Fish catch discarded

The proportion of a country's total catch in the global ocean that is discarded instead of landed and used. This indicator serves as a proxy of bycatch and thus of untargeted and wasteful fishing practices.

Variable		Units
FCO	Catch in the global ocean	tonnes
y	An index of years: {1950–2019}	
f	An index of "fishing entities," *i.e.*, countries	
h	An index of catch type: {1 = discards, 2 = landings}	
g	An index of gear types [42 total]	

$$FCD_{yf} = \frac{\sum_g FCO_{yfg,h=1}}{\sum_g \sum_h FCO_{yfgh}}$$

FGA F-gases emission trend

We measure the average annual growth rate of fluorinated gases (F-gases) emissions over the years 2015 to 2024. Unlike other emissions indicators, we do not adjust for correlations with GDP, as F-gas emissions is unlikely to be correlated with macroeconomic activity.

Variable		Units
FOG	F-gases emissions	Gg CO_2-eq.
FGB	Emission growth rate	proportion

First, we regress logged F-gas emissions over ten years to find a slope,

$$ln(FOG) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in black carbon emissions,

$$FGB = exp(\beta) - 1$$

GEL Grassland conversion

This indicator measures the five-year average permanent conversion of natural and semi-natural grasslands to other types of land cover, such as cropland or built-up areas, across the entire country, as a proportion of grassland extent in the baseline year of 2000.

Variable		Units
GEA	Grasslands extent	ha
GEC	Grasslands conversion	ha
GE5	Mean of last 5 years of conversion	ha
t	An index of years	

First, GE5 we average the last 5 years of grassland conversion within a country,

$$GE5 = \frac{1}{5}\sum_{i=0}^{4} GEC_{t-i}$$

Then, we divide GE5 the grasslands extent (GEA) from the reference year of 2000,

$$GEL = \frac{GE5}{GEA_{2000}}$$

GHO Projected GHG emissions in 2050

This indicator gauges whether countries are on track to reach zero emissions of four greenhouse gases (carbon dioxide, methane, fluorinated gases, and nitrous oxide) by 2050. Emissions in 2050 are a linear projection of average emissions over the period 2015–2024, as a percentage of emissions in 2024.

Variable		Units
CDO	CO_2 emissions	Gg
CH4	CH_4 emissions	Gg
FOG	F-gases emissions	Gg CO_2-eq.
NOT	N_2O emissions	Gg
GHR	Correlation coefficient	—
GHG	GHG emissions	Gg CO_2-eq.
GHN	Projected GHG in 2050	Gg CO_2-eq.

First, we calculate total greenhouse gas emissions, applying Global Warming Potentials (GWP, AR6) to convert all units to Gg of CO_2-equivalents. *N.B.*: the EDGAR dataset estimates of F-gas emissions are in CO_2-eq using GWP, AR5.

$$GHG = CDO + FOG + 273 \times NOT + 27.2 \times CH4$$

Second, we calculate Pearson correlation coefficient between total greenhouse gas emissions and GDP over a ten-year period,

$$GHR = corr(GHG, GDP)$$

Third, we regress GHG emissions over 10 years to find a slope,

$$GHG = \alpha + \beta t$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$\beta' = \begin{cases} \beta \times (1 + GHR) \; if \; \beta \geq 0 \; and \; GHR < 0 \\ \beta \times (1 - GHR) \; if \; \beta < 0 \; and \; GHR > 0 \\ \beta \; otherwise \end{cases}$$

Fifth, using this adjusted slope, we then project emissions from the latest year's data out to 2050,

$$GHN = GHG_{2024} + \beta' \times (2050 - 2024)$$

Sixth, we calculate projected emissions in 2050 denominated by emissions in the latest year,

$$GHO = \frac{GHN}{GHG_{2024}} \times 100\%$$

GTI GHG emission trend relative to emission intensity

This indicator balances two measures of climate performance often in tension: GHG emission trend and emission intensity (GHG per unit of GDP). While a negative trend, captured by the average annual percent change in emissions over the period 2015–2024, is desirable, countries with higher emission intensities should be held to higher standards of good performance. And countries with low emission intensities cannot be rewarded if their GHG emissions are increasing.

Variable		Units	note
GDP	Gross Domestic Product	2021$	
GHG	GHG emissions	Gg CO_2-eq.	see calculation under GHO
GHR	Correlation coefficient	—	see calculation under GHO
GGA	GHG emission trend, adjusted	proportion	
GGB	GHG emission trend	proportion	
GHI	GHG emissions intensity	Gg/$	
$\widehat{GGA}$	Emissions trend indicator	—	0–100 scale
$\widehat{GHI}$	Emissions intensity indicator	—	0–100 scale
B_{GGA}	Best performance for GGA	proportion	
W_{GGA}	Worst performance for GGA	proportion	
B_{GHI}	ln(Best performance for GHI)	Gg/$	
W_{GHI}	ln(Worst performance for GHI)	Gg/$	

	Raw value
B_{GGA}	-0.08
W_{GGA}	0.08

	Nominal value	Raw value	Transformed value
B_{GHI}	1st-percentile	7.6862×10^{-8}	-16.38126
W_{GHI}	99th-percentile	1.8419×10^{-6}	-13.2047

Calculating this metric proceeds in three stages:

1. Constructing an indicator based on GHG emission trend
2. Constructing an indicator based on GHG emission intensity
3. Blending these two indicators

GGA GHG EMISSION TREND INDICATOR

First, we regress logged GHG emissions over ten years to find a slope,

$$ln(GHG) = \alpha + \beta t$$

Second, we calculate an unadjusted average annual growth rate in GHG emissions,

$$GGB = exp(\beta) - 1$$

Third, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$GGA = \begin{cases} GGB \times (1 + GHR)\ if\ GGB \geq 0\ and\ GHR < 0 \\ GGB \times (1 - GHR)\ if\ GGB < 0\ and\ GHR > 0 \\ GGB\ \ otherwise \end{cases}$$

Fourth, we rescale GGA using our distance-to-target method,

$$\widehat{GGA} = \frac{(GGA - W_{GGA})}{(B_{GGA} - W_{GGA})} \times 100$$

GHI GHG EMISSION INTENSITY INDICATOR

First, we divide GHG emissions by GDP,

$$GHI = \frac{GHG}{GDP}$$

Second, we rescale GHI using our distance-to-target method,

$$\widehat{GHI} = \frac{(\ln GHI - W_{GHI})}{(B_{GHI} - W_{GHI})} \times 100$$

BLENDING TREND AND INTENSITY INDICATORS

Following the logic described in the 2026 EPI Report, we blend the trend and intensity indicators,

$$GTI = \begin{cases} \widehat{GGA} - \dfrac{\left(80 - \widehat{GHI}\right)^2}{128} \; for \; \widehat{GHI} < 80 \\ \widehat{GGA} + \dfrac{\left(\widehat{GHI} - 80\right)^2}{8} \; for \; \widehat{GHI} \geq 80 \end{cases}$$

GTP GHG emission trend relative to per capita emissions

This indicator balances two measures of climate performance often in tension: GHG emission trend and *per capita* GHG emissions. While a negative trend, captured by the average annual percent change in emissions over the period 2015–2024, is desirable, countries with higher *per capita* emissions should be held to higher standards of good performance. Additionally, low *per capita* emissions cannot be rewarded if a country's GHG emissions are increasing.

Variable		Units	note
POP	Population	persons	
GHG	GHG emissions	Gg CO_2-eq.	see calculation under GHO
GHR	Correlation coefficient	—	see calculation under GHO
GHP	GHG emissions intensity	Gg/person	
$\widehat{GGA}$	Emissions trend indicator	—	see calculation under GTI
$\widehat{GHP}$	Emissions intensity indicator	—	0–100 scale
B_{GHP}	ln(Best performance for GHP + α)	Gg/$	$\alpha = 4.06 \times 10^{-4}$
W_{GHP}	ln(Worst performance for GHP + α)	Gg/$	

	Nominal value	Raw value	Transformed value
B_{GHP}	0	0	-7.8092
W_{GHP}	99th-percentile	0.0418	-3.1654

Calculating this metric proceeds in three stages:

1. Constructing an indicator based on GHG emission trend
2. Constructing an indicator based on GHG emission intensity
3. Blending these two indicators

GGA GHG EMISSION TREND INDICATOR

See calculation under GTI.

GHP GHG EMISSION PER CAPITA INDICATOR

First, we divide GHG emissions by POP,

$$GHP = \frac{GHG}{POP}$$

Second, we rescale GHP using our distance-to-target method,

$$\widehat{GHP} = \frac{(\ln(GHP + \alpha) - W_{GHP})}{(B_{GHP} - W_{GHP})} \times 100$$

BLENDING TREND AND PER CAPITA INDICATORS

Following the logic described in the 2026 EPI Report, we blend the trend and *per capita* indicators,

$$GTP = \begin{cases} \widehat{GGA} - \dfrac{\left(80 - \widehat{GHP}\right)^2}{128} \; for \; \widehat{GHP} < 80 \\ \widehat{GGA} + \dfrac{\left(\widehat{GHP} - 80\right)^2}{8} \; for \; \widehat{GHP} \geq 80 \end{cases}$$

KFL Tree cover loss within KBAs

This indicator measures the five-year average loss of trees (at ≥30 canopy cover), within Key Biodiversity Areas (KBAs), as a proportion of tree cover in KBAs in the baseline year of 2000.

Variable		Units
KFA	Tree cover area (≥30% canopy cover) in KBAs	ha
KFC	Tree cover loss in KBAs	ha
KF5	Sum of last 5 years of loss	ha
t	An index of years	

First, we sum the last 5 years of tree cover loss within a country's KBAs,

$$TC5 = \sum_{i=0}^{4} TCC_{t-i}$$

Then, we divide KF5 by five times the tree cover area (KFA) from the reference year of 2000,

$$KFL = \frac{KF5}{5 \times KFA_{2000}}$$

KGL Grassland conversion within KBAs

This indicator measures the five-year average permanent conversion of natural and semi-natural grasslands to other types of land cover, such as cropland or built-up areas, within Key Biodiversity Areas (KBAs), as a proportion of grassland extent in KBAs in the baseline year of 2000.

Variable		Units
KGA	Grasslands extent in KBAs	ha
KGC	Grasslands conversion in KBAs	ha
KG5	Mean of last 5 years of conversion	ha
t	An index of years	

First, we average the last 5 years of grassland conversion within a country's KBAs,

$$KG5 = \frac{1}{5}\sum_{i=0}^{4} C_{t-i}$$

Then, we divide KG5 by the grasslands extent within KBAs (KGA) from the reference year of 2000,

$$KGL = \frac{KG5}{KGA_{2000}}$$

LUF Carbon flux from land use change

This indicator measures whether changes in a country's land use, land cover, and forestry (LULCF) over the last decade have resulted in net positive or negative carbon fluxes, relative to hectares of forested area.

Variable		Units
LUE	Net carbon fluxes from LULCF	Gg CO_2
TCA	Tree cover area (≥30% canopy cover)	ha
t	An index for years	
s	An index of estimates: {1 = BLUE, 2 = OSCAR, 3 = LUCE}	

First, we average estimates of carbon fluxes for the three methods, *s*, reported by our data partner,

$$LUE_t = \frac{1}{3}\sum_s LUE_{st}$$

Second, we calculate the cumulative flux of carbon dioxide over the past decade, divided by tree cover are in the year 2000,

$$LUF = \frac{\sum_{i=0}^{9} LUE_t}{TCA_{2000}}$$

MHP Marine Habitat protection

This indicator measures the percentage of important marine and coastal habitats – coral reefs, cold-water corals, sea grasses, salt marshes, mangroves, knolls, and seamounts – within a country's maritime zone(s) that are covered by marine protected areas or Other Effective Area-Based Conservation Measures (OECMs).

Geospatial files	
MPA	Marine protected areas
NEB	Country boundaries
MTZ	Maritime zones
SGR	Global distribution of sea grasses
SLT	Global distribution of salt marshes
MAN	Global distribution of mangroves
KNS	Global distribution of knolls and seamounts
COW	Global distribution of coral reefs
CCO	Global distribution of cold-water corals

We merge and rasterize all Marine Protected Areas (MPAs). Some protected areas are available only as points. For such MPAs, we create circular polygons with an area equal to the area reported in the WDPA, centered at the point's coördinates. Similarly, we merge and rasterize the polygons of each of the six types of important marine and coastal habitats.

Next, for each habitat type, we intersect the habitat rasters with the MPA raster to obtain a raster representing the area of a particular habitat *within* MPAs in each area of interest, *i.e.*, the union of a country's land and its maritime zones, to ensure that coastlines did not clip the extent of coastal habitats like mangroves and saltmarshes.

For each habitat, we then calculate the percentage of habitat pixels falling within MPAs in each country. Our MHP indicator is a simple average of the percentage of protection of the six habitat types – the same as the *Local Proportion of Habitats Protected Index* developed by Kumagai *et al*. (2022)[3]. We refer the interested reader to Kumagai *et al*.'s (2022) paper for further methodological details.

[3] Kumagai, J. A., Favoretto, F., Pruckner, S., Rogers, A. D., Weatherdon, L. V., Aburto-Oropeza, O., & Niamir, A. (2022). Habitat Protection Indexes—New monitoring measures for the conservation of coastal and marine habitats. *Scientific Data, 9*(1), Article 1. https://doi.org/10.1038/s41597-022-01296-4

MKP Marine KBA protection

This indicator measures the percentage of areas designated as Key Biodiversity Areas (KBAs) within a country's maritime zone(s) that are covered by marine protected areas or Other Effective Area-Based Conservation Measures (OECMs).

Geospatial files		
MPA	Marine protected areas	
KBA	Key Biodiversity Areas	
MTZ	Maritime zones	
MPK	Protected marine KBAs	
KPM	Protected marine KBAs within each country	
MKB	Marine KBAs within each country	
Variable		**Units**
MKB	Total marine KBA area	km^2
KPM	Total protected area within marine KBAs	km^2

First, we merge and rasterize all marine protected area and marine KBA polygons to avoid double counting areas that are recorded under different types of protected areas in the WDPA. Next, we intersect the rasterized KBA and marine protected area polygons,

$$\text{MPA} \cap \text{KBA} \rightarrow \text{MPK}$$

That is, MPK represents the pixels that are both under protection and within a KBA.

Second, we overlay the protected KBA with the boundaries of maritime zones, which we then convert to the total protected area of marine KBAs in each country,

$$\text{MPK} \cap \text{MTZ} \rightarrow \text{KPM} \rightarrow KPM$$

Third, we overlay the shapefiles of KBAs and maritime zone boundaries, which is then converted to the total area of marine KBAs in each country,

$$\text{KBA} \cap \text{MTZ} \rightarrow \text{MKB} \rightarrow MKB$$

Fourth, we calculate the percentage of total marine KBAs that are covered by protected areas,

$$MKP = \frac{KPM}{MKB} \times 100\%$$

MPE Marine protection stringency

This indicator estimates the stringency of marine protected areas (MPAs) by comparing total fishing effort intensity (fishing hours) in a given year inside versus outside MPAs within a country's maritime zone(s).

Geospatial files		
MPA	Marine protected areas	
MTZ	Maritime zones	
AFE	Annual fishing effort	
Variable		**Units**
GFE	Global fishing effort	hours per day per grid cell
FIM	Fishing effort within MPAs	hours
FOM	Fishing effort outside MPAs	hours
d	An index of days in each year	
t	An index of years	
g	An index of grid cells	

First, we aggregate tabular data on fishing effort from daily to annual. In calculating these sums, we exclude fishing effort with gear types "pole and line" and "pots and traps", as the ecological impact of one hour of fishing with these smaller scale gears is not comparable to one hour fishing with other industrial-scale gears. We convert the tabular data into a raster, AFE, for each year.

$$\sum_{d=1}^{365\ (or\ 366)} GFE_{dtg} \rightarrow \mathbf{AFE}_t$$

Second, we overlay MPA with MTZ in each year with the corresponding raster, calculating the total fishing effort inside of MPAs with fishing effort outside of MPAs,

$$\left.\begin{matrix}\mathbf{MPA}\\ \mathbf{MTZ}\\ \mathbf{AFE}\end{matrix}\right\} \rightarrow \begin{matrix}FIM\\ FOM\end{matrix}$$

Third, we calculate the ratio of fishing effort within and outside of MPAs,

$$MPE = \frac{FIM}{FOM}$$

In cases where *FOM* = 0, we set *MPE* to be an arbitrarily high value of 1,234, exceeding any reasonable target for worst performance.

NDA N_2O emission trend

We measure the average annual growth rate of nitrous oxide (N_2O) emissions over the years 2015 to 2024 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
NOT	N_2O emissions	Gg
GDP	Gross Domestic Product	2021$
NDR	Correlation coefficient	—
NDB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between N_2O emissions and GDP over a ten-year period,

$$NDR = corr(NOT, GDP)$$

Second, we regress logged N_2O emissions over ten years to find a slope,

$$ln(NOT) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in N_2O emissions,

$$NDB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$NDA = \begin{cases} NDB \times (1 + NDR) \ if \ NDB \geq 0 \ and \ NDR < 0 \\ NDB \times (1 - NDR) \ if \ NDB < 0 \ and \ NDR > 0 \\ NDB \ otherwise \end{cases}$$

NXA NO_X emission trend

We measure the average annual growth rate of nitrogen oxides (NO_X) emissions over the years 2014 to 2023 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
NOX	NO_X emissions	Gg
GDP	Gross Domestic Product	2021$
NXR	Correlation coefficient	—
NXB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between NO_X emissions and GDP over a ten-year period,

$$NXR = corr(NOX, GDP)$$

Second, we regress logged NO_X emissions over ten years to find a slope,

$$ln(NOX) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in NO_X emissions,

$$NXB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$NXA = \begin{cases} NXB \times (1 + NXR) \; if \; NXB \geq 0 \; and \; NXR < 0 \\ NXB \times (1 - NXR) \; if \; NXB < 0 \; and \; NXR > 0 \\ NXB \; otherwise \end{cases}$$

PSU Phosphorus surplus

This indicator measures the difference between phosphorus inputs (as fertilizer) and outputs (as harvested crops) as a proxy of excessive phosphorus fertilizer use that can contribute to the eutrophication of water bodies.

Variable		Units
PCR	Phosphorus crop removal	kg / ha
PTI	Phosphorus total inputs	kg / ha
t	index for years	

Since the indicator is a simple proxy for potential pollution due to excessive fertilizer use, we disregard negative values. Negative values indicate soil mining, which is only problematic in certain contexts (Zou *et al*. 2022)[4],

$$PSU_t = \begin{cases} 0 \; if \; PCR_t > PTI_t \\ PTI_t - PCR_t \; if \; PCR_t \leq PTI_t \end{cases}$$

We calculate a 5-year moving average to smooth over noise in annual time series of fertilizer use data,

$$PSU = \frac{1}{5}\sum_{i=0}^{4} PSU_{t-i}$$

[4] Zou T., Zhang X., and Davidson E.A. (2022). Global trends of cropland phosphorus use and sustainability challenges. *Nature 611*: 81-87. doi: 10.1038/s41586-022-05220-z

PSU Imputation of missing values

Variable		Units
GPC	GDP per capita	\$/person
GVA	Agriculture, forestry, and fishing, value added	% of GDP
PPC	Phosphorus use per capita	kg/person
REG^{UNSD}	UNSD subregions, altered so China is its own region	—

We impute PSU values using the following formula,

$$\widehat{PSU} = \alpha + \beta \ln GPC + \gamma \ln GVA + \boldsymbol{\delta REG^{UNSD}} + \pi \ln PPC + \varepsilon$$

where $\boldsymbol{\delta}$ are coefficients for categorical dummies in the vector of $\boldsymbol{REG^{UNSD}}$.

This process results in the following imputed scores for countries included in the 2026 EPI:

code	iso	country	PSU.ind.2023
585	PLW	Palau	77.84
626	TLS	Timor-Leste	70.86

RCY Relative crop yield

This indicator measures the average yield of 17 major crops relative to estimates of the country-specific maximum attainable yield of those crops based on climate and history. An efficient agricultural system would produce crops at this upper limit, while an inefficient system would be making poor use of its arable land.

Variable		Units
CRY	Crop yields	tonnes / ha
CAH	Area harvested per crop	ha
ATY	Maximum attainable yields	tonnes / ha
CYG	Crop yield gap	—
c	index for 17 major crops	

Mueller *et al*. (2012) provide country-specific estimates of the maximum attainable yield of 17 major crops based on historical yield data: barley, cassava, cotton, groundnut, maize, millet, oil palm, potato, rapeseed, rice, rye, sorghum, soybean, sugar beet, sugarcane, sunflower, and wheat.

First, for each crop, we divide the average yield by the maximum attainable yield in the country,

$$CYG_c = {}^{CRY_c}/_{ATY_c}$$

Second, we average the relative yield of all crops in a country, weighting by the area harvested of each crop,

$$RCY = \sum_c CYG_c \times \frac{CAH_c}{\sum_c CAH_c}$$

Third, Since Mueller *et al.*'s (2012) maximum attainable yields are defined as the 95th percentile of observed yields in a particular climate zone, some actual yields may be higher than the maximum attainable yield. To deal with such cases, we cap the RCY values at 1.

RMS Regional Marine Trophic Index

The Marine Trophic Index (MTI), computed by *Sea Around Us*, describes the degree to which a country is depleting species at higher trophic levels and "fishing down the food web." The metric describes the average trophic level of a country's catch, while accounting for the expansion of fishing operations to additional geographic areas. Our indicator is based on the slope of a line fitted to MTI values over one decade.

Variable		Units
MTI	Time series of Regional Marine Trophic Index values, calculated excluding species with a trophic level below 3.2.	trophic level
CTH	Total catch of seafood	tonnes
m	An index of maritime zones in a country	
t	An index of years	

First, for each maritime zone, we regress logged MTI values over ten years to find a slope,

$$\ln MTI = \alpha + \beta t$$

Second, we calculate the average annual growth rate in MTI values,

$$MTB = \exp(\beta) - 1$$

Third, we calculate the average MTB value across all the maritime zones of a country, weighting values by the proportion of a country's total catch coming from each maritime zone,

$$RMS = \frac{\sum_m (MTB_m \times CTH_m)}{\sum_m CTH_m}$$

SDA SO_2 emission trend

We measure the average annual growth rate of sulfur dioxide (SO_2) emissions over the years 2014 to 2023 and adjust for economic trends to isolate change due to policy effort rather than economic fluctuation.

Variable		Units
SO2	SO_2 emissions	Gg
GDP	Gross Domestic Product	2021$
SDR	Correlation coefficient	—
SDB	Emission growth rate	proportion

First, we calculate the Pearson correlation coefficient between SO_2 emissions and GDP over a ten-year period,

$$SDR = corr(SO2, GDP)$$

Second, we regress logged SO_2 emissions over ten years to find a slope,

$$ln(SO2) = \alpha + \beta t$$

Third, we calculate an unadjusted average annual growth rate in SO_2 emissions,

$$SDB = exp(\beta) - 1$$

Fourth, we account for the correlation between emissions and GDP for certain countries. If a country has a negative growth rate and a positive correlation between emissions and GDP, then the trend might be explained more by economic contraction than policy effort. If a country has a positive growth rate and a negative correlation, then the country might be blunting the effect of economic growth on emissions through successful policy effort. In both of these cases, we bring the average annual growth rate closer to zero to more accurately reflect policy effort instead of extraneous circumstances.

$$SDA = \begin{cases} SDB \times (1 + SDR) \; if \; SDB \geq 0 \; and \; SDR < 0 \\ SDB \times (1 - SDR) \; if \; SDB < 0 \; and \; SDR > 0 \\ SDB \; otherwise \end{cases}$$

SMW Sustainably managed solid waste

Sustainably managed solid waste refers to the proportion of household and commercial waste generated in a country that is collected and treated in a manner that controls environmental risks. This metric counts waste as "controlled" if it is treated through recycling, composting, anaerobic digestion, incineration, or disposed of in a sanitary landfill.

Variable		Units
SWF	Solid waste treatment	proportion
f	An index of fates	

Fates classified as sustainable management in the source data are controlled, sanitary, or unspecified landfill; anaerobic digestion; compost; recycling; incineration; mechanical biological treatment (mbt); and refuse-derived fuel (rdf).

The indicator is a straightforward sum of these proportions, converted to a percentage,

$$SMW = \sum_{f} SWF_f \times 100\%$$

SMW Imputation of missing values

Variable		Units
GPC	GDP per capita	\$/person
REG^{UNSD}	UNSD subregions, altered so China is its own region	—

We impute SMW values using the following formula,

$$\widehat{SMW} = \alpha + \beta \ln GPC + \boldsymbol{\delta} \boldsymbol{REG^{UNSD}} + \varepsilon$$

where $\boldsymbol{\delta}$ are coefficients for categorical dummies in the vector of $\boldsymbol{REG^{UNSD}}$.

This process results in the following imputed scores for 21 countries included in the 2026 EPI:

code	iso	country	SMW.ind.2024
24	AGO	Angola	43.89
108	BDI	Burundi	12.53
120	CMR	Cameroon	32.85
140	CAF	Central African Republic	5.52
148	TCD	Chad	19.83
174	COM	Comoros	34.97
384	CIV	Cote d'Ivoire	29.39
226	GNQ	Equatorial Guinea	54.74
624	GNB	Guinea-Bissau	12.84
426	LSO	Lesotho	35.44
450	MDG	Madagascar	21.01
466	MLI	Mali	13.96
516	NAM	Namibia	60.95
562	NER	Niger	4.10
566	NGA	Nigeria	32.85
586	PAK	Pakistan	27.19
646	RWA	Rwanda	32.83
678	STP	Sao Tome & Principe	35.25
694	SLE	Sierra Leone	15.07
768	TGO	Togo	13.84
716	ZWE	Zimbabwe	42.81

SNM Sustainable Nitrogen Management Index

The Sustainable Nitrogen Management Index seeks to balance efficient application of nitrogen fertilizer with maximum crop yields as a measure of the environmental performance of agricultural production.

Variable		Units
NCR	Nitrogen crop removal	kg / ha
NTI	Nitrogen total inputs	kg / ha
NUE	Nitrogen use efficiency	—
$\widetilde{NUE}$	Normalized NUE	—
$\widetilde{NCR}$	Normalized NCR	—
t	An index for years	

First, we calculate nitrogen use efficiency as the ratio of nitrogen removed by crops (*i.e.*, nitrogen yield) to total nitrogen inputs,

$$NUE = {}^{NCR}/_{NTI}$$

Second, we normalize NUE relative to an optimal reference value of 1. NUE < 1 means that some nitrogen inputs are not being recovered in crops, while NUE > 1 indicate that nitrogen inputs are insufficient and the soil is progressively losing fertility,

$$\widetilde{NUE} = \begin{cases} NUE \ if \ NUE \leq 1 \\ 1 - (NUE - 1) \ if \ 1 < NUE \leq 2 \\ 0 \ if \ NUE > 2 \end{cases}$$

Third, we normalize nitrogen crop removal relative to a reference value of 90 kg/ha, which is the average global yield required to meet food demand in 2050 (Zhang *et al*. 2022)[5],

$$\widetilde{NCR} = \begin{cases} 1 \ if \ NCR > 90 \\ {}^{NCR}/_{90} \ if \ NCR \leq 90 \end{cases}$$

[5] Zhang, X., Wang, Y., Schulte-Uebbing, L., De Vries, W., Zou, T., & Davidson, E. A. (2022). Sustainable Nitrogen Management Index: Definition, Global Assessment, and Potential Improvements. *Frontiers of Agricultural Science and Engineering, 9*(3), 356–365. https://doi.org/10.15302/J-FASE-2022458

The Sustainable Nitrogen Management Index is given by the Euclidean distance to an optimal point in which both $\widetilde{NCR}$ and $\widetilde{NUE}$ are equal to 1,

$$SNM = \sqrt{\left(1 - \widetilde{NCR}\right)^2 + \left(1 - \widetilde{NUE}\right)^2}$$

Finally, we calculate a 5-year moving average to smooth over noise in annual time series of fertilizer use data,

$$SNM = \frac{\sum_{i=0}^{4} SNM_{t-1}}{5}$$

SNM IMPUTATION OF MISSING VALUES

Variable		Units
GPC	GDP per capita	$/person
GVA	Agriculture, forestry, and fishing, value added	% of GDP
NPC	Nitrogen use per capita	kg/person
REG^{UNSD}	UNSD subregions, altered so China is its own region	—

We impute SNM values using the following formula,

$$\widehat{SNM} = \alpha + \beta \ln GPC + \gamma \ln GVA + \boldsymbol{\delta REG^{UNSD}} + \theta \ln NPC + \varepsilon$$

where $\boldsymbol{\delta}$ are coefficients for categorical dummies in the vector of $\boldsymbol{REG^{UNSD}}$.

This process results in the following imputed scores for countries included in the 2026 EPI:

code	iso	country	SNM.ind.2023
585	PLW	Palau	29.33
626	TLS	Timor-Leste	35.18

SOE SO_2 exposure

This indicator measures a country's ambient ground-level concentration of sulfur dioxide (SO_2), weighted by population to better capture the exposure levels in geographic areas with a higher human population density.

Geospatial files		Units
SOE	SO_2 concentration	kg/kg
GPP	Gridded population	persons
NEB	Country boundaries	—

First, the gridded population data only exist every five years over the period 2000–2020. Missing values over this period come from linear interpolation, and we use 2020 values for the years 2021–2024.

Second, we convert SO_2 concentrations from kg/kg to ppm.

Third, we resample and overlay the SO_2 concentration and gridded population raster to generate population-weighted exposure.

Fourth, we overlay the country boundary shapefiles for each country to calculate the average SO_2 exposure experienced by the population.

TBN Terrestrial biome protection

The terrestrial world comprises 14 kinds of ecoregions, or biomes, though not every country has every biome. We measure the area of every biome in a country then calculate how much of those biome types lie within protected areas or Other Effective Area-Based Conservation Measures (OECMs). According to Target 3 of the Kunming-Montreal Global Biodiversity Framework, countries should be protecting at least 30% of each biome type. We weight biome types by their prevalence within each country.

Geospatial files		
TPA	Terrestrial protected areas	
NEB	Country boundaries	
TEW	Terrestrial ecoregions of the world	
TEA	Terrestrial biomes within each country	
BPA	Protected biomes within each country	
TTA	Terrestrial protected areas within each country	
Variable		**Units**
TEA	Terrestrial biomes within each country	km^2
BPA	Protected biomes within each country	km^2
b	An index of biomes	
c	An index of countries	

First, we overlay the shapefiles of biomes and country borders, which is then converted to the total area of each biome in each country,

$$\text{TEW} \cap \text{NEB} \rightarrow \text{TEA} \rightarrow TEA_{bc}$$

Second, we overlay the shapefiles of TPAs and country borders,

$$\text{TPA} \cap \text{NEB} \rightarrow \text{TTA}$$

Third, we overlay the shapefiles of biomes and protected areas, which is then converted to the total protected area of each biome in each country,

$$\text{TEA} \cap \text{TTA} \rightarrow \text{BPA} \rightarrow BPA_{bc}$$

Fourth, we calculate the percentage of each biome present in a country that lies within a protected area,

$$PCT_{bc} = \frac{BPA_{bc}}{TEA_{bc}}$$

Second, we cap the credit given to a country for protecting any given biome at 30%,

$$ICT_{bc} = \begin{cases} PCT_{bc} \ if \ PCT_{bc} \leq 0.30 \\ 0.30 \ if \ PCT_{bc} > 0.30 \end{cases}$$

Third, we calculate the national weight placed on each biome by the proportion of that biome for the entire country,

$$w_{bc} = \frac{TEA_{bc}}{\sum_b TEA_{bc}}$$

Fourth, we calculate the metric as the weighted sum of percent protection for all biomes in a country,

$$TBN_c = \sum_b (w_{bc} \times ICT_{bc}) \times 100\%$$

TCL Tree cover loss

This indicator measures the five-year average loss of trees (at ≥30% canopy cover), across the entire country, as a proportion of tree cover in the baseline year of 2000.

Variable		Units
TCA	Tree cover area (≥30% canopy cover)	ha
TCC	Tree cover loss	ha
TC5	Sum of last 5 years of loss	ha
t	An index of years	

First, we sum the last 5 years of tree cover loss for a country,

$$TC5 = \sum_{i=0}^{4} TCC_{t-i}$$

Then, we divide TC5 by five times the tree cover area (TCA) from the reference year of 2000,

$$TCL = \frac{TC5}{5 \times TCA_{2000}}$$

TKP Terrestrial KPA protection

This indicator is the percentage of Key Biodiversity Areas (KBAs) within a country's territory that is covered by protected areas or Other Effective Area-Based Conservation Measures (OECMs).

Geospatial files		
TPA	Terrestrial protected areas	
NEB	Country boundaries	
KBA	Key Biodiversity Areas	
TKA	Terrestrial KBAs within each country	
KPA	Protected terrestrial KBAs within each country	
TTA	Terrestrial protected areas within each country	
Variable		**Units**
TKA	Total terrestrial KBA area	km^2
KPA	Total protected area within KBAs	km^2

First, we overlay the shapefiles of KBAs and country borders, which is then converted to the total area of KBAs in each country,

$$\text{KBA} \cap \text{NEB} \rightarrow \text{TKA} \rightarrow TKA$$

Second, we overlay the shapefiles of TPAs and country borders,

$$\text{TPA} \cap \text{NEB} \rightarrow \text{TTA}$$

Third, we overlay the shapefiles of KBAs and protected areas, which is then converted to the total protected area of KBAs in each country,

$$\text{TKA} \cap \text{TTA} \rightarrow \text{KPA} \rightarrow KPA$$

Fourth, we calculate the percentage of total KBAs that are covered by protected areas,

$$TKP = \frac{KPA}{TKA} \times 100\%$$

VOE VOC exposure

This indicator measures a country's ambient ground-level concentration of volatile organic compounds (VOC), weighted by population to better capture the exposure levels in geographic areas with a higher human population density. We estimate volatile organic compounds as the summed concentration of ethane, propane, formaldehyde, and isoprene.

Geospatial files		Units
VOE	VOC concentration	kg/kg
GPP	Gridded population	persons
NEB	Country boundaries	—

First, the gridded population data only exist every five years over the period 2000–2020. Missing values over this period come from linear interpolation, and we use 2020 values the years 2021–2024.

Second, we convert VOC concentrations from kg/kg to ppm.

Third, we resample and overlay the VOC concentration and gridded population raster to generate population-weighted exposure.

Fourth, we overlay the country boundary shapefiles for each country to calculate the average VOC exposure experienced by the population.

WWT Wastewater treatment

This indicator measures the percentage of domestic wastewater that is safely treated. A score of 100 indicates 100% treatment, and a score of 0 indicates 0% treatment.

Data primarily come from UN-Water, with supplementary data from UNSD/UNEP country questionnaires and Jones *et al*. (2020). None of the sources provide complete geographical coverage, and the 2026 EPI combines these sources to fill gaps in coverage. To do so, we use the following hierarchy:

First, we use data from UN-Water. This data source provides variables that can be used “off the shelf”: no further calculations are required. If a country is not in this dataset, then …

Second, we use data from the most recent UNSD/UNEP country questionnaire. These files contain individual country responses with the following variables:

Variable		Units
urban	Wastewater treated in urban wastewater treatment plants	mio m3/y
other	Wastewater treated in other treatment plants	mio m3/y
indep	Wastewater treated in independent treatment facilities	mio m3/y
gen	Total wastewater generated	mio m3/y

Wastewater treatment is the ratio of treatment types over total generation,

$$WWT_{UNSD/UNEP} = \frac{urban + other + indep}{gen}$$

If a country is in neither the UN-Water dataset nor has answered the UNSD/UNEP country questionnaire, then …

Third, we use data from Jones *et al*. (2020). This data source provides variables that can be used “off the shelf”: no further calculations are required.

4. Data Sources

Data in the 2026 EPI can be characterized by the following attributes.

TLA	Three letter abbreviation for the variable
Source	The organization that produces or houses the dataset
URL	Where the dataset may be found on the Internet. If the dataset is not publicly available online, the URL points to the source institution.
Date received	The date on which the EPI team received the dataset
Instructions	Any special instructions for navigating the data source website or other means of retrieving the dataset
Citation	Formal citation for the dataset
Documentation *or* Reference	Additional documents that describe the dataset, source organization, or other relevant materials that are helpful in understanding the dataset or its methodology
Note	Additional details for understanding how to retrieve or use the dataset

Due to the variety of data sources, not every field is applicable to every dataset. Each entry below provides the fullest account possible.

4.1 Geospatial data

CCO	Global distribution of cold-water corals
Source	UNEP - World Conservation Monitoring Center
URL	https://data-gis.unep-wcmc.org/server/rest/services/HabitatsAndBiotopes/Global_Distribution_of_Cold_water_Corals/FeatureServer
Date received	2024-03-27
Citation	Freiwald A, Rogers A, Hall-Spencer J, Guinotte JM, Davies AJ, Yesson C, Martin CS, Weatherdon LV (2021). Global distribution of cold-water corals (version 5.1). Fifth update to the dataset in Freiwald et al. (2004) by UNEP-WCMC, in collaboration with Andre Freiwald and John Guinotte. Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/72x9-rt61
Reference	Freiwald A, Fosså JH, Grehan A, Koslow T, Roberts JM (2004). *Cold-water coral reefs: out of sight – no longer out of mind*. Biodiversity Series 22. Cambridge (UK): UNEP World Conservation Monitoring Centre. 86 pp. URL: https://archive.org/details/coldwatercoralre04frei

COE	CO concentration
Source	Copernicus Atmosphere Monitoring Service
URL	https://ads.atmosphere.copernicus.eu/datasets/cams-global-reanalysis-eac4-monthly
Date received	2026-02-10
Instructions	Click on the “Downloads” tab Variable: Multi Level • Carbon monoxide Pressure level: 1000 hPa Model level: 60 Year: Select all Month: Select all Product type: Monthly mean Time: Select all Geographic area: Whole available region Data format: Zipped netCDF (experimental)
Citations	Copernicus Atmosphere Monitoring Service (2020): CAMS global reanalysis (EAC4) monthly averaged fields. Copernicus Atmosphere Monitoring Service (CAMS) Atmosphere Data Store, DOI: 10.24381/fd75fff2 (Accessed on 2026-02-10) Inness, A., Ades, M., Agustí-Panareda, A., Barré, J., Benedictow, A., Blechschmidt, A.-M., Dominguez, J. J., Engelen, R., Eskes, H., Flemming, J., Huijnen, V., Jones, L., Kipling, Z., Massart, S., Parrington, M., Peuch, V.-H., Razinger, M., Remy, S., Schulz, M., & Suttie, M. (2019). The CAMS reanalysis of atmospheric composition. *Atmospheric Chemistry and Physics, 19*(6), 3515–3556. https://doi.org/10.5194/acp-19-3515-2019
Reference	Wolf, M.J., Esty, D.C., Kim, H., Bell, M.L., Brigham, S., Nortonsmith, Q., Zaharieva, S., Wendling, Z.A., de Sherbinin, A. and Emerson, J.W., (2022). New Insights for Tracking Global and Local Trends in Exposure to Air Pollutants. *Environmental Science & Technology*, *56*(7), 3984-3996, https://doi.org/10.1021/acs.est.1c08080..
Note	Requires registration and login to access files.

COW	Global distribution of coral reefs
Source	UNEP - World Conservation Monitoring Center
URL	https://data-gis.unep-wcmc.org/portal/home/item.html?id=0613604367334836863f5c0c10e452bf
Date received	2024-03-27
Citation	UNEP-WCMC, WorldFish Centre, WRI, TNC (2021). Global distribution of coral reefs, compiled from multiple sources including the Millennium Coral Reef Mapping Project. Version 4.1, updated by UNEP-WCMC. Includes contributions from IMaRS-USF and IRD (2005), IMaRS-USF (2005) and Spalding et al. (2001). Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/t2wk-5t34

GPP	Gridded population of the world
Source	Earth Science Data Information System
URL	https://www.earthdata.nasa.gov/data/catalog/sedac-ciesin-sedac-gpwv4-popcount-r11-4.11
Date received	2018-10-30
Citation	Center For International Earth Science Information Network-CIESIN-Columbia University. (2018). *Gridded Population of the World, Version 4 (GPWv4): Population Count, Revision 11* (Version 4.11) [Data set]. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4JW8BX5

KBA	Key Biodiversity Areas
Source	KBA Partnership
URL	https://www.keybiodiversityareas.org/request-gis-data
Date received	2026-03-31
Instructions	Fill out form to request spatial KBA dataset.
Citation	BirdLife International (2025). Digital boundaries of Key Biodiversity Areas from the World Database of Key Biodiversity Areas. Developed by the KBA Partnership: BirdLife International, International Union for the Conservation of Nature, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:Wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, Wildlife Conservation Society and World Wildlife Fund. 2025-09-02 Version.

KNS	Global distribution knolls and seamounts
Source	UNEP - World Conservation Monitoring Center
URL	https://data-gis.unep-wcmc.org/portal/home/item.html?id=4490b872250548a79e8c96da199be5f4
Date received	2024-03-27
Citation	Yesson C, Clark MR, Taylor M, Rogers AD (2011). The global distribution of seamounts based on 30-second bathymetry data. *Deep Sea Research Part I: Oceanographic Research Papers 58*: 442-453. DOI: http://dx.doi.org/10.1016/j.dsr.2011.02.004 Data DOI: http://doi.pangaea.de/10.1594/PANGAEA.757564

MAN	Global distribution of mangroves
Source	Global Mangrove Watch
URL	https://habitats.oceanplus.org/
Date received	2024-03-27
Instructions	Scroll to bottom of page “Download spatial data” Click “Download data” Select “Mangroves” Click “Download selected shape file”
Citation	Bunting P., Rosenqvist A., Lucas R., Rebelo L-M., Hilarides L., Thomas N., Hardy A., Itoh T., Shimada M. and Finlayson C.M. (2018). The Global Mangrove Watch – a New 2010 Global Baseline of Mangrove Extent. *Remote Sensing 10*(10): 1669. doi: 10.3390/rs1010669.

MPA	Marine protected areas
Source	World Database on Protected Areas
URL	https://www.protectedplanet.net/
Date received	2026-05-11
Citation	UNEP-WCMC and IUCN (2026), Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM) [Online], May 2026, Cambridge, UK: UNEP-WCMC and IUCN.

MTZ	Maritime zones
Source	Flanders Marine Institute
URL	https://doi.org/10.14284/382
Date received	2024-03-26
Instructions	Click ”Download Data” button
Reference	Flanders Marine Institute (2019). Maritime Boundaries Geodatabase, version 11. Available online at https://www.marineregions.org/
Note	The source refers to these areas as “EEZs,” a definition that differs from the United Nations Convention on the Law of the Sea (see §1).

NEB	Country boundaries
Source	Natural Earth Data
URL	https://www.naturalearthdata.com/downloads/50m-cultural-vectors/50m-admin-0-countries-2/
Date received	2023-06-26
Instructions	Download version 5.1.1 (with boundary lakes)
Note	The EPI team modified the base map to reässign the Crimean Peninsula to Ukraine.

PRS	Pesticide pollution risk
Source	Tang et al.
URL	https://doi.org/10.1038/S41561-021-00712-5
Date received	2023-02-23
Reference	Tang, F.H., Lenzen, M., McBratney, A. and Maggi, F., (2021). Risk of pesticide pollution at the global scale. *Nature Geoscience, 14*(4), 206-210.
Notes	Updated values based on PESTCHEM-GRIDS v2: figshare.com/articles/dataset/PESTCHEMGRIDS_v2_01_beta_version_/25854769

SGR	Global distribution of sea grasses
Source	UNEP – World Conservation Monitoring Center
URL	https://data-gis.unep-wcmc.org/portal/home/item.html?id=aaa46cd3d3d640b2916b8f0a0ffe07cb
Date received	2024-03-27
Citation	UNEP-WCMC, Short FT (2021). Global distribution of seagrasses (version 7.1). Seventh update to the data layer used in Green and Short (2003). Cambridge (UK): UN Environment World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/x6r3-d211

SLT	Global distribution of salt marshes
Source	UNEP – World Conservation Monitoring Center
URL	https://data-gis.unep-wcmc.org/portal/home/item.html?id=addd1baa160c4d318b84c3b714d3e583
Date received	2024-03-27
Citation	Mcowen C, Weatherdon LV, Bochove J, Sullivan E, Blyth S, Zockler C, Stanwell-Smith D, Kingston N, Martin CS, Spalding M, Fletcher S (2017). A global map of saltmarshes (v6.1). *Biodiversity Data Journal 5*: e11764. Paper DOI: https://doi.org/10.3897/BDJ.5.e11764; Data DOI: https://doi.org/10.34892/07vk-ws51

SOE	SO_2 concentration
Source	Copernicus Atmosphere Monitoring Service
URL	https://ads.atmosphere.copernicus.eu/datasets/cams-global-reanalysis-eac4-monthly
Date received	2026-02-10
Instructions	Click on the “Downloads” tab Variable: Multi Level • Sulfur dioxide Pressure level: 1000 hPa Model level: 60 Year: Select all Month: Select all Product type: Monthly mean Time: Select all Geographic area: Whole available region Data format: Zipped netCDF (experimental)
Citations	Copernicus Atmosphere Monitoring Service (2020): CAMS global reanalysis (EAC4) monthly averaged fields. Copernicus Atmosphere Monitoring Service (CAMS) Atmosphere Data Store, DOI: 10.24381/fd75fff2 (Accessed on 2026-02-10) Inness, A., Ades, M., Agustí-Panareda, A., Barré, J., Benedictow, A., Blechschmidt, A.-M., Dominguez, J. J., Engelen, R., Eskes, H., Flemming, J., Huijnen, V., Jones, L., Kipling, Z., Massart, S., Parrington, M., Peuch, V.-H., Razinger, M., Remy, S., Schulz, M., & Suttie, M. (2019). The CAMS reanalysis of atmospheric composition. *Atmospheric Chemistry and Physics, 19*(6), 3515–3556. https://doi.org/10.5194/acp-19-3515-2019
Reference	Wolf, M.J., Esty, D.C., Kim, H., Bell, M.L., Brigham, S., Nortonsmith, Q., Zaharieva, S., Wendling, Z.A., de Sherbinin, A. and Emerson, J.W., (2022). New Insights for Tracking Global and Local Trends in Exposure to Air Pollutants. *Environmental Science & Technology*, *56*(7), 3984-3996, https://doi.org/10.1021/acs.est.1c08080..
Note	Requires registration and login to access files.

TEW	Terrestrial ecoregions of the world
Source	World Wildlife Fund
URL	https://databasin.org/datasets/68635d7c77f1475f9b6c1d1dbe0a4c4c/
Citation	Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D’amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., & Kassem, K. R. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth. *BioScience, 51*(11), 933–938. https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

TPA	Terrestrial protected areas
Source	World Database on Protected Areas
URL	https://www.protectedplanet.net/
Date received	2026-03-20
Citation	UNEP-WCMC and IUCN (2026), Protected Planet: World Database on Protected and Conserved Areas [On-line], February 2026 Release, Cambridge, UK: UNEP-WCMC and IUCN.

VOE	Volatile Organic Compounds concentration
Source	Copernicus Atmosphere Monitoring Service
URL	https://ads.atmosphere.copernicus.eu/datasets/cams-global-reanalysis-eac4-monthly
Date received	2026-02-10
Instructions	Click on the "Downloads" tab Variable: Multi Level • Ethane • Propane • Formaldehyde • Isoprene Pressure level: 1000 hPa Model level: 60 Year: Select all Month: Select all Product type: Monthly mean Time: Select all Geographic area: Whole available region Data format: Zipped netCDF (experimental)
Citations	Copernicus Atmosphere Monitoring Service (2020): CAMS global reanalysis (EAC4) monthly averaged fields. Copernicus Atmosphere Monitoring Service (CAMS) Atmosphere Data Store, DOI: 10.24381/fd75fff2 (Accessed on 2026-02-10) Inness, A., Ades, M., Agustí-Panareda, A., Barré, J., Benedictow, A., Blechschmidt, A.-M., Dominguez, J. J., Engelen, R., Eskes, H., Flemming, J., Huijnen, V., Jones, L., Kipling, Z., Massart, S., Parrington, M., Peuch, V.-H., Razinger, M., Remy, S., Schulz, M., & Suttie, M. (2019). The CAMS reanalysis of atmospheric composition. *Atmospheric Chemistry and Physics, 19*(6), 3515–3556. https://doi.org/10.5194/acp-19-3515-2019
Reference	Wolf, M.J., Esty, D.C., Kim, H., Bell, M.L., Brigham, S., Nortonsmith, Q., Zaharieva, S., Wendling, Z.A., de Sherbinin, A. and Emerson, J.W., (2022). New Insights for Tracking Global and Local Trends in Exposure to Air Pollutants. *Environmental Science & Technology*, *56*(7), 3984-3996, https://doi.org/10.1021/acs.est.1c08080..
Note	Requires registration and login to access files.

4.2 Tabular data

ATY	Maximum attainable yields
Source	Mueller *et al.* 2012
URL	https://doi.org/10.1038/nature11420
Date received	2023-05-22
Instructions	In the "Supplementary information" section, click "Supplementary Data."
Citation	Mueller, N. D., Gerber, J. S., Johnston, M., Ray, D. K., Ramankutty, N., & Foley, J. A. (2012). Closing yield gaps through nutrient and water management. *Nature, 490*(7419), 254–257. https://doi.org/10.1038/nature11420

BER	Bioclimatic Ecosystem Resilience Index
Source	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
URL	https://data.csiro.au/collection/csiro:72585v4
Date received	2026-03-24
Citation	Ware, Chris; Valavi, Roozbeh; Vickers, Mat; Giljohann, Kate; Mokany, Karel; Purvis, Andy; Walkden, Patrick; De Palma, Adriana; Duffin, Connor; Contu, Sara; Harwood, Thomas; Hoskins, Andrew; & Ferrier, Simon (2026): Global biodiversity indicator data for BHI, BERI, PARC-representativeness, PARC-connectedness and ecosystem condition (2000-2024). v4. CSIRO. Data Collection. https://doi.org/10.25919/3aka-y730
Reference	Ferrier et al. 2020. A globally applicable indicator of the capacity of terrestrial ecosystems to retain biological diversity under climate change: The bioclimatic ecosystem resilience index. *Ecological Indicators 117*, October 2020, 106554. https://doi.org/10.1016/j.ecolind.2020.106554
Note	Prepared by CSIRO, received via personal communication before public release.

BHI	Biodiversity Habitat Index
Source	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
URL	https://data.csiro.au/collection/csiro:72585v4
Date received	2026-02-15
Citation	Ware, Chris; Valavi, Roozbeh; Vickers, Mat; Giljohann, Kate; Mokany, Karel; Purvis, Andy; Walkden, Patrick; De Palma, Adriana; Duffin, Connor; Contu, Sara; Harwood, Thomas; Hoskins, Andrew; & Ferrier, Simon (2026): Global biodiversity indicator data for BHI, BERI, PARC-representativeness, PARC-connectedness and ecosystem condition (2000-2024). v4. CSIRO. Data Collection. https://doi.org/10.25919/3aka-y730
Note	Prepared by CSIRO, received via personal communication before public release.

BLC	Black carbon emissions
Source	Community Emissions Data Systems
URL	https://zenodo.org/records/15059443
Date received	2025-05-28
Instructions	Download "CEDS_v_2025_03_18_aggregate.zip"
Citation	Hoesly, R., Smith, S. J., Ahsan, H., Prime, N., O'Rourke, P., Crippa, M., Klimont, Z., Guizzardi, D., Feng, L., Harkins, C., MCDONALD, B.& Wang, S. (2025). CEDS v_2025_03_18 Aggregate Data (Versions v_2025_03_18) [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.15059443
Reference	Hoesly, R. M., Smith, S. J., Feng, L., Klimont, Z., Janssens-Maenhout, G., Pitkanen, T., Seibert, J. J., Vu, L., Andres, R. J., Bolt, R. M., Bond, T. C., Dawidowski, L., Kholod, N., Kurokawa, J., Li, M., Liu, L., Lu, Z., Moura, M. C. P., O'Rourke, P. R., & Zhang, Q. (2018). Historical (1750–2014) anthropogenic emissions of reactive gases and aerosols from the Community Emissions Data System (CEDS). *Geoscientific Model Development, 11*(1), 369–408. https://doi.org/10.5194/gmd-11-369-2018

CAH	Area harvested per crop
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/QCL
Date received	2026-02-19
Instructions	In the "Bulk Downloads" section, click "All Data."

CDO	CO_2 emissions
Source	Global Carbon Budget
URL	https://globalcarbonbudget.org/datahub/the-latest-gcb-data-2025/
Date received	2026-01-20
Instructions	Download "National Fossil Carbon Emissions v2025 [xlsx]"
Citation	Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Bakker, D. C. E., Hauck, J., Landschützer, P., Le Quéré, C., Li, H., Luijkx, I. T., Peters, G. P., Peters, W., Pongratz, J., Schwingshackl, C., Sitch, S., Canadell, J. G., Ciais, P., Aas, K., Alin, S. R., ... Zeng, J. (2026). Global Carbon Budget 2025. *Earth System Science Data, 18*(5), 3211–3288. https://doi.org/10.5194/essd-18-3211-2026

CH4	CH_4 emissions
Source	EDGAR
URL	https://edgar.jrc.ec.europa.eu/report_2025#data_download
Date received	2025-10-09
Instructions	Download the XLSX file for "EDGAR GHG emissions"
Citation	Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M. et al., GHG emissions of all world countries - 2025 Report, Publications Office of the European Union, Luxembourg, 2025, doi:10.2760/9816914, JRC143227.

CRY	Crop yields
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/QCL
Date received	2026-02-19
Instructions	In the "Bulk Downloads" section, click "All Data."

CTH	Total catch of seafood
Source	*Sea Around Us*
URL	https://www.seaaroundus.org/
Date received	2025-05-30
Instructions	Navigate to Tools & Data Under "Search Type", select "EEZ" Select on EEZ on the map or from the dropdown menu Under the "Indicators" section, click "Marine trophic index" Enter "3.2" into the "Min TL" field and click "redraw graph" . Click "Download Data" button on the top-right Repeat for each EEZ.
Note	The source refers to maritime zones as "EEZs," a definition that differs from the United Nations Convention on the Law of the Sea (see §1).

FCO	Catch in the global ocean
Source	*Sea Around Us*
URL	https://www.seaaroundus.org/
Date received	2025-05-28
Instructions	Navigate to Tools & Data Select "Global" On the chart's menu "Dimension", select "Gear" Click "Download Data" button on the top-right
Note	The source refers to maritime zones as "EEZs," a definition that differs from the United Nations Convention on the Law of the Sea (see §1).

FCZ	Catch in maritime zones
Source	*Sea Around Us*
URL	https://www.seaaroundus.org/
Date received	2025-05-30
Instructions	Navigate to Tools & Data Under "Search Type", select "EEZ" Select on EEZ on the map or from the dropdown menu On the chart's menu "Dimension", select "Gear" Click "Download Data" button on the top-right Repeat for each EEZ.
Note	The source refers to maritime zones as "EEZs," a definition that differs from the United Nations Convention on the Law of the Sea (see §1).

FOG	F-gas emissions
Source	EDGAR
URL	https://edgar.jrc.ec.europa.eu/report_2025#data_download
Date received	2025-10-09
Instructions	Download the XLSX file for "EDGAR GHG emissions"
Citation	Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M. et al., GHG emissions of all world countries - 2025 Report, Publications Office of the European Union, Luxembourg, 2025, doi:10.2760/9816914, JRC143227.

GDP	Gross Domestic Product
Source	World Bank
URL	https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.KD
Date received	2025-06-02
Instructions	Under Download on right side of web page, click “csv”
Documentation	https://databank.worldbank.org/reports.aspx?source=2&type=metadata&series=NY.GDP.MKTP.PP.KD
Note	GDP is in units of PPP (constant 2021 international $)

GDP	Gross Domestic Product
Source	IMF
URL	https://data.imf.org/en/Data%20Explorer
Date received	2026-03-29

Instructions	Under the “Data Explorer” panel on the left
	• Dataset: World Economic Outlook (WEO)
	• Display All/By Table: Full List
	• Country: All
	• Indicator:
	  o Gross domestic product (GDP), Constant prices, Domestic currency
	  o Gross domestic product (GDP), Price deflator, Index
	• Frequency: Annual
	• Time Period: Custom
	  o 01/01/1990 to 12/31/2024
	Click “Apply”
	Click “Download” > Click “Data on this page”
	• File Format: CSV
	• Data Format: Timeseries per row
	• Metadata: Country, Indicator, Frequency, Scale
	  o Click “Download”

Note	These data are used to fill gaps in the GDP data from the World Bank. Before doing so, it is necessary to convert from Constant prices, Domestic currency to PPP (constant 2021 international $) using the Price deflator, Index and the Implied PPP conversion rate (see variable ICP).

GEA	Grasslands extent
Source	Land & Carbon Lab
Date received	2026-04-04
Reference	Parente, L., Sloat, L., Mesquita, V., Consoli, D., Stanimirova, R., Hengl, T., Bonannella, C., Teles, N., Wheeler, I., Hunter, M., Ehrmann, S., Ferreira, L., Mattos, A. P., Oliveira, B., Meyer, C., Şahin, M., Witjes, M., Fritz, S., Malek, Z., & Stolle, F. (2024). Annual 30-m maps of global grassland class and extent (2000–2022) based on spatiotemporal Machine Learning. *Scientific Data, 11*(1), 1303. https://doi.org/10.1038/s41597-024-04139-6
Note	Prepared by Land & Carbon Lab and received via personal communication

GEC	Grasslands conversion
Source	Land & Carbon Lab
Date received	2026-03-12
Reference	Parente, L., Sloat, L., Mesquita, V., Consoli, D., Stanimirova, R., Hengl, T., Bonannella, C., Teles, N., Wheeler, I., Hunter, M., Ehrmann, S., Ferreira, L., Mattos, A. P., Oliveira, B., Meyer, C., Şahin, M., Witjes, M., Fritz, S., Malek, Z., & Stolle, F. (2024). Annual 30-m maps of global grassland class and extent (2000–2022) based on spatiotemporal Machine Learning. *Scientific Data, 11*(1), 1303. https://doi.org/10.1038/s41597-024-04139-6
Note	Prepared by Land & Carbon Lab and received via personal communication

GFE	Global fishing effort
Source	Global Fishing Watch
URL	https://globalfishingwatch.org/data-download/datasets/public-fishing-effort
Date received	2024-03-27
Instructions	Create free account with Global Fishing Watch Select all files with the name "fleet-daily-csvs-100-v3-*.zip" over the years 2012–2024. Click "Download"
Citation	Kroodsma, D. A., Mayorga, J., Hochberg, T., Miller, N. A., Boerder, K., Ferretti, F., Wilson, A., Bergman, B., White, T. D., Block, B. A., Woods, P., Sullivan, B., Costello, C., & Worm, B. (2018). Tracking the global footprint of fisheries. *Science, 359*(6378), 904–908. https://doi.org/10.1126/science.aao5646

GVA	Agriculture, forestry, and fishing, value added
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/CS
Date received	2026-04-23
Instructions	Countries: select all Elements: Share of Value Added US$, 2015 prices Items: select all Years: 2005–2023

HFD	Household solid fuels
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-05-28
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Household air pollution from solid fuels Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-05-28.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

ICP	Implied PPP conversion rate
Source	IMF
URL	https://www.imf.org/external/datamapper/PPPEX@WEO/OEMDC/ADVEC/WEOWORLD/
Date received	2026-03-29
Instructions	Click on the button for "EXCEL FILE" under "All Country Data"
Note	These data are used to convert IMF's GDP data from Constant prices, Domestic currency to PPP (constant 2021 international $) using the Price deflator, Index (see variable GDP).

KFA	Tree cover area (≥30% canopy cover) in KBAs
Source	Global Forest Watch
URL	https://www.globalforestwatch.org/
Date received	2025-07-18
Reference	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science, 342*(6160), 850–853. https://doi.org/10.1126/science.1244693
Note	Prepared by Global Forest Watch, received via personal communication. Viewable online: https://gfw.global/h9dh7w

KFC	Tree cover loss in KBAs
Source	Global Forest Watch
URL	https://www.globalforestwatch.org/
Date received	2025-07-18
Reference	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science, 342*(6160), 850–853. https://doi.org/10.1126/science.1244693
Note	Prepared by Global Forest Watch, received via personal communication. Viewable online: https://gfw.global/yDtvP1

KGA	Grasslands extent in KBAs
Source	Land & Carbon Lab
Date received	2026-03-31
Reference	Parente, L., Sloat, L., Mesquita, V., Consoli, D., Stanimirova, R., Hengl, T., Bonannella, C., Teles, N., Wheeler, I., Hunter, M., Ehrmann, S., Ferreira, L., Mattos, A. P., Oliveira, B., Meyer, C., Şahin, M., Witjes, M., Fritz, S., Malek, Z., & Stolle, F. (2024). Annual 30-m maps of global grassland class and extent (2000–2022) based on spatiotemporal Machine Learning. *Scientific Data, 11*(1), 1303. https://doi.org/10.1038/s41597-024-04139-6
Note	Prepared by Land & Carbon Lab and received via personal communication

KGC	Grasslands conversion in KBAs
Source	Land & Carbon Lab
Date received	2026-03-31
Reference	Parente, L., Sloat, L., Mesquita, V., Consoli, D., Stanimirova, R., Hengl, T., Bonannella, C., Teles, N., Wheeler, I., Hunter, M., Ehrmann, S., Ferreira, L., Mattos, A. P., Oliveira, B., Meyer, C., Şahin, M., Witjes, M., Fritz, S., Malek, Z., & Stolle, F. (2024). Annual 30-m maps of global grassland class and extent (2000–2022) based on spatiotemporal Machine Learning. *Scientific Data, 11*(1), 1303. https://doi.org/10.1038/s41597-024-04139-6
Note	Prepared by Land & Carbon Lab and received via personal communication

LUE	Net carbon fluxes from LULCF
Source	Global Carbon Budget
URL	https://globalcarbonbudget.org/datahub/the-latest-gcb-data-2025/
Date received	2026-01-20
Instructions	Download "National land use change carbon emissions v2025 [xlsx]"
Citation	Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Bakker, D. C. E., Hauck, J., Landschützer, P., Le Quéré, C., Li, H., Luijkx, I. T., Peters, G. P., Peters, W., Pongratz, J., Schwingshackl, C., Sitch, S., Canadell, J. G., Ciais, P., Aas, K., Alin, S. R., … Zeng, J. (2026). Global Carbon Budget 2025. *Earth System Science Data, 18*(5), 3211–3288. https://doi.org/10.5194/essd-18-3211-2026
References	Hansis, E., Davis, S. J., & Pongratz, J. (2015). Relevance of methodological choices for accounting of land use change carbon fluxes. *Global Biogeochemical Cycles, 29*(8), 1230–1246. https://doi.org/10.1002/2014GB004997 Gasser, T., Crepin, L., Quilcaille, Y., Houghton, R. A., Ciais, P., & Obersteiner, M. (2020). Historical CO_2 emissions from land use and land cover change and their uncertainty. *Biogeosciences, 17*(15), 4075–4101. https://doi.org/10.5194/bg-17-4075-2020 Qin, Z., Zhu, Y., Canadell, J. G., Chen, M., Li, T., Mishra, U., & Yuan, W. (2024). Global spatially explicit carbon emissions from land-use change over the past six decades (1961–2020). *One Earth, 7*(5), 835–847. https://doi.org/10.1016/j.oneear.2024.04.002

MTI	Regional Marine Trophic Index
Source	*Sea Around Us*
URL	https://www.seaaroundus.org/
Date received	2025-05-30
Instructions	Navigate to Tools & Data Under "Search Type", select "EEZ" Select on EEZ on the map or from the dropdown menu Under the "Indicators" section, click "Marine trophic index" Enter "3.2" into the "Min TL" field and click "redraw graph" . Click "Download Data" button on the top-right Repeat for each EEZ.
Note	The source refers to maritime zones as "EEZs," a definition that differs from the United Nations Convention on the Law of the Sea (see §1).

NCR	Nitrogen crop removal
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/ESB
Date received	2026-02-18
Instructions	For Countries, select all. For Elements, select Cropland nitrogen per unit area. For Items, select Crop Removal. For Years, select all.

NOD	NO2 exposure
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-05-28
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Nitrogen dioxide pollution Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-05-28.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

NOT	N_2O emissions
Source	EDGAR
URL	https://edgar.jrc.ec.europa.eu/report_2025#data_download
Date received	2025-10-09
Instructions	Download the XLSX file for “EDGAR GHG emissions”
Citation	Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M. et al., GHG emissions of all world countries - 2025 Report, Publications Office of the European Union, Luxembourg, 2025, doi:10.2760/9816914, JRC143227.

NOX	NO_X emissions
Source	Community Emissions Data Systems
URL	https://zenodo.org/records/15059443
Date received	2025-05-28
Instructions	Download “CEDS_v_2025_03_18_aggregate.zip”
Citation	Hoesly, R., Smith, S. J., Ahsan, H., Prime, N., O’Rourke, P., Crippa, M., Klimont, Z., Guizzardi, D., Feng, L., Harkins, C., MCDONALD, B.& Wang, S. (2025). CEDS v_2025_03_18 Aggregate Data (Versions v_2025_03_18) [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.15059443
Reference	Hoesly, R. M., Smith, S. J., Feng, L., Klimont, Z., Janssens-Maenhout, G., Pitkanen, T., Seibert, J. J., Vu, L., Andres, R. J., Bolt, R. M., Bond, T. C., Dawidowski, L., Kholod, N., Kurokawa, J., Li, M., Liu, L., Lu, Z., Moura, M. C. P., O’Rourke, P. R., & Zhang, Q. (2018). Historical (1750–2014) anthropogenic emissions of reactive gases and aerosols from the Community Emissions Data System (CEDS). *Geoscientific Model Development, 11*(1), 369–408. https://doi.org/10.5194/gmd-11-369-2018

NPC	Nitrogen use per capita
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/RFN
Date received	2026-04-23
Instructions	Countries: select all Elements: select all Items: select all Years: 2005–2023

NTI	Nitrogen total inputs
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/ESB
Date received	2026-02-18
Instructions	For Countries, select all. For Elements, select Cropland nitrogen per unit area. For Items Aggregated, select Input + (Total). For Years, select all

OZD	Ozone exposure
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-11-03
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Ambient ozone pollution Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-11-03.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

PAC	Protected Areas Connectedness Index
Source	Commonwealth Scientific and Industrial Research Organization (CSIRO)
URL	https://data.csiro.au/collection/csiro:72585v4
Date received	2026-03-24
Citations	Ware, Chris; Valavi, Roozbeh; Vickers, Mat; Giljohann, Kate; Mokany, Karel; Purvis, Andy; Walkden, Patrick; De Palma, Adriana; Duffin, Connor; Contu, Sara; Harwood, Thomas; Hoskins, Andrew; & Ferrier, Simon (2026): Global biodiversity indicator data for BHI, BERI, PARC-representativeness, PARC-connectedness and ecosystem condition (2000-2024). v4. CSIRO. Data Collection. https://doi.org/10.25919/3aka-y730
Note	Prepared by CSIRO, received via personal communication.

PAR	Protected Areas Representativeness Index
Source	Commonwealth Scientific and Industrial Research Organization (CSIRO)
URL	https://data.csiro.au/collection/csiro:72585v4
Date received	2026-03-24
Citations	Ware, Chris; Valavi, Roozbeh; Vickers, Mat; Giljohann, Kate; Mokany, Karel; Purvis, Andy; Walkden, Patrick; De Palma, Adriana; Duffin, Connor; Contu, Sara; Harwood, Thomas; Hoskins, Andrew; & Ferrier, Simon (2026): Global biodiversity indicator data for BHI, BERI, PARC-representativeness, PARC-connectedness and ecosystem condition (2000-2024). v4. CSIRO. Data Collection. https://doi.org/10.25919/3aka-y730
Note	Prepared by CSIRO, received via personal communication.

PBD	Lead exposure
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-11-03
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Lead exposure Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-11-03.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

PCR	Phosphorus crop removal
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/ESB
Date received	2026-02-18
Instructions	For Countries, select all For Elements, select Cropland phosphorus per unit area For Items, select Crop Removal For Years, select all

PMD	Ambient PM2.5 exposure
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-11-03
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Ambient particulate matter pollution Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-11-03.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

PPC	Phosphorus use per capita
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/RFN
Date received	2026-04-23
Instructions	Countries: select all Elements: select all Items: select all Years: 2005–2023

POP	Population
Source	World Bank
URL	https://data.worldbank.org/indicator/SP.POP.TOTL
Date received	2025-06-16
Instructions	Under Download on right side of web page, click "csv"
Documentation	http://databank.worldbank.org/data/reports.aspx?source=2&type=metadata&series=SP.POP.TOTL

POP	Population
Source	IMF
URL	https://www.imf.org/en/Publications/WEO/weo-database/2025/april
Date received	2025-05-28
Instructions	Click on "By Countries (country-level data) Click on "All Countries" Click "Continue" at top of page Select "Population" Click "Continue" at bottom of page Select: Start year = 1994, End year = 2024 Unclick all Notes and unclick "Subject descriptor" Click next to "ISO Alpha-3 Code" Click "Prepare Report"
Note	This dataset helps fill gaps in the World Bank population data.

PTI	Phosphorus total inputs
Source	FAOSTAT
URL	https://www.fao.org/faostat/en/#data/ESB
Date received	2026-02-18
Instructions	For Countries, select all. For Elements, select Cropland phosphorus per unit area. For Items Aggregated, select Input + (Total). For Years, select all.

RLI	Red List Index
Source	International Union for Conservation of Nature (IUCN) & BirdLife International
URL	https://unstats.un.org/sdgs/dataportal/database
Date received	2026-05-27
Instructions	Select Data Series = 15.5.1 Select Geographic Areas = All groupings (266 of 266) Select Period = 2000–2025 Click "Download" (cloud icon with down arrow) Click "Show Results" Click "Download XLS" under the data table preview
Citation	https://www.iucnredlist.org/
Reference	https://unstats.un.org/sdgs/metadata

SHI	Species Habitat Index
Source	Map of Life
URL	https://mol.org/indicators/habitat/indicators/shi
Date received	2026-03-22
References	Convention on Biological Diversity Secretariat. (2021). *Measuring ecosystem integrity (Goal A) in the port-2020 Global Biodiversity Framework: The GEO BON Species Habitat Index* (Note by the Executive Secretary CBD/WG2020/3/INF/6). https://www.cbd.int/doc/c/2397/5133/3ce87fa6c735a7bf1cafb905/wg2020-03-inf-06-en.pdf IPBES, Brondizio, E., Diaz, S., Settele, J., & Ngo, H. T. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (Version 1). Zenodo. https://doi.org/10.5281/ZENODO.3831673 Jetz, W., McGeoch, M. A., Guralnick, R., Ferrier, S., Beck, J., Costello, M. J., Fernandez, M., Geller, G. N., Keil, P., Merow, C., Meyer, C., Muller-Karger, F. E., Pereira, H. M., Regan, E. C., Schmeller, D. S., & Turak, E. (2019). Essential biodiversity variables for mapping and monitoring species populations. *Nature Ecology & Evolution, 3*(4), 539–551. https://doi.org/10.1038/s41559-019-0826-1 Jetz, W., McGowan, J., Rinnan, D. S., Possingham, H. P., Visconti, P., O'Donnell, B., & Londoño-Murcia, M. C. (2021). Include biodiversity representation indicators in area-based conservation targets. *Nature Ecology & Evolution, 6*(2), 123–126. https://doi.org/10.1038/s41559-021-01620-y Powers, R. P., & Jetz, W. (2019). Global habitat loss and extinction risk of terrestrial vertebrates under future land-use-change scenarios. *Nature Climate Change, 9*(4), 323–329. https://doi.org/10.1038/s41558-019-0406-z Rinnan, D. S., Reygondeau, G., McGowan, J., Lam, V., Sumaila, R., Ranipeta, A., Kaschner, K., Garilao, C., Cheung, W. L., & Jetz, W. (2021). *Targeted, collaborative biodiversity conservation in the global ocean can benefit fisheries economies*. https://doi.org/10.1101/2021.04.23.441004 Rinnan, D. S., Sica, Y., Ranipeta, A., Wilshire, J., & Jetz, W. (2020). *Multi-scale planning helps resolve global conservation needs with regional priorities*. https://doi.org/10.1101/2020.02.05.936047
Note	Prepared by Map of Life, received via personal communication.

SO2	SO_2 emissions
Source	Community Emissions Data Systems
URL	https://zenodo.org/records/15059443
Date received	2025-05-28
Instructions	Download “CEDS_v_2025_03_18_aggregate.zip”
Citation	Hoesly, R., Smith, S. J., Ahsan, H., Prime, N., O’Rourke, P., Crippa, M., Klimont, Z., Guizzardi, D., Feng, L., Harkins, C., MCDONALD, B.& Wang, S. (2025). CEDS v_2025_03_18 Aggregate Data (Versions v_2025_03_18) [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.15059443
Reference	Hoesly, R. M., Smith, S. J., Feng, L., Klimont, Z., Janssens-Maenhout, G., Pitkanen, T., Seibert, J. J., Vu, L., Andres, R. J., Bolt, R. M., Bond, T. C., Dawidowski, L., Kholod, N., Kurokawa, J., Li, M., Liu, L., Lu, Z., Moura, M. C. P., O’Rourke, P. R., & Zhang, Q. (2018). Historical (1750–2014) anthropogenic emissions of reactive gases and aerosols from the Community Emissions Data System (CEDS). *Geoscientific Model Development, 11*(1), 369–408. https://doi.org/10.5194/gmd-11-369-2018

SPI	Species Protection Index
Source	Map of Life
URL	https://mol.org/resources/indicators/spi
Date received	2026-03-22
References	IPBES, Brondizio, E., Diaz, S., Settele, J., & Ngo, H. T. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (Version 1). Zenodo. https://doi.org/10.5281/ZENODO.3831673 Jetz, W., McGeoch, M. A., Guralnick, R., Ferrier, S., Beck, J., Costello, M. J., Fernandez, M., Geller, G. N., Keil, P., Merow, C., Meyer, C., Muller-Karger, F. E., Pereira, H. M., Regan, E. C., Schmeller, D. S., & Turak, E. (2019). Essential biodiversity variables for mapping and monitoring species populations. *Nature Ecology & Evolution, 3*(4), 539–551. https://doi.org/10.1038/s41559-019-0826-1 Jetz, W., McGowan, J., Rinnan, D. S., Possingham, H. P., Visconti, P., O'Donnell, B., & Londoño-Murcia, M. C. (2021). Include biodiversity representation indicators in area-based conservation targets. *Nature Ecology & Evolution, 6*(2), 123–126. https://doi.org/10.1038/s41559-021-01620-y Powers, R. P., & Jetz, W. (2019). Global habitat loss and extinction risk of terrestrial vertebrates under future land-use-change scenarios. *Nature Climate Change, 9*(4), 323–329. https://doi.org/10.1038/s41558-019-0406-z Rinnan, D. S., Reygondeau, G., McGowan, J., Lam, V., Sumaila, R., Ranipeta, A., Kaschner, K., Garilao, C., Cheung, W. L., & Jetz, W. (2021). *Targeted, collaborative biodiversity conservation in the global ocean can benefit fisheries economies*. https://doi.org/10.1101/2021.04.23.441004 Rinnan, D. S., Sica, Y., Ranipeta, A., Wilshire, J., & Jetz, W. (2020). *Multi-scale planning helps resolve global conservation needs with regional priorities*. https://doi.org/10.1101/2020.02.05.936047
Note	Prepared by Map of Life, received via personal communication

SWF	Solid waste treatment
Source	World Bank
URL	https://datacatalog.worldbank.org/search/dataset/0039597/what-a-waste-global-database
Date received	2026-03-23
Instructions	Click on download icon next to "Country Level Data & Codebook"
Citation	Cook, E., Bhada-Tata, P., Ionkova, K., Van Woerden, F., & Yadav, S. (2026). *What a Waste 3.0: Global Snapshot of Solid Waste Management Toward Circularity until 2050*. World Bank. https://doi.org/10.1596/978-1-4648-2309-1

TCA	Tree cover area (≥30% canopy cover)
Source	Global Forest Watch
URL	https://www.globalforestwatch.org/
Date received	2025-07-18
Reference	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science, 342*(6160), 850–853. https://doi.org/10.1126/science.1244693
Note	Prepared by Global Forest Watch, received via personal communication. Viewable online: https://gfw.global/8qmioo

TCC	Tree cover loss
Source	Global Forest Watch
URL	https://www.globalforestwatch.org/
Date received	2025-07-18
Reference	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science, 342*(6160), 850–853. https://doi.org/10.1126/science.1244693
Note	Prepared by Global Forest Watch, received via personal communication. Viewable online: https://gfw.global/OMnEyx

USD	Unsafe sanitation
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-11-03
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Unsafe sanitation Cause: All causes Location: Select all countries and territories Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-11-03.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

UWD	Unsafe drinking water
Source	Institute for Health Metrics and Evaluation
URL	http://ghdx.healthdata.org/gbd-results-tool
Date received	2025-11-03
Instructions	GDB Estimate: Risk factor Measure: DALYs Metric: Rate Risk: Unsafe water source Cause: All causes Location: *Select all countries and territories* Age: Age-standardized Sex: both Year: Select all
Citation	Institute for Health Metrics and Evaluation (IHME). GBD Results. Seattle, WA: IHME, University of Washington, 2025. Available from https://vizhub.healthdata.org/gbd-results/. Accessed 2025-11-03.
Reference	Schumacher, A. E., Zheng, P., Barber, R. M., A, B., Aalipour, M. A., Aalruz, H., Ababneh, H. S., Abaraogu, U. O., Abbafati, C., Abbas, N., Abbasifard, M., Abbaspour, F., Abd Al Magied, A. H. A., Abd ElHafeez, S., Abdalla, M. A., Abdallah, E. M., Abdel Razeq, N. M. I., Abdel-Hameed, R., Abdel-Rahman, W. M., … Murray, C. J. L. (2025). Global age-sex-specific all-cause mortality and life expectancy estimates for 204 countries and territories and 660 subnational locations, 1950–2023: A demographic analysis for the Global Burden of Disease Study 2023. *The Lancet, 406*(10513), 1731–1810. https://doi.org/10.1016/S0140-6736(25)01330-3

WWT	Wastewater treatment
Source	Jones *et al*. 2020
URL	https://doi.pangaea.de/10.1594/PANGAEA.918731
Date received	2024-03-27
Citation	Jones, Edward R; van Vliet, Michelle T H; Qadir, Manzoor; Bierkens, Marc F P (2021): Country-level and gridded estimates of wastewater production, collection, treatment and reuse. Earth System Science Data, 13(2), 237-254, https://doi.org/10.5194/essd-13-237-2021

WWT	Wastewater treatment
Source	UN Statistics Division
URL	https://unstats.un.org/unsd/envstats/country_files
Date received	2026-02-25

WWT	Wastewater treatment
Source	UN-Water
URL	https://www.sdg6data.org/en/tables
Date received	2026-03-18
Instructions	In left panel, click "Country (or area)" • "Select all countries" Click "Water" Click on "+ Water quality and wastewater" • 6.3.1 Proportion of wastewater flow (safely) treated o Domestic ▪ Total At top of left panel, click on yellow button, "VIEW SELECTION" At top of table, click on button depicting a cloud with a down arrow. Click on "Export to CSV"
Documentation	https://www.sdg6data.org/en/about/data-sources

5. Indicator Attributes

5.1 Temporal coverage

Datasets as received from our data providers contain variables that span from 1750 to 2025. Some datasets contain only a single year of observation. Inspecting the raw data files available for download will show truncated time series. Indicators are calculated over the period 1996–2025 for those years in which data are available. Table 4 displays the temporal coverage for the indicators.

5.2 Change calculations

When possible, we calculate a 10-year change in performance, applying the 2026 EPI methods to the most recent year of observed data, *t*, and to data from a baseline year. The baseline year will be either ten years prior, *t-10*, or the oldest available observation, whichever is most recent (see Table 5). In cases where there is only a single year of observation, we do not calculate a 10-year change.

5.3 Transformations

Skewed data should be transformed to remove the influence of outliers on the overall distribution of the indicator scores. The 2026 EPI uses two kinds of transformations. First, a logarithmic transformation,

$$\tilde{X} = \ln(X + \alpha)$$

Where X is the raw values of the variable and α is a small shift applied to all values in the dataset – and to targets. This shift will be greater than zero when either the dataset or the targets have a zero value.

Second, we also use a quadratic transformation on the indicator score for Species Habitat Index (SHI),

$$\breve{X} = \frac{X^2}{100}$$

NB: the quadratic transformation applies to the *score*, after the distance-to-target calculation, not to the raw *metric*.

Table 5 shows which indicators were calculated with a transformation and, among those, which required an alpha shift.

Table 4. Temporal coverage of indicators in the 2026 EPI

Note: Indicators SMW and WWT have a single observation per country among different years.

Table 5. Attributes of the indicators used in the 2026 EPI

			Nominal		Raw		Transformed			Most	Base-
TLA	Trsf	alpha	Good	Bad	Good	Bad	Good	Bad	MF	recent	line
BCA					-0.045	0.045				2023	2013
BER			95%	5%	0.564	0.117				2024	2014
BHI			99%	1%	0.873	0.562				2024	2014
BTO	log	0.1		99%	0	0.938	-2.303	0.037	SEA	2019	2009
BTZ	log	0.1		99%	0	0.794	-2.303	-0.112	SEA	2019	2009
CDA					-0.083	0.083				2024	2014
CHA					-0.053	0.053				2024	2014
COE	log		1%	99%	0.051	0.758	-2.971	-0.277		2024	2014
FCD	log	0.01		99%	0	0.525	-4.605	-0.626	SEA	2019	2009
FGA					-0.120	0.120				2024	2014
GEL	log		5%	99%	0.001	0.472	-6.702	-0.751	GRF	2024	2020
GHO		1			10	150				2024	2014
GTI					100	0				2024	2014
GTP					100	0				2024	2014
HFD	log		5%	99%	1.792	8615.448	0.584	9.061		2023	2013
KFL	log	1.14E-6		95%	0	0.010	-13.684	-4.573	TCF	2024	2014
KGL	log		5%	99%	8.46E-4	0.672	-7.075	-0.397	GRF	2024	2020
LUF	log	0.0002		90%	0	0.113	-8.517	-2.174	TCF	2024	2014
MHP					100	0			MHF	2025	2015
MKP					100	0			SEA	2025	2015
MPE	log	1.44E-7			0.01	2	-4.605	0.693	SEA	2024	2014
NDA					-0.0287	0.0287				2024	2014
NOD	log	0.1	5%	99%	0.483	25.561	-0.540	3.245		2023	2013
NXA					-0.050	0.050				2023	2013
OZD	log	0.02			1	250	0.020	5.522		2023	2013
PAC					0.5	0				2024	2014
PAR					0.5	0				2024	2014
PBD	log		1%	99%	164.71	2888.16	5.104	7.968		2023	2013
PMD	log		1%	90%	106.21	2297.32	4.665	7.740		2023	2013
PRS					0	4.5				2018	2015
PSU	log	0.09		99%	0	2.38E+2	-2.408	5.471		2023	2013
RCY				1%	1	1.91E-5				2024	2014
RLI				5%	1	0.689				2025	2015
RMS					0.015	-0.015			SEA	2019	2009
SDA					-0.084	0.084				2023	2013
SHI	quad				100	90				2024	
SMW					100	0				*various*	

Notes: *Trsf* = transformation, *MF* = materiality filter, % indicate percentiles

Table 5. Attributes of the indicators used in the 2026 EPI (*continued*)

			Nominal		Raw		Transformed			Most	Base-
TLA	Trsf	alpha	Good	Bad	Good	Bad	Good	Bad	MF	recent	line
SNM				99%	0	1.308				2023	2013
SOE	log		5%	95%	2.83E-4	0.063	-8.168	-2.761		2024	2014
SPI					100	0				2025	
TBN					30	0				2025	2015
TCL	log	9.7E-7		99%	0	0.021	-13.846	-3.886	TCF	2024	2014
TKP					100	0				2025	2015
USD	log		1%	99%	0.579	7238.493	-0.546	8.887		2023	2013
UWD	log		1%	99%	1.217	8509.109	0.196	9.049		2023	2013
VOE	log		5%	95%	0.001	0.097	-7.208	-2.333		2024	2014
WWT					100	0				*various*	

Notes: *Trsf* = transformation, *MF* = materiality filter, % indicate percentiles

5.4 Targets

The general equation for scoring indicators is

$$Indicator\ Score = \frac{(X - W)}{(B - W)} \times 100$$

where X is a country's value, B is the target for best performance, and W is the target for worst performance. If a country's value exceeds B, its score is capped at 100, and if the value falls below W, the score is set to 0.

The targets for best ("Good") and worst ("Bad") performance can be expressed in three ways:

- Nominal = as a percentile of values in all countries in all years
- Raw = as a value in the original units of the metric
- Transformed = as the transformed value of the metric

Targets are set in either terms of Nominal or Raw; if the former, then the Raw value must be calculated before scoring can proceed.

If metrics are logarithmically transformed before scoring, this transformation must be applied to the raw values and to the targets,

$$Indicator\ Score = \frac{[\ln(X + \alpha) - \ln(W + \alpha)]}{[\ln(B + \alpha) - \ln(W + \alpha)]} \times 100$$

Table 5 contains values for targets in the 2026 EPI.

6. Country Attributes

6.1 Sovereignty

Some data sources provide datasets with information about territories that are constituents of or governed, administered, or protected by other countries. We consider factors such as policy autonomy, statistical reporting practices, and customary treatment in international datasets when determining whether a territory merits separate inclusion in the EPI database. For territories that we treat as constituents of other countries (Table 6), we aggregate values to the sovereign country in the production of our raw data files.

Table 6. Territories aggregated to sovereign countries in the 2026 EPI

Territory	Sovereign
Aksai Chin	China
Åland Islands	Finland
American Samoa	United States
Arunachal Pradesh	India
Ashmore and Cartier Islands	Australia
Azad Kashmir	Pakistan
Azores	Portugal
Bonaire, Sint Eustatius, and Saba	Netherlands
Bouvet Island	Norway
British Indian Ocean Territory	United Kingdom
Christmas Island	Australia
Cocos Islands	Australia
French Guiana	France
French Southern Territories	France
Gibraltar	United Kingdom
Guadeloupe	France
Guam	United States
Heard Island and McDonald Islands	Australia
Jammu and Kashmir	India
Kaurik	India
Lapthal	India
Madeira	Portugal
Martinique	France

Territory	Sovereign
Mayotte	France
Montserrat	United Kingdom
Norfolk Island	Australia
Northern Cyprus	Cyprus
Northern Mariana Islands	United States
Pa-li-chia-ssu	China
Pitcairn	United Kingdom
Puerto Rico	United States
Réunion	France
Saint Helena	United Kingdom
Saint Martin	France
Saint Pierre and Miquelon	France
Sang	India
Shaksgam Valley	China
Somaliland	Somalia
South Georgia and the South Sandwich Islands	United Kingdom
Svalbard and Jan Mayen Islands	Norway
Tokelau	New Zealand
United States Minor Outlying Islands	United States
United States Virgin Islands	United States

6.2 Materiality filters

6.2.1 Landlocked countries

The EPI reckons 44 included countries as being either landlocked or, due to very small coastlines, effectively so:

Afghanistan
Armenia
Austria
Azerbaijan
Belarus
Bhutan
Bolivia
Bosnia & Herzegovina
Botswana
Burkina Faso
Burundi
Cent. African Republic
Chad
Czechia
Dem. Rep. Congo
Eswatini
Ethiopia
Hungary
Iraq
Jordan
Kazakhstan
Kyrgyzstan
Laos
Lesotho
Luxembourg
Malawi
Mali
Moldova
Mongolia
Nepal
Niger
North Macedonia
Paraguay
Rwanda
Serbia
Slovakia
Slovenia
Switzerland
Tajikistan
Turkmenistan
Uganda
Uzbekistan
Zambia
Zimbabwe

6.2.2 Marine habitat protection

Another 22 countries lack sufficient important habitats within their maritime zones to support calculation of the marine habitat protection indicator:

Albania	Gambia	Poland
Belgium	Georgia	Republic of Congo
Benin	Germany	Romania
Bulgaria	Guyana	Sweden
Cambodia	Israel	Timor-Leste
Cameroon	Latvia	Togo
Finland	Lithuania	
Gabon	Montenegro	

6.2.3 Tree cover

The EPI counts 16 included countries with less than 2,000 hectares of tree cover in 2000:

Bahrain	Kuwait	Samoa
Burkina Faso	Malta	Saudi Arabia
Cabo Verde	Mauritania	Tonga
Djibouti	Niger	United Arab Emirates
Iceland	Oman	
Kiribati	Qatar	

6.2.4 Grasslands

The EPI counts 22 included countries with less than 50 hectares of grassland extent in 2000:

- Belarus
- Belgium
- Brunei Darussalam
- Dominica
- Grenada
- Hungary
- Kiribati
- Latvia
- Luxembourg
- Maldives
- Malta
- Mauritius
- Moldova
- Palau
- Saint Kitts and Nevis
- Saint Lucia
- Samoa
- Sao Tome and Principe
- Solomon Islands
- St. Vincent and the Grenadines
- Tonga
- Trinidad and Tobago

7. Missingness and Weights

Missing components of the EPI are given no weight in the aggregation of the scores. If a country has a missing value for an indicator or an issue category, the weight that component would have carried is re-allocated proportionally to the other non-missing components within that level of aggregation.

For example, if an issue category is composed of four indicators, the weighting and aggregation scheme would involve,

Indicator	Weight	Re-allocated weight
A	w_a	w'_a
B	w_b	w'_b
C	w_c	w'_c
D	w_d	0

If Indicator D were missing for a county, then the weights of the remaining indicators for that country would be given by the formula

$$w'_a = \frac{w_a}{w_a + w_b + w_c}$$

and so on for the other remaining, non-missing indicators.

If all indicators are missing, then the issue category score will also be missing. The same process or re-allocating weights applies for missing issue categories within policy objectives.

The weighting scheme for any country will depend, then, on the pattern of missingness among the indicators and issue categories. The re-allocated weights will depart from the baseline weighting scheme in Section 2.

8. Data Field Guide

Tabular data are available for download at https://epi.yale.edu/downloads. These files include both raw data and indicators. Raw data files contain variables and metrics in their original units. Indicator files contain the scores for the 47 metrics on a 0–100 scale.

In both raw data and indicator files, variable names follow a common convention. Raw data variables take the form *TLA*.raw.*YYYY*, where *TLA* is the three-letter abbreviations and *YYYY* can take a value from a range of years, depending on the temporal coverage available from the data provider. Similarly, variables for indicators take the form *TLA*.ind.*YYYY*. Note that the years covered in each indicator file are truncated over a common period, 1996–2025.

We provide two versions of the raw data and indicator files: with missing values noted as "NA" and with missing value noted by codes describing the missingness (Table 7).

Table 7. Missing value codes in the 2026 EPI

Code	Meaning
-9999	the as-received dataset has cells with missing values
-8888	the country is not in the as-received dataset
-7777	the missing values are missing because they are not material
-6666	at least one variable used to calculate the metric is missing
-5555	the as-received dataset does not cover the years
-4444	the data values are not reliable due to country size

Unfortunately, many of the geospatial datasets used to produce the 2026 EPI metrics are orders of magnitude larger than the tabular data. Hosting these files on the EPI website is not feasible.

Neither raw data nor indicator files are available for higher levels of aggregation, *i.e.*, issue categories and policy objectives. Scores for these levels are in the results files.

If one were to entirely replicate the 2026 EPI, it would be necessary to first obtain the raw data from the data sources (§4) and then perform any necessary calculations (§3), transformations (§5.3), and rescaling (§5.4) to obtain the indicator scores, which would subsequently be weighted (§2) and aggregated.