An operational approach

The WIIX takes the following into account for calculating your impact on the local water resource:
- Quantity of water withdrawn from and restored to a water resource;
- Quality of water withdrawn from and restored to a water resource;
- Type of water resource used (surface water, groundwater, municipal network);
- Local water stress (WSI);
- Consumption of energy and chemical products related to water treatments;
- Waste generated and the mode of disposal;
- Transportation of waste and chemical products;
- Reuse of waste and energy.
    > *As waste can be used to produce energy or as an agricultural fertilizer substitute, the impact of creating sustainable products like energy or fertilizer is considered counteractive. This is explained in an informative section in the tool and is not included in the results of the total Water Impact Index.*

How does the WIIX calculator work?

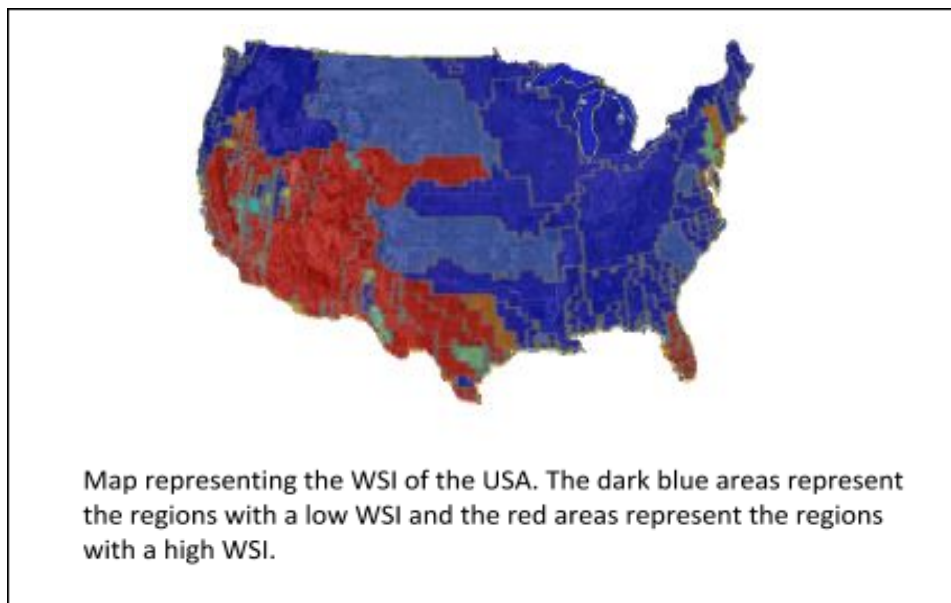For a given activity, the WIIX calculation uses the following formula:

$$\text{Water Impact IndeX} = \sum_i (W_i \times Q_i \times WSI_i) - \sum_j (R_j \times Q_j \times WSI_j)$$

Where:
- i et j correspond respectively to points of withdrawal from, and release of water into, the environment;
- W_i et R_j correspond respectively to quantities of water withdrawn from and released into the environment (in m3);
- Q_i et Q_j are the factors of quality for water withdrawn and released;
- WSI is an index of regional water stress – the Water Stress Index.

The results of the Water Impact Index are expressed in **m3 WIIX equivalent**. This does not represent a concrete value. It represents the volume of water, weighted by factors of stress and quality.

The Water Stress Index (WSI) is based on the work of the Chair of Ecological System Design of ETH Zurich [1]. This index of water stress is a function of the rate of use of available water resources in a specific region. The seasonal variability and storage capacity (dams) are also factored into this index. The WSI is an index of values between 0 and 1. When the WSI is close to 1, it means that water resources are limited relative to the needs to the region. Conversely, when the WSI is close to 0, it means water resources in the area are abundant.

Map representing the WSI of the USA. The dark blue areas represent the regions with a low WSI and the red areas represent the regions with a high WSI.

The WIIX calculator also uses a **water quality factor** that relies on **standards for environmental quality**. For a given substance, these standards represent the maximum concentration possible that can exist in a water source without threatening its environmental health. In the WIIX, the reference concentrations used correspond to the Environmental Quality Standards defined by the European Water Framework Directive [2].

These standards are updated when new data is published. Water quality factors are calculated by comparing the concentration of a substance in the water withdrawn or discharged to environmental quality standards.

The water impact of chemical product usage, energy consumption and production, and waste disposal is calculated using data from the Water Database developed by Veolia and the engineering company Quantis. This database allows you to measure the water impact of any product, service, enterprise, or organization necessary for your operation [3].

How to Read a Water Impact Index result?

When the result of the Water Impact Index (WiiX direct + WiiX indirect) is greater than 0, it means that your activity has an impact (a footprint) on the local water resource.
Conversely, if the result is negative, your activity improves the availability of local water resources (e.g.: You withdraw sea water and release treated water to a river).
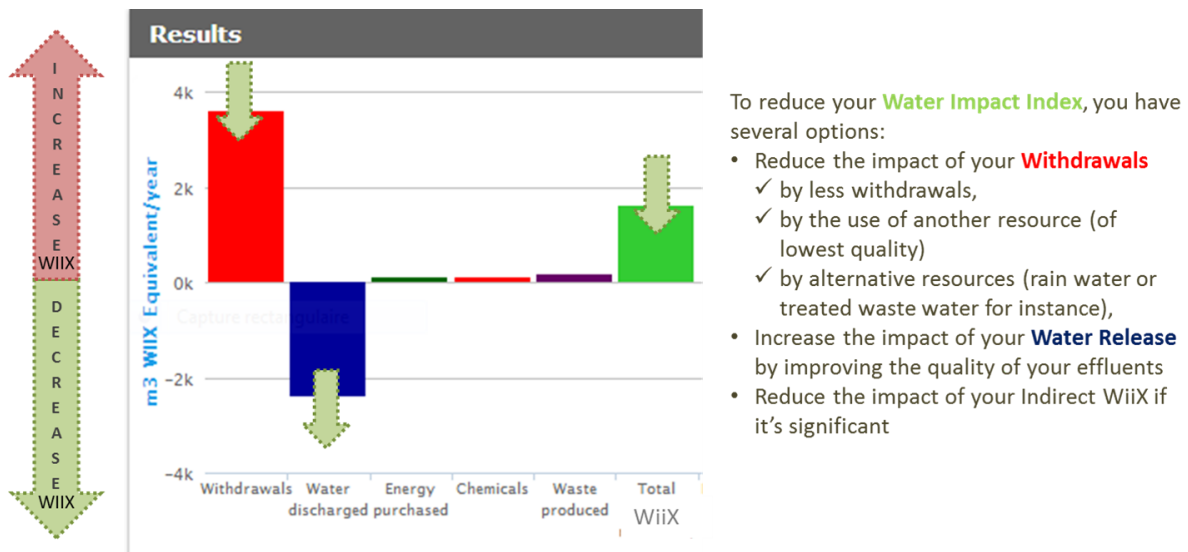
Fictional example of Water Impact Index results

Using the "life cycle" approach, the Water Impact IndeX allows you to determine if the water footprint is generated directly by the site, or if it is upstream or downstream on the value chain. This is the distinction between the direct and indirect WiiX.

References:
[1] Pfister S, Koehler A, Hellweg S (2009) Assessing the environmental impact of freshwater consumption in LCA. Environmental Science & Technology (43):4098-4104
Access to WSI : http://www.ifu.ethz.ch/ESD/downloads/EI99plus/Impact_factors_Water_LCA_pfister_et_al.kmz
[2] Directive 2008/105/CE du Parlement Européen et du Conseil du 16 décembre 2008 établissant des normes de qualité environnementale dans le domaine de l'eau
[3] http://www.quantis-intl.com/fr/waterdatabase.php