Water footprint and ISO 14046: A synthesis of an expert workshop

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INTRODUCTION

- Agricultural sector is a major user of scarce freshwater resource in South Africa.
  - Direct contribution to Gross Domestic Product of SA is small (<3%) (DAFF, 2014).
  - Currently the agricultural sector may be an inefficient user of freshwater (Nieuwoudt, Backeberg & du Plessis 2004:162)

- Agricultural sector is crucial for food security in SA
  - Produce food;
  - Generate employment along whole value chain.

=> Need to use scarce freshwater resource in a sustainable manner.
  - Environmental; economic; social (Three pillars of sustainable water use (Hoekstra, 2014))

INTRODUCTION (CONT…)

- Water footprint is important sustainability indicator for agri-food sector (Ridoutt et al., 2010).
  - It is believed that water footprint information can guide policy towards sustainable use of freshwater (Hoekstra *et al*., 2011).

- Hoekstra et al. (2011) define the water footprint of a product as the volume of freshwater (direct and indirect) that is used to produce a product, measured over the whole supply chain (or life cycle) of a product.
  - Green-, blue-, and grey water footprint

- Different methods are used for WFA:
  - Consumptive water-use based volumetric water footprint (Hoekstra et al., 2011).
  - Life Cycle Analysis (LCA) (Pfister et al., 2009).
  - Milà i Canals et al. (2008
  - Hydrological water balance method (Deurer et al., 2011)

INTRODUCTION (CONT…)

- Methods that are mostly used:
  - Consumptive water-use based volumetric water footprint (Hoekstra et al., 2011).
  - Life Cycle Analysis (LCA) (Pfister et al., 2009).
- Two methods have some fundamental differences, however, insufficient evidence in literature to judge one necessarily better than other.
- ISO 14046 provides new dynamic to topic.
  - Principles, requirements and guidelines for WFA.
  - Only published in August 2014.
  - Limited information is available on ISO 14046 to inform WFA in SA.
- Thus, given the research interest in WFA, it is important to get insight into:
  - the different methods for WFA;
  - WFA in the context of ISO 14046.

INTRODUCTION (CONT…)

- Hosted workshop (UFS, WRC, RMRDSA, NRF) to scrutinise different methods for WFA in the context of ISO 14046 in September 2014 in Bloemfontein.
- Two international experts
  - Dr Ashok Chapagain (WFN)
    - Expert in WFN method
  - Dr Brad Ridoutt (CSIRO)
    - Expert in LCA method, and participated in development of ISO 14046.
- Scientists from SA involved in WFA (mainly on WRC projects)

UFS	WRC
UP	Pegasys
CSIR	People from industry
RU	

INTRODUCTION (CONT…)

- Aim – Report findings of expert workshop on WFA methods
  - to select and recommend a method for WFA in SA,
  - that will allow for accurately benchmarking water footprints in SA,
  - to effectively inform sustainable freshwater use in SA.

  -> In context of new ISO 14046 standard.

WORKSHOP – ISO 14046 (RIDOUTT)

- Published Full International Standard.
  - highest level of consensus between participants.
- Overcome confusion of different uses of term “water footprint”.
  - WU is defined comprehensively, including water pollution and consumption (evaporated and incorporated into product).
  - Can be reported as one number, or profile of indicators.
    - Only after EIA can be called “water footprint”
    - Otherwise, used with qualifiers (i.e. “water scarcity footprint”)
  - ISO doesn’t police use of term, but does give authority if used according to ISO 14046.
- Not water resources management guideline.
  - Assessing environmental impact of water use along life cycle of product.
- Prevent “industry bashing” through reporting of volumetric water footprint indicators.

WORKSHOP – ISO 14046 (RIDOUTT) CONT…

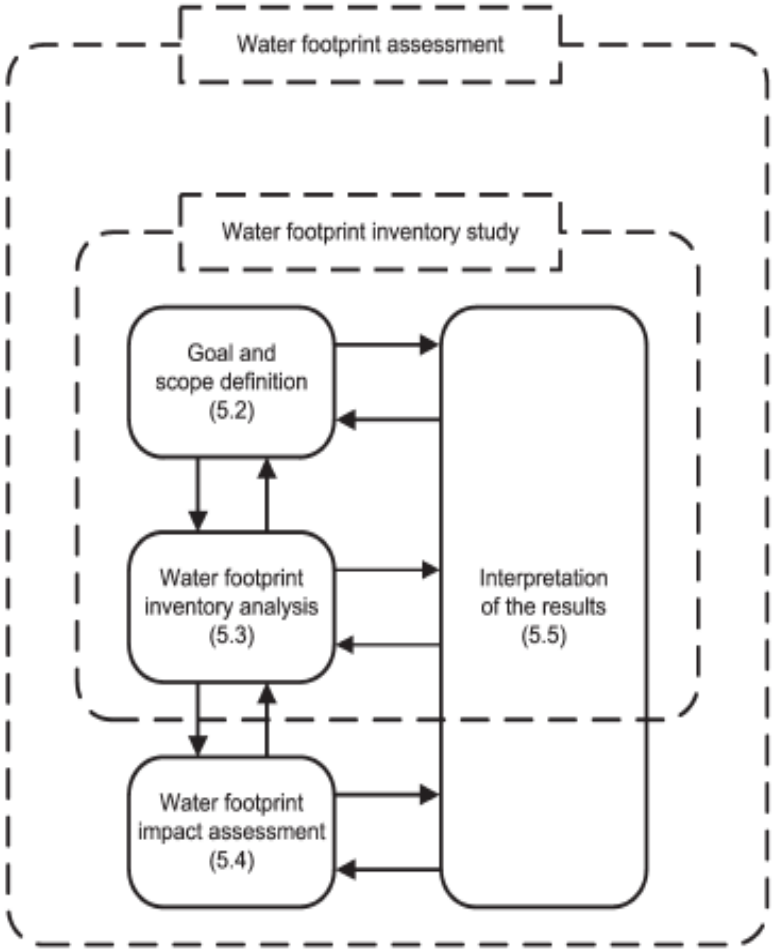

Figure 1 — Phases of a water footprint assessment

- Data requirements focus on change in environmental impact:
  - Land use
    - **changes** in drainage; stream-flow; ground water flow; or water evaporation that arise from land-use changes or changes in management activities, where relevant to the scope of the study to be undertaken.
  - Water use
    - "water consumption" is described as water removed from, but not returned to the same basin.
    - **Change** in evaporation because of land use changes is considered
      - Pure evapotranspiration flows not considered.

WORKSHOP – LCA (RIDOUTT)

- ISO 14046 largely based on LCA approach.
- Focus of assessment is on impact of **change** in behaviour on the environment, including on water resource.

- Calculate a Water Stress Index (WSI)

$$\text{Indicator result for consumptive water use } (H_2Oe) = \sum_i \frac{CWU_i \times WSI_i}{WSI_{global}}$$

- LCA does not buy into dilution factor method for assessing impact of pollution on freshwater resource (as WFN).
  - Models are available to assess the specific environmental impact of different types of emissions.
- LCA does not consider green water as part of water footprint.
  - Linked to land, decision-maker has little influence on it.

WORKSHOP – WFN (CHAPAGAIN)

- WFN approach is concerned with sustainability of WF.
- Four stages
  - Defining the scope
  - Water footprint accounting
    - Consumptive use volumetric approach
    - **Green-**, blue-, and **grey** water footprint
  - Sustainability assessment
    - Environmental (WF vs Water availability)
    - Economic (Maximise financial returns)
    - Social (Equitable distribution of water)
  - Response formulation
- Volumetric WF-indicator **is not** final outcome of WFN-approach, but response formulation after sustainability assessment.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

- Essentially both methods want to minimise impact of human behaviour on freshwater resource.
- ISO 14046
  - Provides principles, requirements and guidelines for WFA.
  - Is not prescriptive regarding the method for water footprint accounting.
  - Recommend the use of “water footprint” only after EIA.
    - Otherwise use a qualifier (i.e. water scarcity footprint).

  => ISO standard is interested on environmental impact of changed behaviour.
- Main difference between LCA and WFN methods include:

LCA	WFN
Focus on environmental impact, and expression of WF in H2O equivalents.	Focus on sustainability assessment of WF, and response formulations for reducing WF
Does not consider green water footprint as part of water footprint.	Does consider green water footprint as part of total water footprint.
Does not buy into grey water footprint concept of WFN. Argues that more appropriate methods are already available to assess impact of pollution.	Expresses grey water footprint as the volume of freshwater required to assimilate polluted freshwater to ambient water quality standards.

CONCLUSIONS AND RECOMMENDATIONS

Recommendations:

- Clearly specify
  - The aim and scope of the WFA.
    - Why are you doing WFA?
    - What exactly are you doing (i.e. case study, etc.)?
  - What method was applied?
    - WFN or LCA
  - What data was collected and used?

Thank You
Dankie

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