AWARE 1.2 method documentation

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Content

1 New Impact Method – AWARE 1.2

AWARE (Available WAter REmaining) is an LCIA method developed by WULCA working group to answer the question: "**What is the potential to deprive another freshwater user (human or ecosystem) by consuming freshwater in this region?**"

The Characterization Factors (CFs) are calculated starting from the local water ***Availability – Demand***, where in the "demand" both human and ecosystem needs are considered. The underlying assumption it that the less water remaining per area, the higher the potential to deprive another user.

The CFs in this method range from 0.1 to 100 and can be applied to calculate water scarcity footprints. A CF value of 1 corresponds to regions with a remaining water availability per area over time that aligns with the world average, while a value of 10 indicates a region with ten times less available water per area than the world average (or that it needs 10x more time to generate the same amount of unused water). The distribution of the CFs is higher above the average value of 1 then below, due to the calculation method applied, which gives higher more mathematical weight to smaller values of Availability – Demand (that translate into larger CFs). Consequently, regions with larger CFs have greater discriminatory power, useful for identifying scarce regions, which is where the method is most valuable.

It is also important to note that a CF value of 1 does not equate to the average water consumption factor worldwide, which is used for unknown locations. This factor is calculated as the world consumption-weighted average of all factors, with a value of circa 42.95 for unknown water use.

The calculated impact is given by the inventory of water consumed during the process (hence, integrated into the product, evaporated or transferred to another watershed or released into the ocean) multiplied by the local CF. The unit of measurement of this impact is **cubic meters world equivalent (m^3 world eq),** which provides a global reference point. For instance, a result of 45 m^3 world eq indicates that the assessed water consumption is equivalent to 45 cubic meters consumed in an average global location. This approach accounts for the varying scarcity of water in different regions, enabling a standardized comparison of water consumption impacts on a global scale. By utilizing the m^3 world eq unit, users can better understand the global significance of their water use relative to the average impact of water consumption worldwide.

2 openLCA implementation

The new method is available both **location-based regionalized** and **flow-based regionalized**. Therefore, it's compatible with the new regionalization tool, but can still be used with traditional databases.

The new openLCA implementation is based on the latest version available of the method, that can be find at this link (country-level values).

2.1 Temporal scale

The CFs are provided in the method pack in the **annual aggregation for unknown activities**. Hence, where the CFs are aggregated to account for unspecified water consumptions, not distinguishing between agricultural and non-agricultural use, but respecting temporal and geographical patterns of all types of human water consumption at once.

2.2 Spatial scale

As for the spatial scale, the CFs are provided **country-aggregated** and also the other **special aggregations** provided by WULCA, when relevant, are implemented.

Note that the native scale of AWARE CFs is sub-watershed, and the aggregations are performed applying a consumption-weighting logic, to better reflect the probability of where the process is located, when the precise location is unknown.

Sub-national CFs, according to this dataset by WULCA, have been used for Brazil, China and India regions. For other special aggregations of regions, such as those from the ecoinvent database, we calculated the CFs as a weighted average, using the CFs of the individual countries included in the aggregation and weighting them by each country's annual water consumption. This approach is consistent with the calculation of other AWARE factors.

When this approach was not feasible—for instance, when calculating the CF for sub-national aggregations of non-ISO regions such as "BR-Midwestern grid"—we used placeholders as follows:

Location name	code	proxy	CF
Sub-Sahara Africa	AFR	Africa CF	71,60061
Alaska Systems Coordinating Council	ASCC	Alaska CF	2,28

HICC	HICC	Hawaii CF	13,56
Hong Kong	HK	Arithmetic average of Hong Kong administrative regions	26,84
SERC Reliability Corporation	SERC	US CF	33,12697203
Midwest Reliability Organization, US part only	US-MRO	US CF	33,12697203
Northeast Power Coordinating Council, US part only	US-NPCC	US CF	33,12697203
Western Electricity Coordinating Council, US part only	US-WECC	US CF	33,12697203
Holy See (Vatican City State)	VA	Lazio region CF	46,97
Brazil non-ISO sub-national aggregation (e.g. BR-Mid-western grid		Brazil CF	2,27520389
Other cases		World average	42,95353087

It's also possible to download at this link (Extension files to openLCA LCIA Methods) the geoJSON setup file for this method, with the flow-binding already set, useful to **access the native sub-watershed-level CFs**. Please refer to the "Regionalization" chapter of our openLCA manual for further details on the new openLCA regionalized calculation tool.

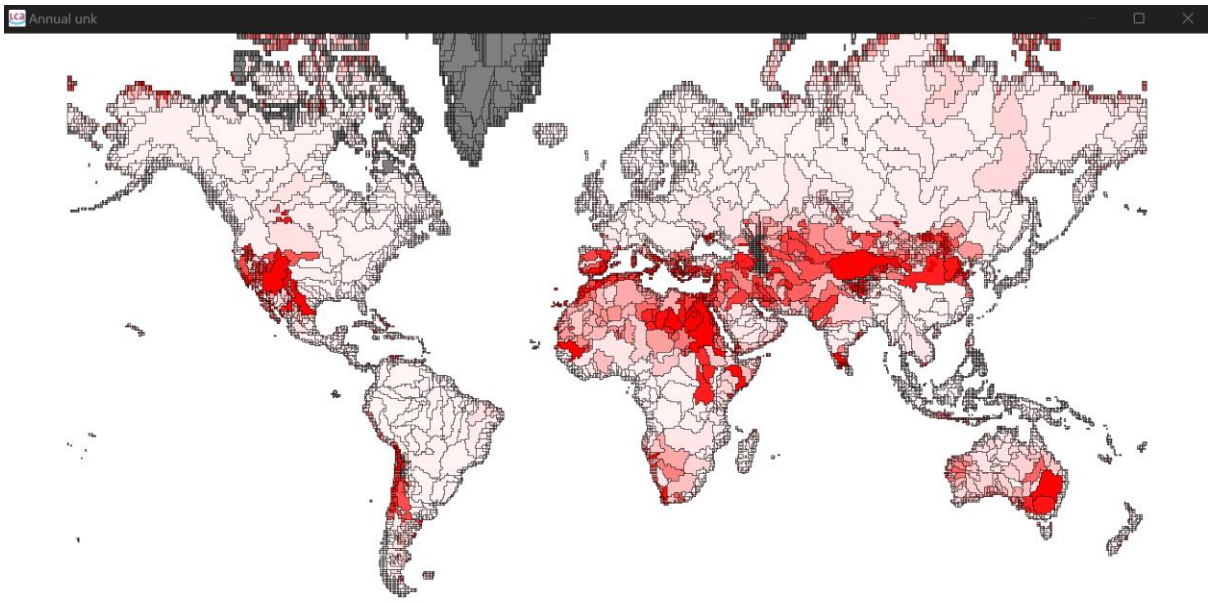

Figure 1 - geoJSON with AWARE 1.2 CFs (annual aggregation for unknown activities) at the native sub-watershed scale, opened in openLCA 2

3 Get the new method AWARE 1.2 for openLCA

The method package is available in Nexus here: https://nexus.openlca.org/database/openLCA%20LCIA%20methods.

3.1.1 How to update the LCIA Methods in openLCA:

If you want to update the method package in a database that already contains the previous version, you have different options:

- Delete the current version of the method package (both methods and impact categories folders) and then import the latest one,
- Import the latest one and use the option “Update data sets with newer version”. This option will update the existing version of the method package with the newest one. At the end you will see the new folder and the old one, which will be empty and you can safely delete.

We recommend to make a copy or a backup of the database in use before making any changes. Moreover, it’s not possible to have different version of the method package within the same database. In that case, we advise to have two copies of the same database with different versions of the methods imported.

4 Support

For any feedback, inquiries regarding the implementation of AWARE 1.2, or related questions, please contact us.

GreenDelta GmbH, the developer of openLCA, offers prioritized and guaranteed professional support for openLCA users through the GreenDelta helpdesk: https://www.openlca.org/service-contracts/. Community-driven (support is also available at https://ask.openlca.org/.

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5 Resources

Boulay, A. M., Bare, J., Benini, L., Berger, M., Lathuillière, M. J., Manzardo, A., ... & Pfister, S. (2018). The WULCA consensus characterization model for water scarcity footprints: assessing impacts of water consumption based on available water remaining (AWARE). The International Journal of Life Cycle Assessment, 23, 368-378.

https://wulca-waterlca.org/

Boulay, A. M., & Lenoir, L. (2020). Sub-national regionalisation of the AWARE indicator for water scarcity footprint calculations. Ecological Indicators, 111, 106017.

Sala, S., Benini, L., Castellani, V., Vidal Legaz, B., De Laurentiis, V., & Pant, R. (2019). Suggestions for the update of the Environmental Footprint Life Cycle Impact Assessment. Publications Office of the European Union.