Global Water Tool Version 2015 1.3

Dataset and definitions

July 2015

The external datasets used in the tool were developed by:

Food and Agriculture Organization (FAO) AQUASTAT	Country
World Health Organization and UNICEF Joint Monitoring Program	Country
United Nations Population Division (UNDESA)	Country
World Resources Institute (WRI)	Country & Watershed
International Water Management Institute (IWMI)	Watershed
Conservation International (CI)	Watershed

The datasets were selected to meet all of the following criteria:

- global coverage
- available in the public domain
- considered valid by the global community of water stakeholders including academics, non-governmental organizations (NGOs), government organizations and industry
- recent and regularly updated

The original datasets have not been modified, except for harmonizing the names of countries across datasets.

Details are provided below. The definitions have been simplified in some cases; complete definitions can be obtained from the data owners' respective websites. We have noted in the last column whether the datasets have been **Updated (U)** or are **New (N)** compared to the 2011 version of the Global Water Tool.

What's new in this version?

- GWT Version 2015 1.3 includes **updated data sets with improved modelling by country & watershed level, with WRI metrics on Baseline water stress, Inter-annual variability and Seasonal Variability.** The WRI **Projected Change in Water Stress 2020, 2030, 2040** metrics are now also included.
- The **latest data sets from FAO Aquastat and WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP)** have been used.
- The Mean Annual Relative Water Stress Index – 2000 from the University of New Hampshire, USA has been deleted.
- UNDESA, IMWI and CI data sets as well as WRI's Annual Renewable Water Supply per Person 1995 and 2025 have been kept - the latter is now unmaintained by WRI.

- This version also includes updated reporting metrics, improved GIS-based mapping, and user-friendly additions (easier data import, improved navigation and offline capabilities, improved coding).

Data on Projected Change in Water Stress 2020, 2030, 2040 will be included when released by the WRI.

1. Datasets details

FAO AQUASTAT (Country data)

The Food and Agriculture Organization (FAO) of the United Nations leads international efforts to defeat hunger. AQUASTAT is the FAO global information system on water and agriculture developed by the Land and Water Development Division.

www.fao.org/nr/water/aquastat/main/index.stm
More information on definitions: www.fao.org/nr/water/aquastat/data/glossary/search.html

Data	Unit	Description	U/N
Total internal renewable – IRWR (2014)	10^9 m^3/ year	Long-term average annual flow of rivers and recharge of aquifers generated from endogenous precipitation	U
Total internal renewable per person – IRWR/person (2014)	m^3/ person/ year	Total annual internal renewable water resources per inhabitant	U
Total external renewable – actual (2014)	10^9 m^3/year	The part of the country's annual renewable water resources that is not generated in the country	U
Total renewable – TRWR - actual (2014)	10^9 m^3/ year	Maximum theoretical yearly amount of water actually available for a country at a given moment	U
Total renewable per person – TRWR/person – actual (2014)	m^3/ person/ year	Total annual actual renewable water resources per inhabitant	U
Projected total renewable per person 2025 and 2050 – actual - TRWR/person (2014)	m^3/ person/ year	Projected total annual actual renewable water resources per inhabitant not taking into consideration climate change (2025, 2050)	U
Dependency ratio (2014)	%	Percent of total renewable water resources originating outside the country. A country with a dependency ratio equal to 0% does not receive any water from neighboring countries. A country with a dependency ratio equal to 100% receives all its renewable water from upstream countries, without producing any of its own. Dependency ratio can be an indicator of where tension and conflict over water-sharing and use can occur.	U
Agricultural water withdrawal as part of total water withdrawal (2000 to 2013 depending on countries)	%	Agricultural water withdrawal as percentage of total water withdrawal	U
Municipal water withdrawal as part of total water withdrawal (2000 to 2013 depending on countries)	%	Municipal water withdrawal as percentage of total. It refers to withdrawal of water that is connected to the public network.	U
Industrial water withdrawal as part of total water withdrawal (2000 to 2013 depending on countries)	%	Industrial water withdrawal as percentage of total water withdrawal. It refers to self-abstraction, i.e. withdrawal of water that is not connected to the public network	U

Data	Unit	Description	U/N
Total water withdrawal per person (2000 to 2013 depending on countries)	m^3/person/ year	Includes renewable freshwater resources as well as potential over-abstraction of renewable groundwater or withdrawal of fossil groundwater and eventual use of desalinated water or treated wastewater. Does not include other categories of water use (hydropower, mining, recreation, navigation, fisheries, etc.) which are characterized by a very low net consumption rate.	U
Total freshwater withdrawal - surface water + groundwater (2000 to 2013 depending on countries)	10^9 m^3/ year	Sum of surface water withdrawal and groundwater withdrawal	U
Total freshwater withdrawal as % of TRWR (2000 to 2013 depending on countries)	%	Total freshwater withdrawn in a given year in percentage of the actual total renewable water resources. This parameter is an indication of the pressure on the renewable water resources.	U
Desalinated water produced – (2000 to 2010 depending on countries)	10^9 m^3/year	Water produced annually by desalination, estimated on the basis of the total capacity of water desalination installations	U

WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) (Country data)

The goals of the JMP are to report on the status of water supply and sanitation and to support countries in their efforts to monitor this sector, which will enable better planning and management. The data collected for JMP mainly come from assessment questionnaires and household surveys.

www.wssinfo.org

Data	Unit	Description	U/N
Population total – 2014	number		U
Urban population – 2014	%	Percentage of total.	U
Rural population – 2014	%	Percentage of total.	U
Proportion of total population served with improved water – 2014	%	An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with fecal matter.	U
Proportion of Urban population served with Improved Water – 2014	%		U
Proportion of Rural population served with Improved Water – 2014	%		U
Proportion of Total population served with Improved Sanitation – 2014	%	An improved sanitation facility is defined as one that hygienically separates human excreta from human contact.	U
Proportion of Urban population served with Improved Sanitation – 2014	%		U
Proportion of Rural population served with Improved Sanitation – 2014	%		U

Population Division of the Department of Economic and Social Affairs of the UN Secretariat (Country data)

Since 1988 the Population Division of the Department of Economic and Social Affairs of the United Nations has been issuing every two years revised and updated estimates and projections of the urban and rural populations of all countries in the world and of their major urban agglomerations.

www.un.org/esa/population/unpop.htm and http://esa.un.org/unpd/wup

Urban annual growth rate 2015-2020	%	Average national exponential rate of growth of the urban population over a given period (2015-2020).	U

World Resources Institute (WRI Aqueduct) (Country & Watershed data)

WRI is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

The 'Aqueduct Global Maps 2.1' document explains how each indicator is calculated and the data that is used.
http://www.wri.org/publication/aqueduct-global-maps-21

The 'Aqueduct Country and River Basin Rankings' document explains how each of the indicators is aggregated from a sub-catchment to a river basin and country scale.
www.wri.org/publication/aqueduct-country-river-basin-rankings

Data	Unit	Description	U/N
Baseline Water Stress (2014)	%	Baseline water stress measures total annual water withdrawals (municipal, industrial, and agricultural) expressed as a percent of the total annual available flow. Higher values indicate more competition among users. Arid areas with low water use are shown in gray, but scored as high stress when calculating aggregated scores. **Calculation:** Water withdrawals (2010) divided by mean available blue water (1950–2008). Areas with available blue water and water withdrawal less than 0.03 and 0.012 m/m2 respectively are coded as "arid and low water use".	N
Inter-annual Variability (2014)		Inter-annual variability measures the variation in water supply between years. **Calculation:** Standard deviation of annual total blue water divided by the mean of total blue water (1950–2008).	N
Seasonal Variability (2014)		Seasonal variability measures variation in water supply between months of the year. **Calculation:** Standard deviation of monthly total blue water divided by the mean of monthly total blue water (1950–2008). The means of total blue water for each of the 12 months of the year were calculated, and the variances estimated between the mean monthly values.	N

Available blue water: available blue water is the total amount of water available to a catchment before any uses are satisfied. Calculated as all water flowing into the catchment from upstream catchments plus any imports of water to the catchment minus upstream consumptive use plus runoff in the catchment.

Total blue water: total blue water for each catchment is the accumulated runoff upstream of the *catchment* plus the runoff in the catchment.

For each indicator, WRI offers the results at three different scales:
- sub-catchment, as displayed on the Aqueduct Water Risk Atlas *www.wri.org/resources/data-sets/aqueduct-global-maps-20,*
- country as displayed in the Aqueduct Country Rankings:

www.wri.org/applications/maps/aqueduct-country-river-basin-rankings/#x=0.00&y=-0.00&l=2&v=home&d=bws&f=0&o=&init=y
- river basin, as displayed in the Aqueduct River Basin Rankings *www.wri.org/applications/maps/aqueduct-country-river-basin-rankings/#x=0.00&y=-0.00&l=2&v=home&d=bws&f=1&o=36&init=y*

The result for any given indicator at any given location varies based on the scale at which the indicator is measured. WRI gives the example of Pretoria, facing extremely high water stress when using the sub-catchment scale, high water stress when looking at the country score, low water stress when using the river basin scale (Orange River Basin).
GWT includes the country and sub-catchment scales.
- **The Output Country tab aggregates data by country, using the country scale.**
- **The Output Watershed tab aggregates data by watershed, using the sub-catchment scale.**

World Resources Institute (WRI) (specific to the Watershed data)

The Per Capita Water Supply data for 1995 and projections for 2025 were obtained from the Pilot Analysis of Global Ecosystems: Freshwater Systems. Washington DC: WRI produced by Revenga, C., J. Brunner, N. Henninger, K. Kassem, and R. Payne. 2000.

The Aqueduct Water Stress Projections Data include indicators of change in water supply, water demand, water stress, and seasonal variability, projected for the coming decades under scenarios of climate and economic growth. Credits: Luck, M., M. Landis, F. Gassert. 2015. “Aqueduct Water Stress Projections: Decadal projections of water supply and demand using CMIP5 GCMs.” Washington, DC: World Resources Institute.
http://www.wri.org/publication/aqueduct-water-stress-projections-decadal-projections-water-supply-and-demand-using

Data	Unit	Description	U/N
Annual Renewable Water Supply per Person – 1995 (2000)	m^3/ person/ year	Indicates the average annual renewable water supply per person for individual river basins as of 1995. Water experts define areas where per capita water supply drops below 1,700 m^3/year as experiencing “water stress” – a situation in which disruptive water shortages can frequently occur. These estimates were developed by dividing global runoff values at the river basins level by the population of each basin for 1995. The global runoff database is based on a water balance model driven by climate variables (e.g. temperature and precipitation) and calibrated with observed discharge data from monitoring stations. The model also takes into account information on variables on land cover and soil type.	U

Annual Renewable Water Supply per Person by Projections – 2025 (2000)	m^3/ person/ year	Indicates the average annual renewable water supply per person for individual river basins as projected for 2025. Water supply is calculated based on the water balance model described for the 1995 data. Populations projections are based on national middle-range growth rate estimates from the UN Population Division, based on the population in each river basin for 1995. Water experts define areas where per capita water supply drops below 1,700 m^3/year as experiencing “water stress” – a situation in which disruptive water shortages can frequently occur.	U
Projected value in water stress by the year 2020/ 2030/ 2040 under a business as usual scenario (2015)			N

International Water Management Institute (Watershed data)

www.iwmi.cgiar.org

IWMI is a non-profit, scientific research organization focusing on the sustainable use of water and land resources in developing countries. IWMI works in partnership with governments, civil society and the private sector to develop scalable agricultural water management solutions that have a real impact on poverty reduction, food security and ecosystem health. IWMI is a member of CGIAR, a global research partnership for a food-secure future.

Data	Unit	Description	U/N
Environmental Water Scarcity Index by Basin (2006)		Indicator based on the WaterGAP water balance model that calculated the ratio of human water use (sum of domestic, industrial and agricultural) to renewable water resources. Environmental water scarcity refers to cases where the amount of water removed from the system for human use puts the ecosystem at risk by tapping into the environmental water demand – that is, the amount of water needed to sustain the integrity of the freshwater ecosystem.	U
Areas of physical and economic water scarcity		4 categories: 1) Little or no water scarcity: Abundant water resources relative to use, with less than 25% of water from rivers withdrawn for human purposes. 2) Physical water scarcity: Water resources development is approaching or has exceeded sustainable limits. More than 75% of river flows are withdrawn for agriculture, industry and domestic purposes (accounting for recycling of return flows). 3) Approaching physical water scarcity: More than 60% of river flows are withdrawn. These basins will experience physical water scarcity in the near future. 4) Economic water scarcity: Human, institutional and financial capital limit access to water even though water in nature is locally available to meet human demands. Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.	U

Conservation International (CI) (Watershed data)

http://www.conservation.org/
http://www.cepf.net/resources/hotspots/Pages/default.aspx

The biodiversity hotspot map shows regions of global conservation importance defined by the presence of high levels of threat (at least 70% habitat loss) in areas with high levels of species endemism (at least 1,500 endemic plant species). Data was released in 2011.

Reference: Mittermeier, R.A., Robles Gil, P., Hoffman, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. and da Fonseca, G.A.B. 2004. Hotspots Revisited: Earth's Biologically Richest and Most Threatened Terrestrial Ecoregions. CEMEX, Mexico.

How were biodiversity hotspots chosen, and why?

- Scale: A number of scales and types of datasets were considered, resulting in agreement that data at a regional scale was considered most complementary with the current scale of data offered via the Global Water Tool, and most appropriate for the intended high-level assessment. Site scale data, e.g. Key Biodiversity Areas, High Conservation Value Areas or nationally protected areas, are strongly recommended for subsequent finer scale assessment at key sites.
- Biodiversity priority: At a regional scale, biodiversity hotspots were considered along with Ecoregions, High Biodiversity Wilderness Areas, Intact Forest Landscapes and others. The biodiversity hotspots dataset was considered most appropriate for use in the Global Water Tool because it not only demonstrates an "overall" assessment of ecosystem health, value or status, but also at whether an area is threatened. In addition, hotspots data also include some information on freshwater vertebrates within each hotspot. If a user is interested in any area that is of high biodiversity importance but has experienced lower levels of threat, Conservation International's High Biodiversity Wilderness Areas complements the hotspots data.

Where can I find information on other data and tools of interest?

- For information on available data, the United Nations Environment Programme World Conservation Monitoring Centre's (UNEP-WCMC) **A to Z of areas of biodiversity importance** is the ideal hub. It is a glossary of various important systems to assign and protect areas for biodiversity conservation (www.biodiversitya-z.org).
- Many companies are using **IBAT – Integrated Biodiversity Assessment Tool for business** to access accurate and up-to-date biodiversity information to support critical business decisions at a very local level. BirdLife International, Conservation International, the International Union for Conservation of Nature (IUCN) and UNEP-WCMC partnered to develop it, working closely with key corporate partners to ensure a user-focused and credible tool. IBAT could be a valuable next step after the Global Water Tool's biodiversity bonus as its underlying data layers provide additional information at a finer regional spatial scale, for example on many freshwater protected areas, critical sites and species (www.ibatforbusiness.org).
- **WBCSD** has also developed a number of ecosystem-relevant tools. Led by the World Resources Institute, the **Corporate Ecosystem Services Review** (2008) is a structured methodology to strategically assess ecosystem impacts and dependence. The **Guide to Corporate Ecosystem Valuation** (2011) is a framework for improving decision-making by including ecosystem values, as well as the **Business Guide to Water Valuation: an introduction to concepts and techniques** (2013). WBCSD's **Business Ecosystems Training (BET)** program is also available.

2. Definitions and datasets – how to better understand outputs

1. What is the definition of freshwater within the tool?

The constituent content of freshwater should be defined by local regulations. In the absence of local regulations, a limit of 1000 mg/L of TDS (total dissolved solids) – the limit recommended by the World Health Organization – is the guidance for categorization of fresh and non-fresh for surface and groundwater.

2. One (or several) definition(s) do not strictly apply to my company. Can I still use the tool for accurate reporting?

The tool is not aimed at benchmarking between companies. As long as you are consistent in defining terms within your entity, the tool will provide accurate reporting for internal purposes. To report in accordance with GRI Indicators, the terms as defined in the tool must be followed.

3. Are the definitions used in this tool the same as GRI?

The definitions enable reporting on GRI Indicators G4-EN8 (Total water withdrawal by source), G4-EN10 (Percentage and total volume of water recycled and reused), and G4-EN22 (Total water discharge by quality and destination). At this time, Indicators G4-EN9 and G4-EN26 on water sources (or bodies) significantly affected by water withdrawal and discharge, respectively, are not addressed in this tool due to the complexity of obtaining detailed local water information.
Any of the information generated with this tool can form part of a GRI-based report.

- For example, while GRI does not request “total water consumption”, organizations may choose to include this in their GRI-based report to complement the GRI Water Indicators.
- Similarly, GRI requests total figures for the entire organization. However, organizations may also wish to provide a breakdown by site, region or operation type, if it will provide appropriate context on significant impacts.

Note that GRI has two other Water Indicators not covered in this tool: G4-EN9 “Water sources significantly affected by withdrawal of water” and G4-EN26 “Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the organization’s discharges of water and runoff”.

4. Are there gaps in the datasets? Is it accurate at a local level?

Although these are the best available global datasets, gaps and problems of resolution do exist. In addition, country based datasets might hide some important regional variations in terms of water availability. The tool is not appropriate for analyses at local and river basin level, as the resolution may be too coarse for accurate estimates. We suggest users who would like to assess a specific location look at datasets that are based on observed values that will be more accurate at a site-level.

5. What should I do if a site comes up as water stressed (or no data), but it’s unlikely this is really the case?

The background datasets may be the best available to some experts, they may still have gaps or inaccurate data. We recommend you get in touch with your local employees or other stakeholders directly. They might be able to tell you more about the actual situation, or you might want to check with a more local/national data source that would have better data. The GWT is for high-level global assessment, but should not be used for local water planning / management. You cannot change the background datasets of the GWT, but when you document your full assessment, you can show that you acted on the results and found out what the local situations were.

6. Is Annual Renewable Water Supply per Person – 1995 and 2025 defined as Total renewable (actual) (TRWR) divided by number or persons (in 1995 and 2025)?

No, the Annual Renewable Water Supply per Person is the modeled Q divided by the number of people, and the projected number of people for 2025, based on mid-level projections by the UN Population Division. Conceptually the two variables are the same, but the input data to calculate water supply is different: The Annual Renewable Water Supply per Person uses average runoff instead of FAO country data to estimate water supply.
The TRWR per person corresponds to the maximum theoretical yearly amount of water actually available for a country at a given moment (in this case, the most recent available dataset which is 2006), whereas the Annual Renewable Water Supply per Person uses average runoff from 1950 to 2000 (only one number), divided by the population of 1995 and projections for 2025.

7. Do the Total freshwater withdrawal as percentage of total renewable freshwater resources (TRWR) and the total water withdrawal by sectors include desalinated water or treated wastewater?

The total water withdrawal by sectors does include non-conventional sources of water (desalinated water and treated wastewater). However, the non-conventional water is then subtracted from the total withdrawal by sector and then it is divided by the total actual renewable freshwater resources to give the Total freshwater withdrawal as percentage of total renewable freshwater resources (TRWR). Therefore the latter does not include desalinated water or treated wastewater.

8. Do the FAO total renewable per person (actual) projections to 2025 and 2050 include climate change impacts?

No, as such a complex exercise involving scenario development has not yet been done.