WULCA

A LIFE CYCLE INITIATIVE PROJECT

Water Use in LCA (WULCA): Presentation of AWARE method

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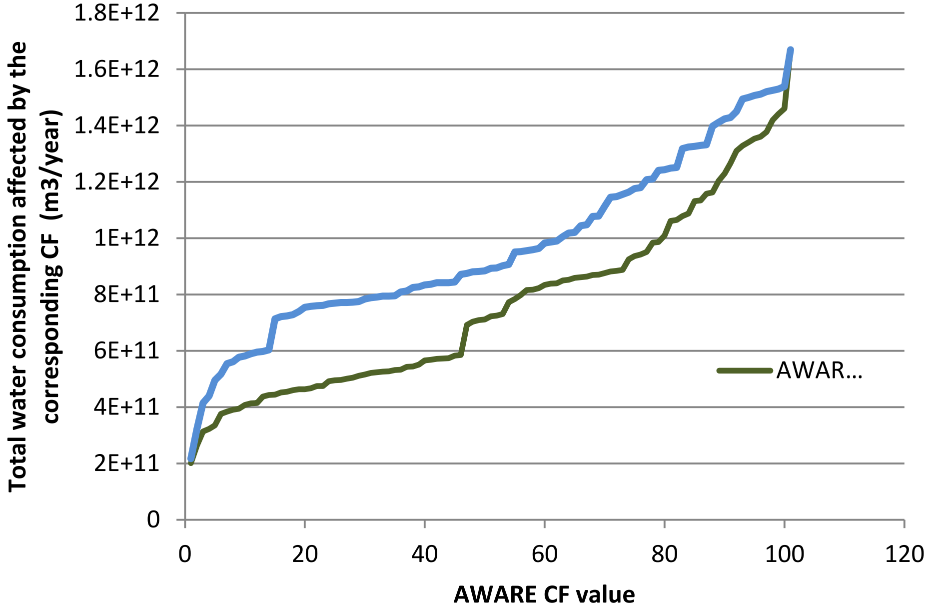
Agenda

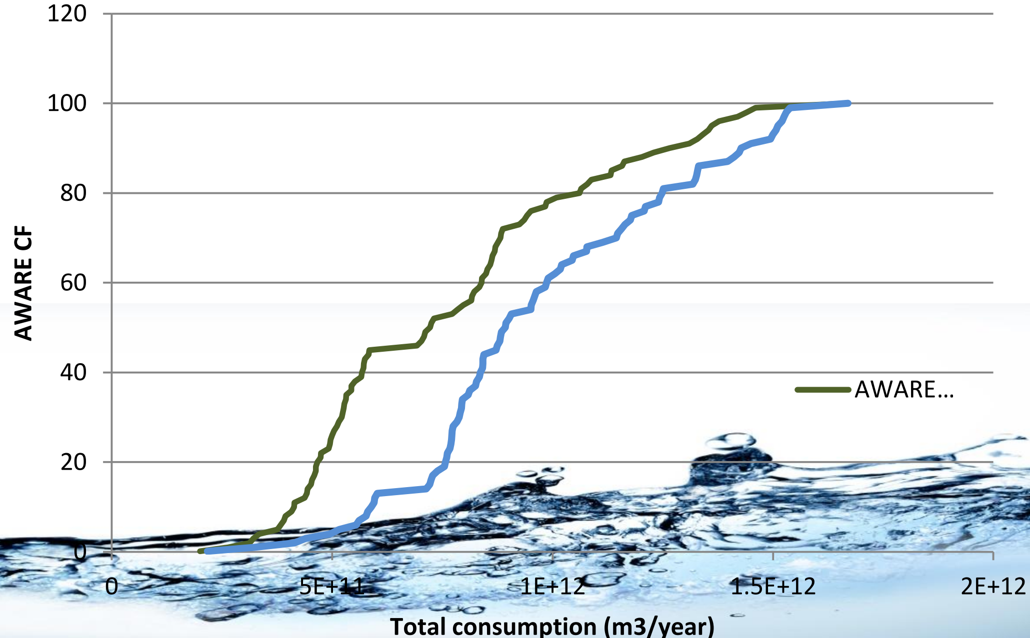
1- AWARE paper review
- status
- changes made (AWARE_EWR+50%)
- choice of graph
- Acknowledgments – institutions?

2- Case studies

Overview of conclusions

AWARE EWR150 comparison chart





7 case studies

- 1 Food basket of product
- 2 Danone water and juice bottles
- 3 Volkswagen
- 4 Flow regulator
- 5 Cement (SuizAgua)
-Already presented:
    -6 Biodiesel (Carla Caldeira)
    -7 Rice case study (Task force case study) → new findings?

Food basket of product - Results

-results comparable with alternative variations (AWARE100_EWR50; AWARE10; AWARE1000) and alternative models (DTA and DTA_X).

- Results are similar to those obtained with a large number of models both based on CTA such as Blue water scarcity (Hoekstra et al., 2012) and Water scarcity (Boulay et al., 2011), as well WTA, such as WSI and Surplus Energy (Pfister et al., 2009).

-More relevant differences are expected to occur when LCA models with higher regionalization are characterized, especially if foreground analyses are performed at the level of watersheds.

-WAVE (Berger et al., 2014), although being based on CTA, produces very different results as the CF for geographically unspecified flows is missing.

-Models such as Water scarcity (Yano et al., 2015) and Agricultural water scarcity (Motoshita et al., 2014) are different in nature and in scope, therefore provide slightly different results.

-The models: ILCD v1.07, ILCD as implemented in Simapro and Ecoscarcity-2013 point towards the same hotspots, being all based on a similar approach.

Food basket of product - Conclusion

- Majority of LCIA methods for assessing water scarcity agree in identifying the top 3 most contributing products to the impacts associated with EU consumption patterns as well as on the most relevant life cycle phases, exception made for the ILCD v1.07 model and few other diverging results.
- The applicability of the AWARE model and its alternative versions is proved and documented as no major inconsistencies are found and the results are substantially compatible to those obtained from other models.
- Nevertheless, such similarity may be partially due to the low level of regionalization which is provided by the European Food Basket in its current version.
- Future developments of the underlying LCA model should improve the geographic specification of processes, as regional variability is a key aspect in water scarcity assessment.

Danone - Key learnings

- Although when comparing the water scarcity footprint of the different products studied the ranking is the same when using *Pfister et al. 2009* or *AWARE 100,* it may be different if other products would have been selected, considering other locations. Indeed, the ranking among country average characterization factors is significantly different when comparing *Pfister et al. 2009* and *AWARE 100* methods.
- *AWARE 100* proposes specific characterization factors for agricultural water use. It tends to increase the contribution of agricultural products to water scarcity footprint compared to other type of water use.
- Finally, Sensitivity analysis on *AWARE 10* and *AWARE 1000* shows that at the country level, and at locations where the ratio 1/(Availability-Demand) is high, the cut-off rule has a significant impact on the results.

Danone Recommendations for WULCA

- Since different methods (Pfister 2009) can give different results, recommendation to validate the data with local and country-wide data, similarly to the closed basins study
- Doing a distinction between Agri and Non-Agri characterization factors seems to make sense from a conceptual point of view. However, for some countries, Non-Agri characterization factors are higher than Agri-characterization factors. According to WULCA it reflects the actual situation.
- The cut-off rule has a significant impact on characterization factors. This cut-off factor should be selected carefully considering that a higher cut-off would increase significantly country average characterization factors, which are often used in LCA since the exact location of water use of background processes are often unknown.

Cement - Results

•Given the scales of each method, largest absolute value for water scarcity footprint is given by AWARE1000, followed by AWARE100_EWR+50%, AWARE100, AWARE 10, DTA and DTAx. In this case study, **all different water scarcity footprint methodologies gave as result that electricity consumption from Colombian matrix was the main hotspot**.

•In this case, electricity water footprint was obtained from database. This procedure doesn't consider monthly variability of water consumption, which in the case of hydroelectricity varies importantly between months depending on water balance and can even be negative in some months, when more water is released than entered by precipitation or input of river flow (WD4 ISO14073, 2015).

•In terms of MJ, energy consumption on plant is 88% carbon, 10% electricity and 2% diesel8%bioldiesel. In comparison, water scarcity footprint is between 75% (DTA) and 85% (AWARE1000) due to electricity consumption. In terms of water scarcity footprint, coal is a better choice, but in terms of water availability footprint, pollution due to coal mining increases its relevance.

Cement Results (cont.)

•The use of **different thresholds may increase significantly the absolute value for average water scarcity of a country**, even if it is of low water scarcity. In the case of Colombia, scarcity increased around 50% between AWARE10 and AWARE100, and between AWARE100 and AWARE1000. This increase relates to high stress Caribe basin, which is the one with areas and months of AWARE greater than 10, and even though it covers only 9% of national territory.

•For Colombia, water availability change in dry years can be pretty high; therefore it may be important **to include dry scenarios in order to identify hotspots during these seasons**. These results can be of mayor interest for a company if it has direct operations in areas of temporal water scarcity, because it would be more aware about needs for preparing for these seasons. The company can also work with its supplier for a better water management on hotspots watersheds.

Cement – Potential problems

- For supplies for which only the country of origin is known, its AWARE indicator may be overestimated and therefore its water scarcity footprint may hinder importance as hotspots of other supplies or direct processes, for which there are water basin location available. This is true for all indicators but for AWARE may be of greater concern. Additional analysis for only processes with specific location available may be of interest, especially if company has greater potential of influence over them.

- When excluding processes for which there is not a local water basin of origin available, water scarcity footprint changed significantly when downscaling AWARE100 (increase of 41%). **This result increase awareness about downscaling when possible**, especially for productive processes where location is known and given that their basins have large areas and changing microclimates.

Volkswagen - Lessons learned

- AWARE 100 provides a good compromise between inventory and characterization factors (compared to AWARE10 or 1000), although it is a sensitive choice.
- Normalization of 1/AMD to world average makes it difficult to interpret results of methodological sensitivity analysis
- As a measure of physical water scarcity, many countries (e.g. in sub-Saharan Africa) which suffer from economic water scarcity appear uncritical
- Results were sensitive to EWR+50%

Volkswagen – Potential Problems

-Availability of spatially explicit data
- "Even though we did not identify obvious mistakes in the CFs or obviously wrong conclusions drawn from the application of AWARE, the interpretation of the results was not always straightforward and some CFs appeared counter-intuitive."
    - Case where agri is lower than non-agri (i.e. UAE)
    - Saudi Arabia lower than Spain or Greece

→ Due to country aggregation, justified scientifically, yet needs to be explained in interpretation.

Flow Regulator – Potential problems

-Availability of spatially explicit data
- "Even though we did not identify obvious mistakes in the CFs or obviously wrong conclusions drawn from the application of AWARE, the interpretation of the results was not always straightforward and some CFs appeared counter-intuitive."
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Flow Regulator – Lessons learned

→1- Provision of annual country-specific CFs based on agricultural, non-agricultural, and total consumption weighted monthly basin CFs is a relevant support for practitioners.

→ significant change in the category indicator result depending on the weighting used to get to the yearly average CFs. This can be explained by the fact that agricultural consumption (irrigation) occurs mainly during the dry month with low available water remaining. Hence, in a consumption weighted average the high CFs of these months dominate the annual average CF. Not only does the UDP change significantly, but the composition, ranking and contribution share of individual countries to the total UDP shows relevant changes too. Depending on how strong individual countries change their CFs (yr_non_agri vs. yr_avg), so does their ranking and contribution to the total UDP.

Flow Regulator – Lessons learned

→**2- Choice of cutoff**

→AWARE 100 provides a good compromise between inventory and characterization factors (compared to AWARE10 or 1000), although it is a sensitive choice.

→influence the relative difference between the countries but also the ranking of countries. This can be explained by two facts. First, monthly basin CFs are more likely to become equal if the upper limit is 10 only. Second, if the upper limit of CFs for water scarce months is 100 or even 1,000, the relative weighting of these CFs in the annual average is much higher.

Flow Regulator - Lessons learned

- 3- Results were sensitive to EWR+50%
  - an increase of 37% in the UDP and changed the ranking of countries' contributions to the total UDP significantly
- 4- Normalization of 1/AMD to world average makes it difficult to interpret results of methodological sensitivity analysis (different cutoffs)
- As a measure of physical water scarcity, many countries (e.g. in sub-Saharan Africa) which suffer from economic water scarcity appear uncritical

Next steps

- Next meeting for remaining case studies (in 2-3 weeks)
- Follow up case studies with Rolf, Olivier and Pellston steering committee
- Article re-submission
- LCA Food paper (submitted)
- Conferences: LCA Food, ecobalance, LCA Case Study Symposium

-AOB?