

Integrating Brain Health into Global Environmental Governance: A Policy Analysis of Major United Nations Conventions



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Background & Rationale

Global environmental conventions have a significant impact on population brain health by shaping governance conditions that influence environmental exposures and psychosocial stressors. However, brain health is often overlooked in the development and assessment of these treaties.

Research has established links between the exposures governed by these treaties and measurable neurological effects. For instance, long-term exposure to air pollution is associated with an increased risk of epilepsy, whereas access to residential greenery has protective benefits for brain health.

This oversight is important because neurological and mental health conditions are among the largest and fastest-growing contributors to the global burden of disease. Moreover, these conditions are strongly influenced by environmental factors, making them modifiable upstream drivers that current governance structures fail to address.

RESEARCH QUESTION

Do major United Nations-ratified environmental and rights conventions adequately account for neurological and mental health conditions in the countries most vulnerable to the harms they govern?

Methods

A two-part design: a structured policy synthesis of major UN-ratified environmental conventions across four governance tiers and further categorised into six domains of their connection to brain health, and a descriptive country-level comparison of brain-health outcomes in the most-affected countries against global averages.

For each convention, the top 20 most-affected countries was operationally defined using the indicator best aligned with the specific harm or effect the convention governs and addresses. If strong comparable data on a convention-specific indicator did not exist, the closest available proxy was used.

DOMAIN	CONVENTIONS
Chemicals	Stockholm, Minamata, Rotterdam, Basel
Climate	Paris Agreement, UNFCCC
Land & biodiversity	UNCCD, CBD
Disaster risk	Sendai Framework
Atmosphere	Vienna Convention / Montreal Protocol
Rights	CRC, CRPD

Table 1. Indicators used to rank the top 20 countries per convention

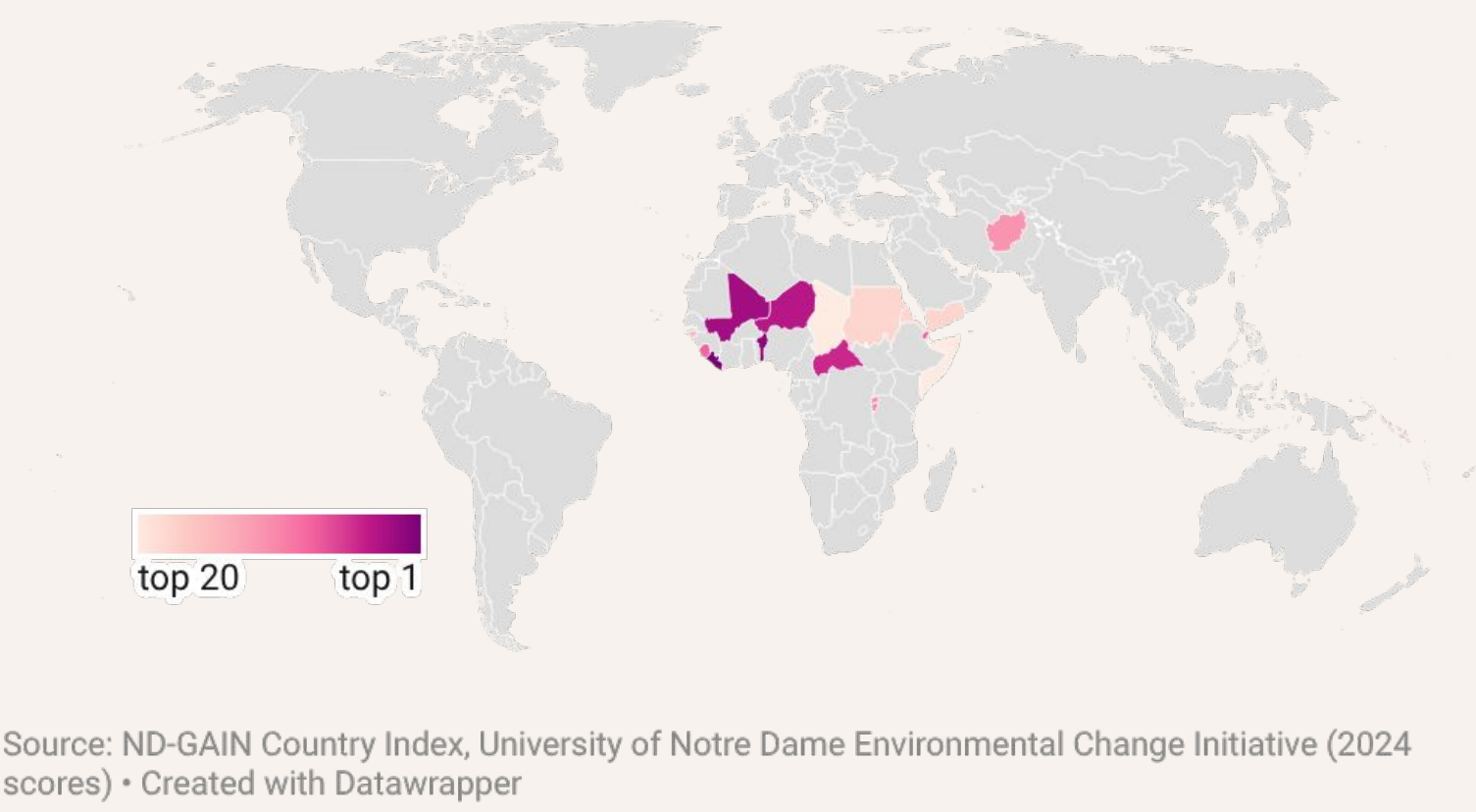
CONVENTION	INDICATOR	SOURCE
Paris Agreement	ND-GAIN Vulnerability sub-index	Notre Dame GAIN
UNFCCC	Droughts, floods & extreme temps (EN.CLC.MDAT.ZS)	World Bank WDI
UNCCD	Proportion of degraded land, SDG 15.3.1	UNCCD Data Dashboard
CBD	Threatened bird species (EN.BIR.THRD.NO)	World Bank WDI
Sendai Framework	Disaster risk reduction score (EN.CLC.DRSK.XQ)	World Bank WDI
CRC	Under-5 mortality rate	World Bank WDI
CRPD	No ranked indicator — narrative only	—
Stockholm / Minamata / Rotterdam / Basel / Plastics	No ranked dataset — case-study evidence	UNEP GMP, ASGM regions, e-waste sites

Discussions

- 1) Suicide/mental health has the strongest direct climate mechanism
 - Each 1 °C short-term temperature rise → ↑suicide- and mental-disorder-related moratlity, suicidal behaviour, and psychiatric hospital access [1]
 - Extreme weather conditions → exacerbates PTSD, depression and suicidality via **trauma, displacement, food insecurity**, with 25-50% of those exposed developing adverse mental-health outcomes [2]
 - Proposed biochemistry: **heat-induced dysregulation of the serotonergic (5-HT) system** [3]
 - Dehydration → ↓5-HT → ↓ governance of thermoregulation → acute temperature shifts destabilise mood circuits [4]
 - Complications from psychotropic medications: heat-stress excitotoxicity and impaired thermoregulation [3]
- 2) Epilepsy elevated through multiple converging routes
 - Thermoregulation contributes to epileptogenesis → **heat stress and heat waves** can **increase risk of seizure** [5]
 - Climate-driven increases in **fever, stress, and sleep deprivation** → ↑ seizure burden and SUDEP risk
 - Documented associations between **environmental pesticide exposure** and epilepsy [6]
- 3) Artifact in lower dementia and Parkinson's signalling
 - Established biochemical pathways predicts higher neurodegenerative risks in these populations (ROS, mitochondrial dysfunction, neuroinflammation, metal dyshomeostasis) [7]
 - Dementia and PD are both **age-related conditions (onset typically >65)** → mechanically suppressing crude prevalence through truncated survival and persists in age-standardised data [8]
 - A surveillance artifact + diagnostic under-ascertainment

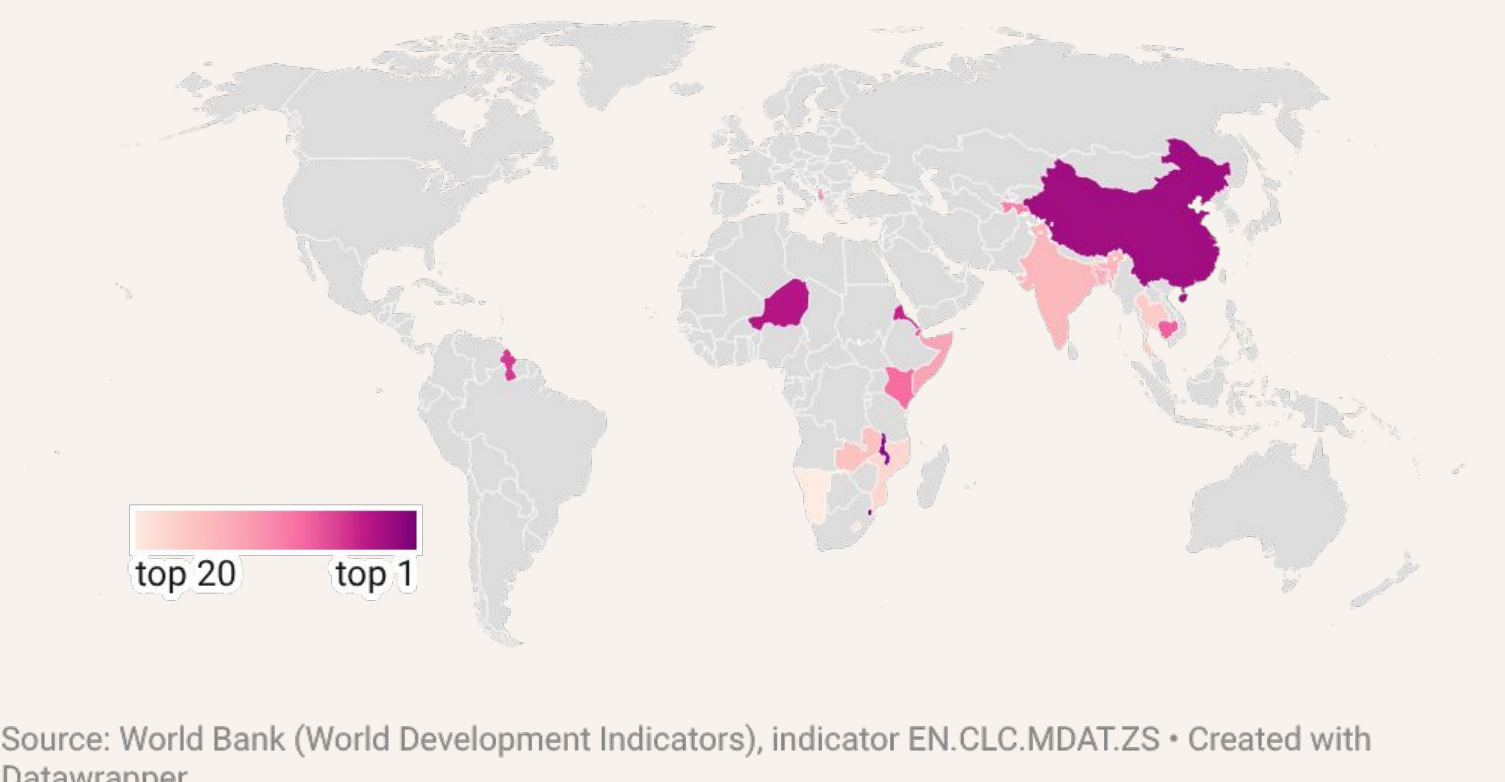
Results

Top 20 Countries Most Vulnerable to Climate Change (Paris Agreement)



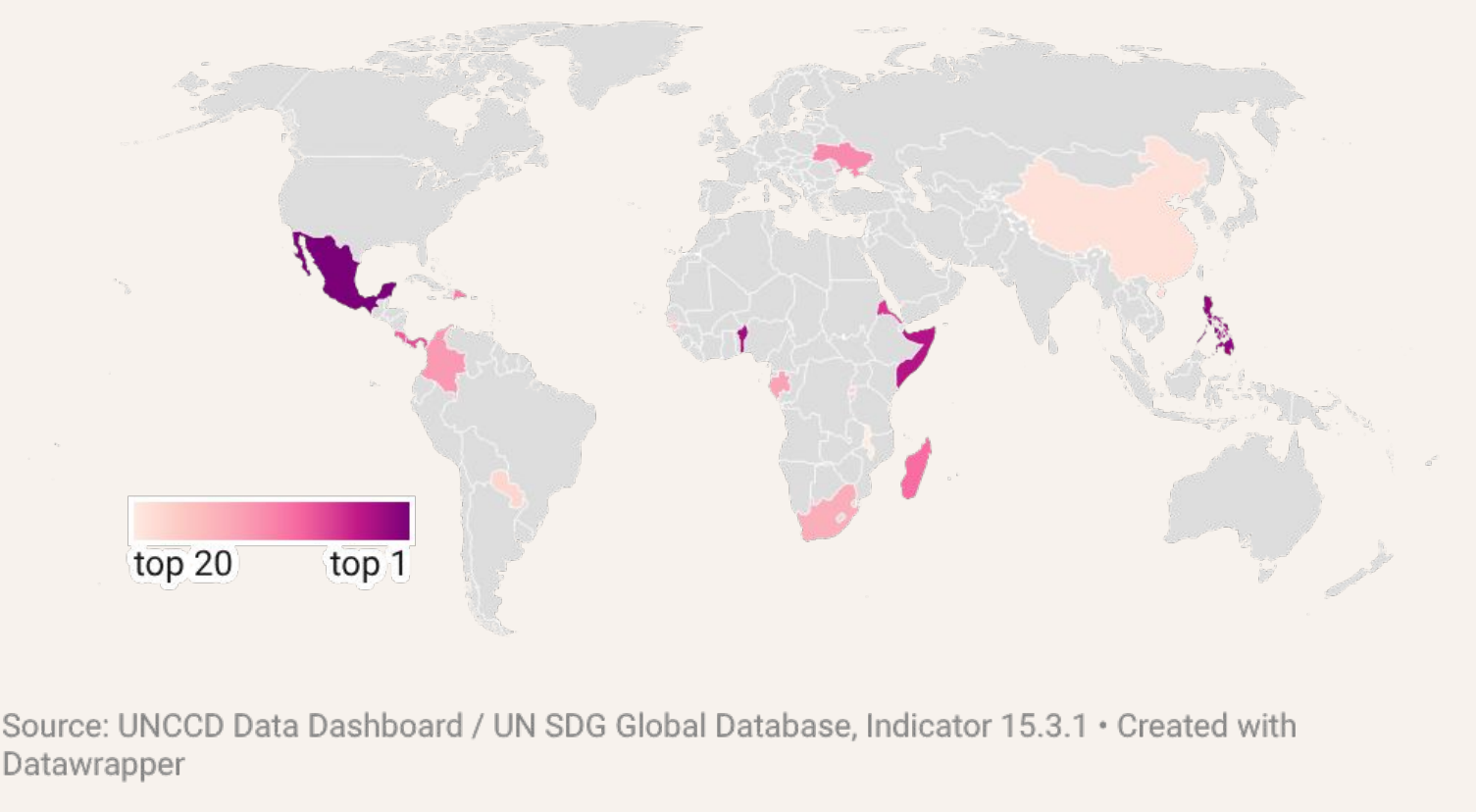
Source: ND-GAIN Country Index, University of Notre Dame Environmental Change Initiative (2024 scores) • Created with Datawrapper

Top 20 Countries Most Affected by Droughts, Floods, and Extreme Temperatures (UNFCCC Agreement)



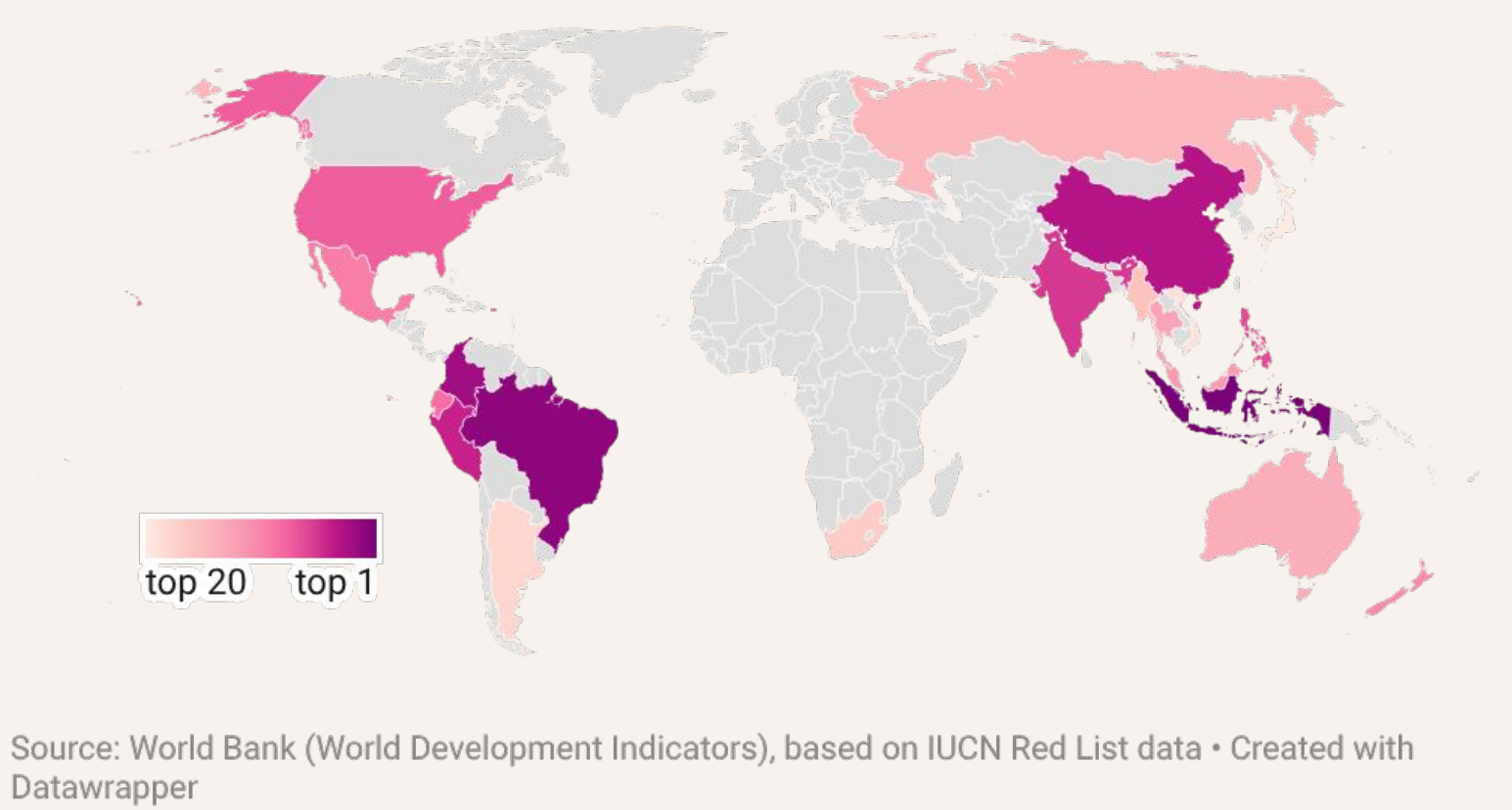
Source: World Bank (World Development Indicators), indicator EN.CLC.MDAT.ZS • Created with Datawrapper

Top 20 Countries Most Affected by Land Degradation (UNCCD)



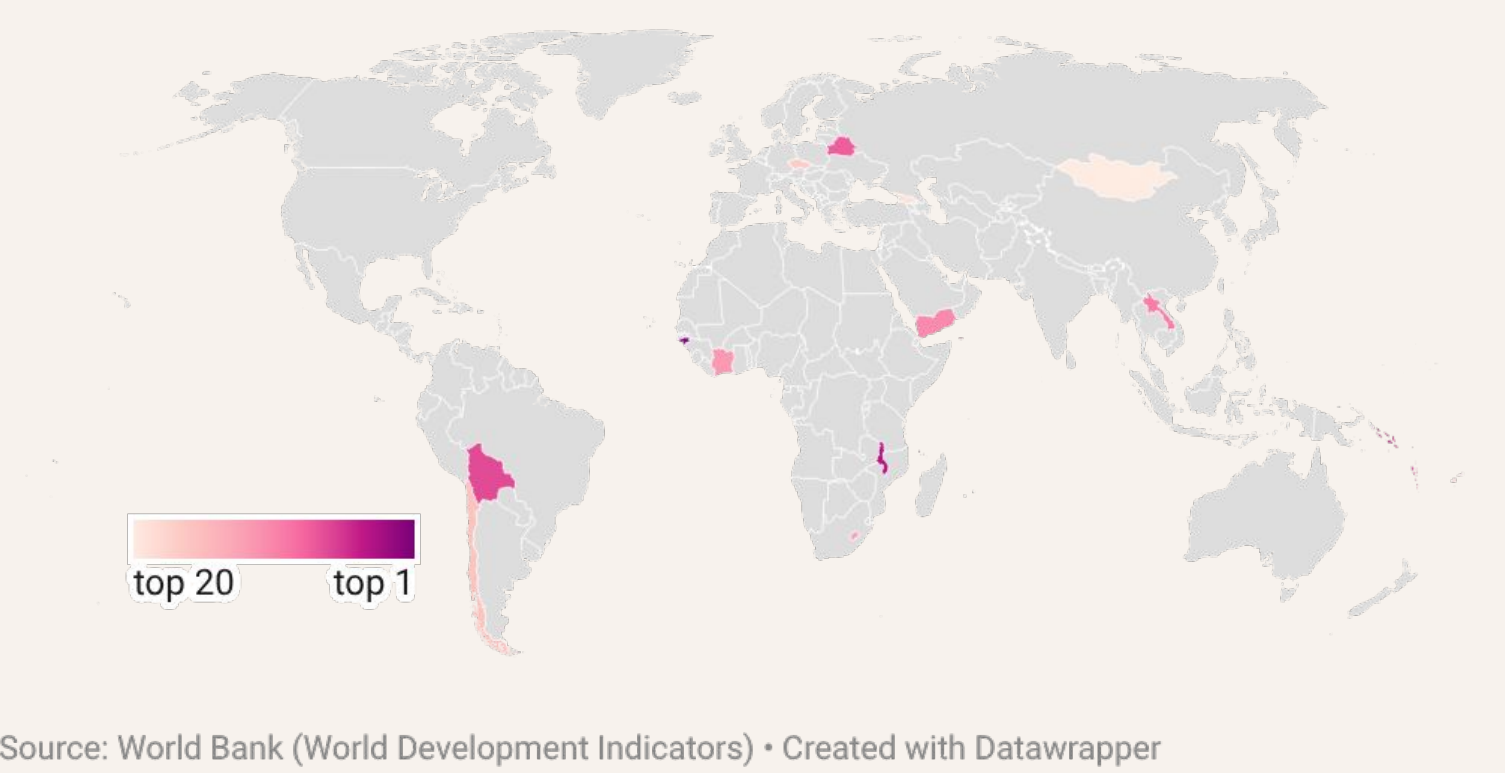
Source: UNCCD Data Dashboard / UN SDG Global Database, Indicator 15.3.1 • Created with Datawrapper

Top 20 Countries with the Most Threatened Bird Species (CBD)



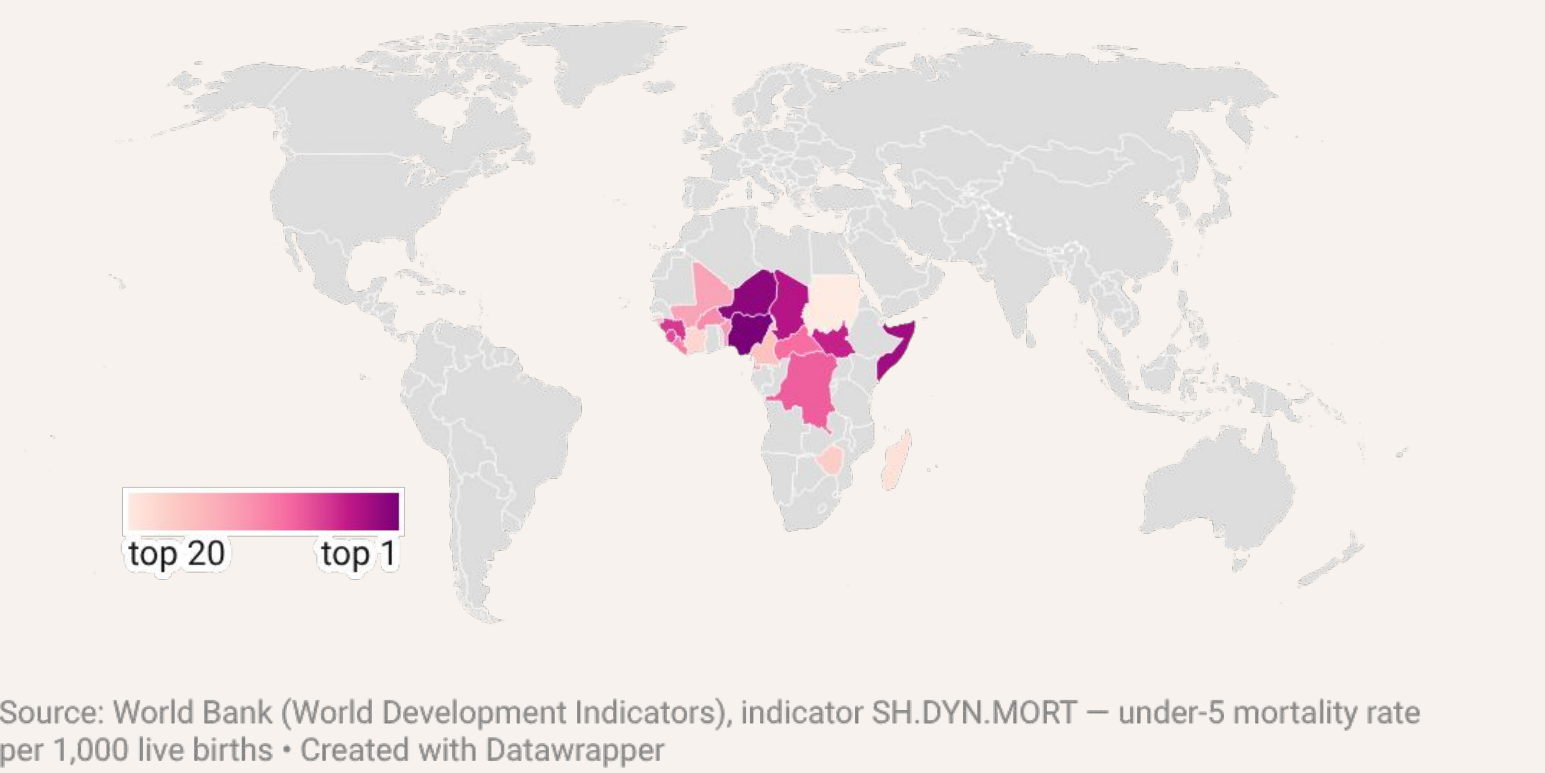
Source: World Bank (World Development Indicators), based on IUCN Red List data • Created with Datawrapper

Top 20 Countries with the Lowest Disaster Risk Reduction Progress (Sendai Framework)



Source: World Bank (World Development Indicators) • Created with Datawrapper

Top 20 Countries with the Highest Child Mortality (CRC)



Source: World Bank (World Development Indicators), indicator SH.DYN.MORT — under-5 mortality rate per 1,000 live births • Created with Datawrapper

Country rankings for each convention were compared to seven global brain-health benchmarks (GBD 2021): dementia, epilepsy, stroke mortality, Parkinson's, depression, anxiety, and suicide mortality.

Table 2. Deviation from global average by brain-health indicator (%)

CONVENTION	DEMENTIA	EPILEPSY	STROKE	PARKINSON'S	DEPR.	ANXIETY	SUICIDE
Paris Agreement	-26.8	+2.2	+68.3	-93.1	+3.1	+23.3	+25.6
UNFCCC	-25.4	+15.4	+15.5	-81.0	-8.4	-0.3	+41.2
UNCCD	-18.8	+29.1	0.0	-74.1	-6.0	+21.7	+15.7
CBD	-17.4	+8.7	-17.4	-41.4	-15.8	+20.6	+1.1
Sendai	-26.0	+15.4	+49.0	-71.0	-11.7	+11.6	+6.0
CRC/CRPD	-30.4	+12.1	+52.2	-98.3	+6.9	+40.2	+36.7

Core finding:

Across all six mapped conventions, **epilepsy and suicide mortality** are elevated among the most-affected countries relative to the global average, while **dementia and Parkinson's prevalence** are consistently and substantially lower.

Key Message:

Existing global conventions are **insufficient in comprehensively addressing brain health**.

Proposed Recommendations

- Amend the chemical, climate, and rights conventions to
- name developmental and neurodegenerative neurotoxicity as binding, precaution-based endpoints
 - mandate disaggregated, age-standardised brain-health surveillance using LMIC-validated tools
 - enforce shared exporter–donor responsibility to convert the current invisibility of brain harm into an accountable, measured obligation

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[1] Thompson et al., 2023; [2] Clayton et al., 2024; [3] Li et al., 2026; [4] Zhou et al., 2023; [5] Di Sapia et al., 2026; [6] Glucebi et al., 2021; [7] Stipa et al., 2026; [8] Allegri et al., 2025