

Codebook for 2022 TFDD Spatial Update

Transboundary Freshwater Dispute Database

A geo-spatial database containing the delineations of international transboundary river basins and basin country units (BCU) and relevant attribute information. This codebook describes the data found in the attribute tables of the associated basin and BCU shapefiles.

Codebook Updated: 7 March 2022

Note on Use: Wide use of electronic and hardcopy versions of data, GIS coverages, and findings produced by the Transboundary Freshwater Dispute Database (TFDD) project is encouraged. The data, coverages, and findings are not copyrighted, although due credit is appreciated.

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Please attach this credit when citing TFDD products:

"Product of the Transboundary Freshwater Dispute Database, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University. Additional information about the TFDD can be found at:

<http://transboundarywaters.science.oregonstate.edu>."

If the product is to be used on the web, a hyperlink to the above address would be appreciated.

Basins

Count: 311 International Basins

File Name: BasinMaster311_20220307

Last Updated: 7 March 2022

Geographic Coordinate System: WGS84

Projected Coordinate System for Area Calculations: World Cylindrical Equal Area

Attribute Table Data

1. Identifier (FID)

A numerical code created by ERSI Arcmap as a unique identifier for each polygon and its attribute data.

2. Basin Country Code (BCODE)

Four-letter TFDD Basin code for the basin. For example, the Amazon Basin is AMZN.

3. Basin Name (Basin_Name)

TFDD Basin Name for the above BCODE. River names are separated by a hyphen (-) for multiple rivers that drain to the same outlet, i.e. Ganges-Brahmaputra-Meghna. Rivers that are known by two or three common names or different spellings are separated by slashes (/), i.e. Congo/Zaire. There is no preference or priority implied by the ordering of the river names.

4. *Continent (Continent_)*

The continent of the river basin area. Two letter code for each continent, as follows:

AF: Africa
AS: Asia
EU: Europe
NA: North America, included Central America
SA: South America

5. *Area (Area_km2)*

Area of the river basin in kilometers squared (km²). The area was calculated in ESRI ArcMap using the World Cylindrical Equal Area Projection.

6. *Population Count in 2007 (Pop_2007)*

Total population count in the river basin area for 2007. The data is calculated from Landsat 2009 dataset for 2007 data.

Data Source: This product was made utilizing the LandScan (2009)TM High Resolution global Population Data Set copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory under Contract No. DE-AC05-00OR22725 with the United States Department of Energy. The United States Government has certain rights in this Data Set. Neither UT-BATTELLE, LLC NOR THE UNITED STATES DEPARTMENT OF ENERGY, NOR ANY OF THEIR EMPLOYEES, MAKES ANY WARRANTY, EXPRESS OR IMPLIED, OR ASSUMES ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, OR USEFULNESS OF THE DATA SET. Available at: <https://landscan.ornl.gov/>

7. *Population Density in 2007 (PopDen2007)*

Population density in the river basin area for 2007. The data is calculated from Landsat 2009 dataset for 2007 data and divided by the area, mentioned above.

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9. Population Density in 2012 (PopDen2012)

Population density in the river basin area for 2012. The data is calculated from Landscan 2014 dataset for 2012 data and divided by the area, mentioned above.

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10. Population Count in 2015 (Pop_2015)

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12. Projected Population Count in 2020 (Pop_2020)

Total projected population count in the river basin area for 2020. The data is calculated from CIESIN 2017 Gridded Population of the World Dataset.

Data Source: Center for International Earth Science Information Network - CIESIN - Columbia University. 2017. Gridded Population of the World, Version 4 (GPWv4): Population Count Adjusted to Match 2015 Revision of UN WPP Country Totals, Revision 10. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4JQ0XZW>.

Accessed January 2018. Available at: <http://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-count-adjusted-to-2015-unwpp-country-totals-rev10>

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Projected population density in the river basin area for 2020. The data is calculated from CIESIN 2017 Gridded Population of the World Dataset and divided by the area, mentioned above.

Data Source: Center for International Earth Science Information Network - CIESIN - Columbia University. 2017. Gridded Population of the World, Version 4 (GPWv4): Population Count Adjusted to Match 2015 Revision of UN WPP Country Totals, Revision 10. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4JQ0XZW>. Accessed January 2018. Available at: <http://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-count-adjusted-to-2015-unwpp-country-totals-rev10>

14. Count of Existing Dams (Dams_Exist)

This is the number of dams existing in the river basin area based on the GRanD Database. Please note: “While the main focus was to include all reservoirs with a storage capacity of more than 0.1 km³, many smaller reservoirs were added if data were available” (GRanD Database, 2011), and dams with data categorized as “unreliable” by the GRanD Database were not included in this calculation.

Data Source: Lehner, B., R-Liermann, C., Revenga, C., Vörösmarty, C., Fekete, B., Crouzet, P., Döll, P. et al.: High resolution mapping of the world’s reservoirs and dams for sustainable river flow management. *Frontiers in Ecology and the Environment*. Source: GWSP Digital Water Atlas (2008). Map 81: GRanD Database (V1.0). Accessed in January 2018. Available online at <http://atlas.gwsp.org>.

15. Count Planned, Proposed or Under Construction Dams (Dam_Plnd)

This is the number of planned, proposed, or under construction dam based on Petersen-Perlman 2014. Please note: Dams included are 10 MW of hydroelectric capacity and greater (Petersen-Perlman 2014).

Data Source: Petersen-Perlman, Jacob. 2014. Mechanisms of cooperation for states’ construction of larger-scale water infrastructure projects in transboundary river basins. Ph.D. Dissertation. Oregon State University. Available at: http://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/z029p857n

16. Average Annual Runoff (runoff)

The average annual runoff for the baseline period of 1971-2000 aggregated to the river basin scale in mm/year. Data were not calculated for river basins marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component with source data from the Center for Environmental Systems Research.

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

17. Average Annual Withdrawal (withdrawal)

The total annual water withdrawal in the river basin area for the year 2010 in km³/yr. Data were not calculated for river basins marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component by WaterGAP2.2 with source data from the Center for Environmental Systems Research.

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

18. Average Annual Consumption (consumption)

The total annual water consumption in the river basin area for the year 2010 in km³/yr. Data were not calculated for river basins marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component by WaterGAP2.2 with source data from the Center for Environmental Systems Research.

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

19. Relative Risk Category for Hydropolitical Tension (HydroPolTen)

The number from 1 to 5 is the relative risk for a river basin to have hydropolitical tension. The risk of hydropolitical tension is based on the level of institutional vulnerability and the level of hazard due to water infrastructure development. Institutional vulnerability is based on the formal institutional capacity in the basin country units, and the hazard level is based on the development on planned and proposed water infrastructure. Data were not calculated for river basins marked N/A. Data were calculated as a part of the Transboundary Water Assessment Programme – River Basin component by researchers at Oregon State University and the TFDD.

Relative Risk Categories:

- Very Low: 1
- Low: 2
- Moderate: 3
- High: 4
- Very High: 5

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

20. Number of Riparians per Basin (NumberRipa)

This is the number of riparian states or disputed territories that share an international basin.

Data Calculated by TFDD.

Basin Country Units

Count: 814 Basin Country Units

File Name: BCUMaster311_20220307

Last Updated: 7 March 2022

Geographic Coordinate System: WGS84

Projected Coordinate System for Area Calculations: World Cylindrical Equal Area

Attribute Table Data

1. Identifier (FID)

A numerical code created by ERSI Arcmap as a unique identifier for each polygon and its attribute data.

2. Administrative Name (adm0_name)

Name of the country or disputed area associated with the CCODE.

3. Member Status (FIRST_stat)

United Nations member status or disputed territory information based on data from the FAO GAUL dataset.

Data Source: FAO GeoNetwork. 2015. Global Administrative Unit Layers (GAUL), 2015 Edition, Available at: <http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691>

4. Country Code (CCODE)

Three-letter TFDD country code of the Basin Country Unit. The CCODE is based on the coding system used by the FAO GAUL Dataset.

5. Alternate Country Code (Alt_CCODE)

A previously used three-letter country code that is relevant for only a few countries. These are not used in BCCODE development but are kept for reference to older TFDD Datasets.

6. Basin Country Code (BCODE)

Four-letter TFDD Basin code for the basin. For example, the Amazon Basin is AMZN.

Data Source: FAO GeoNetwork. 2015. Global Administrative Unit Layers (GAUL), 2015 Edition, Available at: <http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691>

7. Basin Country Unit Code (BCCODE)

The is the unique TFDD code for each basin country unit, based on a combination of the BCODE_CCODE. For example, AMZN_BRA is the code for the basin country unit of the Amazon basin in Brazil, where AMZN is the four-letter code for the Amazon Basin and BRA is the three-letter country code for Brazil.

8. Basin Name (Basin_Name)

TFDD Basin Name for the above BCODE. River names are separated by a hyphen (-) for multiple rivers that drain to the same outlet, i.e. Ganges-Brahmaputra-Meghna. Rivers that are known by two

or three common names or different spellings are separated by slashes (/), i.e. Congo/Zaire. There is no preference or priority implied by the ordering of the river names.

9. Continent (Continent_)

The continent of the basin country unit area. Two-letter code for each continent, as follows:

AF: Africa
AS: Asia
EU: Europe
NA: North America, included Central America
SA: South America

10. Area (Area_km2)

Area of the basin country unit in kilometers squared (km²). The area was calculated in ESRI ArcMap using the World Cylindrical Equal Area Projection.

11. Population Count in 2007 (Pop_2007)

Total population count in the basin country unit area for 2007. The data is calculated from Landscan 2009 dataset for 2007 data.

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13. Population Count in 2012 (Pop_2012_P)

Total population count in the basin country unit area for 2012. The data is calculated from Landscan 2014 dataset for 2012 data.

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Total projected population count in the basin country unit area for 2020. The data is calculated from CIESIN 2017 Gridded Population of the World Dataset.

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21. Average Annual Runoff (runoff)

The average annual runoff for the baseline period of 1971-2000 aggregated to the basin country unit scale in mm/year. Data were not calculated for basin country units marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component with source data from the Center for Environmental Systems Research.

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available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

22. Average Annual Withdrawal (withdrawal)

The total annual water withdrawal in the basin country unit area for the year 2010 in km³/yr. Data were not calculated for basin country units marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component by WaterGAP2.2 with source data from the Center for Environmental Systems Research.

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23. Average Annual Consumption (consumption)

The total annual water consumption in the basin country unit area for the year 2010 in km³/yr. Data were not calculated for basin country units marked N/A. Data were calculated as part of the Transboundary Water Assessment Programme – River Basin component by WaterGAP2.2 with source data from the Center for Environmental Systems Research.

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

24. Relative Risk Category for Hydropolitical Tension (HydroPolTen)

The number from 1 to 5 is the relative risk for a basin country unit to have hydropolitical tension. The risk of hydropolitical tension is based on the level of institutional vulnerability and the level of hazard due to water infrastructure development. Institutional vulnerability is based on the formal institutional capacity in the basin country units, and the hazard level is based on the development on planned and proposed water infrastructure. Data were not calculated for basin country units marked N/A. Data were calculated as a part of the Transboundary Water Assessment Programme – River Basin component by researchers at Oregon State University and the TFDD.

Relative Risk Categories:

- Very Low: 1
- Low: 2
- Moderate: 3
- High: 4
- Very High: 5

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25. Institutional Vulnerability (InstitVuln)

This is the capacity of each basin country unit to absorb tension. It is measured by five components of formal transboundary cooperation; the number of components satisfied are summed to result in an institutional vulnerability score of 0 to 5, with 0 of most vulnerable and 5 being least vulnerable. See the following table:

Treaty-RBO component	Possible value
At least one water treaty. <i>A treaty is meant as a formal agreement between sovereign nation-states substantively referring to water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained (Hamner & Wolf, 1998). Geographic scope must be specific enough to identify that, at minimum, the treaty applies to all waters shared between signatories</i>	0/1
At least one treaty with an allocation mechanism, <i>for allocating water for water quantity and/or hydropower uses</i>	0/1
At least one treaty with a flow variability management mechanism, <i>for facing flood and/or drought events or other specific variation in flow</i>	0/1
At least one treaty with a conflict resolution mechanism, <i>i.e. mechanisms specified to address disagreements among the signatories, including arbitration, diplomatic channels, a commission, third-party involvement, and/or a permanent judicial organ</i>	0/1
At least one river basin organization, <i>meant as a bilateral or multilateral body of officials representing participating governments in dialogue about coordinated management of international water bodies.</i>	0/1
Total possible value for a basin-country unit	0 to 5

Figure: Institutional vulnerability components of formal institutional capacity. Table from TWAP Institutional Vulnerability metadata sheet 2016.

Data Source: UNEP-DHI. “Transboundary River Basins: Status and Trends.” Transboundary Waters Assessment Programme. Nairobi, Kenya: United Nations Environment Programme, 2016. Report available at: <http://twap-rivers.org> and data available at: <http://twap-rivers.org/indicators/>. Accessed: May 2018.

Raw Data Sources for TFDD Spatial Delineations GIS Data

Product of the Transboundary Freshwater Dispute Database, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University. Additional information about the TFDD can be found at: <http://transboundarywaters.science.oregonstate.edu>.

Wolf, Aaron T., Jeffrey A. Natharius, Jeffrey J. Danielson, Brian S. Ward, and Jan K. Pender. “International River Basins of the World.” *International Journal of Water Resources Development* 15, no. 4 (December 1, 1999): 387–427. <https://doi.org/10.1080/07900629948682>.

Lehner, B., Grill G. (2013): Global river hydrography and network routing: baseline data and new approaches to study the world's large river systems. *Hydrological Processes*, 27(15): 2171–2186. Data is available at www.hydrosheds.org.

Anderson, Ewan W. *International Boundaries: A Geopolitical Atlas*. New York: Routledge, 2003.

FAO. "Global Administrative Unit Layers (GAUL)." FAOGEO NETWORK. (GeoLayer): Food and Agriculture Organization of the United Nations, 2014.

<http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691>.