Documentation for the
Natural Resource Protection and Child Health Indicators, 2023 Release

March 2024

Center for International Earth Science Information Network (CIESIN), Columbia University

Abstract

This document outlines the basic methodology and data sets used to construct the Natural Resource Protection and Child Health Indicators, 2023 Release (2010-2022), along with use cases, limitations, and use constraints.

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We appreciate feedback regarding this data set, such as suggestions, discovery of errors, difficulties in using the data, and format preferences. Please contact:

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NASA Socioeconomic Data and Applications Center (SEDAC)
Documentation for the Natural Resource Protection and Child Health Indicators, 2023 Release (2010-2022)

Contents

I.   Introduction

The Natural Resource Protection and Child Health Indicators, 2023 Release, is produced in support of the U.S. Millennium Challenge Corporation (MCC) as selection criteria for funding eligibility. Since 2006, the Natural Resource Protection Indicator (NRPI) and Child Health Indicator (CHI) have been used in the MCC country scorecards.[1] Additionally, since 2020 the CHI has been used by the U.S. Agency for International Development (USAID) for its Country Roadmap.[2] The NRPI and CHI are based on proximity-to-target scores ranging from 0 to 100. The NRPI originally was based on the weighted average percentage of biomes under protected status. Starting in 2022, the MCC board voted to change the NRPI to an average of four components of the 2022 Environmental Performance Index (EPI), produced by the Yale Center for Environmental Law and Policy (YCELP) and CIESIN. Details are found in the section below detailing the NRPI. The NRPI covers 76 countries. The CHI is a composite index for 198 countries derived from the average of three proximity-to-target scores for access to at least basic water and sanitation together with child mortality rates. The 2023 release includes a consistent time series of NRPI scores for 2019 to 2022 and CHI scores for 2010 to 2022.

II.   Data and Methodology

Input data

Data on the Natural Resource Protection Indicator (NRPI) are derived from four components of the 2022 Environmental Performance Index (EPI) (YCELP and CIESIN, 2022). The four components are: Biodiversity and Habitat, Ecosystem Services, Fisheries, and Agriculture. The Biodiversity and Habitat

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[1] https://www.mcc.gov/who-we-select/scorecards
[2] https://roadmaps.usaid.gov/

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component measures the share of terrestrial and marine areas that are protected, as well as the protection of rare species and their habitats. The Ecosystem Services component measures annual loss of tree cover, wetlands, and grasslands. The Agriculture component measures the sustainable use of nitrogen and pesticides in farming. The Fisheries component measures the sustainability of fishing practices, including the share of fish caught from overfished populations, and the use of harmful fishing practices such as trawling.

The 2023 Child Heath Indicator (CHI) scores are based on data from three underlying indicators: Access to At Least Basic Sanitation, Access to At Least Basic Water, and Child Mortality.

1. **Access to At Least Basic Sanitation:** Produced by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), access to at least basic sanitation includes the population using improved sanitation methods that are not shared. Improved sanitation methods comprise flush or pour-flush to piped sewer system, septic tank, or pit latrine; ventilated improved pit (VIP) latrine; pit latrine with slab; or composting toilet.
2. **Access to At Least Basic Water:** Produced by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), access to at least basic water includes the population using improved drinking water sources, which require less than 30 minutes for collection. Improved drinking water sources comprise piped water into dwelling, yard or plot; public tap or standpipe; tubewell or borehole; protected spring; protected dug well; or rainwater collection.
3. **Child Mortality (Ages 1–4 – i.e., from age of 1 to exact age 5):** Produced by the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), this indicator represents the probability of dying between exact ages 1 and 5, expressed per 1,000 children in that age group (4q1). Because the causes of child mortality among 1-4 year olds are strongly influenced by environmental causes, this indicator is considered to be a useful proxy for underlying environmental conditions.

Data on Access to Least Basic Sanitation and Access to At Least Basic Water were obtained from:

- Joint Monitoring Program (JMP) for Water Supply, Sanitation and Hygiene. Estimates on the use of water, sanitation and hygiene by country (2000-2022), updated January 2023. World Health Organization (WHO) and United Nations Children's Fund (UNICEF). https://washdata.org/data/downloads#WLD. Accessed 17 July 2023.
    - Data covering the range 2010 to 2022 were used.

Data on Child Mortality (the probability of dying between age 1 and 5 (4q1)) were obtained from:

- United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), last updated 2022, downloaded from http://www.childmortality.org. Accessed 17 July 2023.
    - Data covering the range 2010 to 2022 were used.

For complete definitions of the child mortality variables, see the *Child Mortality Estimation Explanatory Notes*. September 2020. https://childmortality.org/wp-content/uploads/2019/09/UNIGME_explanatory_notes_EN_2020.pdf.

There were gaps in the sanitation and water time series. To fill gaps in the time series for water and/or

sanitation data, the following procedures were used for the countries below:

<u>Water</u>
Missing 2022: Copied 2021 to 2022
- Solomon Islands, Congo, Kazakhstan, American Samoa
Missing 2021-2022: Copied 2020 to 2021-2022
- Nicaragua, Micronesia, Saint Pierre and Miquelon, Falkland Islands, and Virgin Islands
Missing 2020-2022: Copied 2019 to 2020-2022
- Comoros, Nauru, Bahamas
Missing 2019-2022: Copied 2018 to 2019-2022
- Saint Vincent and the Grenadines
Missing 2018-2022: Copied 2017 to 2018-2022
- Equatorial Guinea, Dominica, Grenada, Antigua and Barbuda, Saint Kitts and Nevis, Saint Maarten, Curacao, Anguilla, Montenegro
Missing 2017-2022: Copied 2016 to 2017-2022
- Eritrea, Argentina, Aruba

<u>Sanitation</u>
Missing 2022: Copied 2021 to 2022
- Congo, Solomon Islands, Nauru, Equatorial Guinea, Dominica, Grenada, Latvia, Saint Kitts and Nevis, Mauritius, Croatia, Anguilla, Saint Maarten, Curacao
Missing 2021-2022: Copied 2020 to 2021-2022
- Nicaragua, Sudan, Micronesia (Federated States of)
Missing 2020-2022: Copied 2019 to 2020-2022
- Comoros, Bahamas, Azerbaijan
Missing 2019-2022: Copied 2018 to 2019-2020
- Saint Vincent and the Grenadines, Bosnia and Herzegovina
Missing 2018-2022: Copied 2018 to 2019-2022
- Equatorial Guinea, Dominica, Grenada, Saint Kitts and Nevis, Mauritius, Anguilla, Saint Maarten, Curacao
Missing 2017-2022: Copied 2016 to 2017-2022
- Eritrea, Argentina, British Virgin Islands
Missing 2016-2022: Copied 2015 to 2016-2022
- Faroe Islands

Methods

General Methods
All indicators are computed as a standardized proximity-to-target score ranging from 0 (worst performance) to 100 (at target or best performance) using the min-max method (OECD, 2008).

Natural Resource Protection Indicator
For the Natural Resource Protection Indicator (NRPI), the four components of the 2022 Environmental Performance Index (EPI) used in the MCC scorecards include Biodiversity and Habitat, Ecosystem Services, Fisheries, and Agriculture. MCC combines these four components using EPI's weighting

methodology. EPI assigns each component a specific weight. To compute the overall score, MCC multiplies the score for each component by the weight for that component, adds them together, and divides by the total weight. If a country is missing data for a particular indicator, the weight for that indicator is not included in the numerator and denominator of the fraction. This is most common in landlocked countries, which have no fisheries scores.

> MCC's Natural Resource Protection Indicator = [(Agriculture Score x Agriculture Weight) + (Fisheries Score x Fisheries Weight) + (Biodiversity and Habitat Score x Biodiversity and Habitat Weight) + (Ecosystem Services Score x Ecosystem Services Weight)] ÷ [Agriculture Weight + Fisheries Weight + Biodiversity and Habitat Weight + Ecosystem Services Weight]

For example, using data from the 2020 EPI, the weights for these components would be as follows: Agriculture: 0.05, Fisheries: 0.1, Ecosystem Services: 0.1, and Biodiversity and Habitat: 0.25. This means that a country with all four areas measured, such as Cameroon would have their score calculated as follows. Cameroon had the following component scores: Agriculture: 40.4, Fisheries: 10.5, Ecosystem Services: 31.5, and Biodiversity and Habitat: 48.6. The numerator for this calculation is the weighted sum of the four scores i.e. (40.4 x 0.05) + (10.5 x 0.1) + (31.5 x 0.1) + (48.6 x 0.25) = 18.37. The denominator is just the sum of the weights (0.05 + 0.1 + 0.1 + 0.25) = 0.5. Which means Cameroon would have scored 36.74 (18.37 ÷ 0.5). On the other hand, if Cameroon did not have fishing data for that year, fishing would not be included either in the numerator or the denominator making the score without fisheries data 43.3 (17.32 ÷ 0.4).

Child Health Indicator
The Child Health Indicator (CHI) is calculated as follows. For Access to At Least Basic Sanitation and Access to At Least Basic Water, the proximity-to-target measure is equal to the reported percentage. For example, if a country has 84% of its population with access to adequate sanitation, it is considered to have a proximity-to-target score of 84. For child mortality, the ratio of the measured child mortality rate in the age group 1-4 (per 1000 children aged 1) in a given country to the highest child mortality rate in that age group in each year is computed. To calculate the child mortality proximity-to-target score, it is necessary to have a benchmark for the highest reported child mortality as a worst performance lower bound. The general formula is as follows:

$$100 - \left(\left(\frac{country\ value}{highest\ probability}\right) * 100\right)$$

In the time series data reported by the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) between 2010 and 2021, Niger had the highest reported child mortality rate between ages 1 and 4, at 72.196 per 1,000 population aged 1. The formula for calculation is as follows: 100 - ((country value) / 72.196) * 100). For example, a country whose child mortality rate is 43.3 per 1000 would have a proximity-to-target score of 40.02 (or 100 - ((43.3/72.196) * 100)). The time series for water and sanitation run through 2022. Since the time series for child mortality ends in 2021, the 2021 values were repeated for that indicator for the year 2022.

III. Data Set Description(s)

Data set description:
The NRPI and CHI data consist of country-level estimates in a Microsoft Excel spreadsheet. This spreadsheet includes the NRPI scores for 2019-2022 and CHI scores for 2010-2022.

Data set web page:
SEDAC URL:
https://sedac.ciesin.columbia.edu/data/set/nrmi-natural-resource-protection-child-health-indicators-2023
Permanent URL: https://doi.org/10.7927/hvgh-g750

Data set format:
The data are available in Microsoft Excel (XLSX) format as a downloadable zip file. The downloadable is a compressed zip file, containing: 1) Workbook with country-level values for the NRPI and CHI, and 2) PDF documentation.

Data set download:
nrpi-chi-2023-xlsx.zip

IV. How to Use the Data

The tabular data can be used directly for statistical analysis.

V. Potential Use Cases

The NRPI and CHI scores are used as a component of the MCC scorecards and more recently, the CHI has been adopted as part of United States Agency for International Development (USAID) Self Reliance Roadmaps (see https://selfreliance.usaid.gov/). The data can be used in statistical analyses where country-level indicators are needed.

VI. Limitations

All data inputs have uncertainties, but no effort to quantify the uncertainties were made.

VII. Acknowledgments

continued operation of the Socioeconomic Data and Applications Center (SEDAC), which is operated by the Center for International Earth Science Information Network (CIESIN) of Columbia University.

VIII. Disclaimer

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X. Recommended Citation(s)

Data set(s):

Center for International Earth Science Information Network (CIESIN), Columbia University. 2023. Natural Resource Protection and Child Health Indicators, 2023 Release. Palisades, New York: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/hvgh-g750. Accessed DAY MONTH YEAR.

XI. Source Code

No source code is provided.

XII. References

Joint Monitoring Program (JMP) for Water Supply, Sanitation and Hygiene. Estimates on the use of water, sanitation and hygiene by country (2000-2022), updated January 2023. World Health

Organization (WHO) and United Nations Children's Fund (UNICEF). https://washdata.org/data/downloads#WLD. Accessed 17 July 2023.

Organization for Economic Cooperation and Development (OECD). 2008. *Handbook on constructing composite indicators: Methodology and user guide.* Paris: OECD publishing.

United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), last updated 2022, downloaded from http://www.childmortality.org. Accessed 17 July 2023.

Yale Center for Environmental Law and Policy (YCELP), Yale University, and Center for International Earth Science Information Network (CIESIN), Columbia University. 2022. 2022 Environmental Performance Index (EPI). Palisades, New York: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/dwt2-9k25.

XIII. Documentation Copyright and License

Appendix 1. Data Revision History

No revisions have been made to this data set.

Appendix 2. Contributing Authors & Documentation Revision History

Revision Date	ORCID	Contributors	Revisions
March 11, 2024	0000-0002-8875-4864	A. de Sherbinin	This document is the 1st instance of documentation.