



WULCA
A LIFE CYCLE
INITIATIVE PROJECT



WULCA stress meeting

March 11th, 2014

Agenda

- Reminder of options being explored
- Advancement for option B2
- Presentation of Jane Bare's work
- Discussion

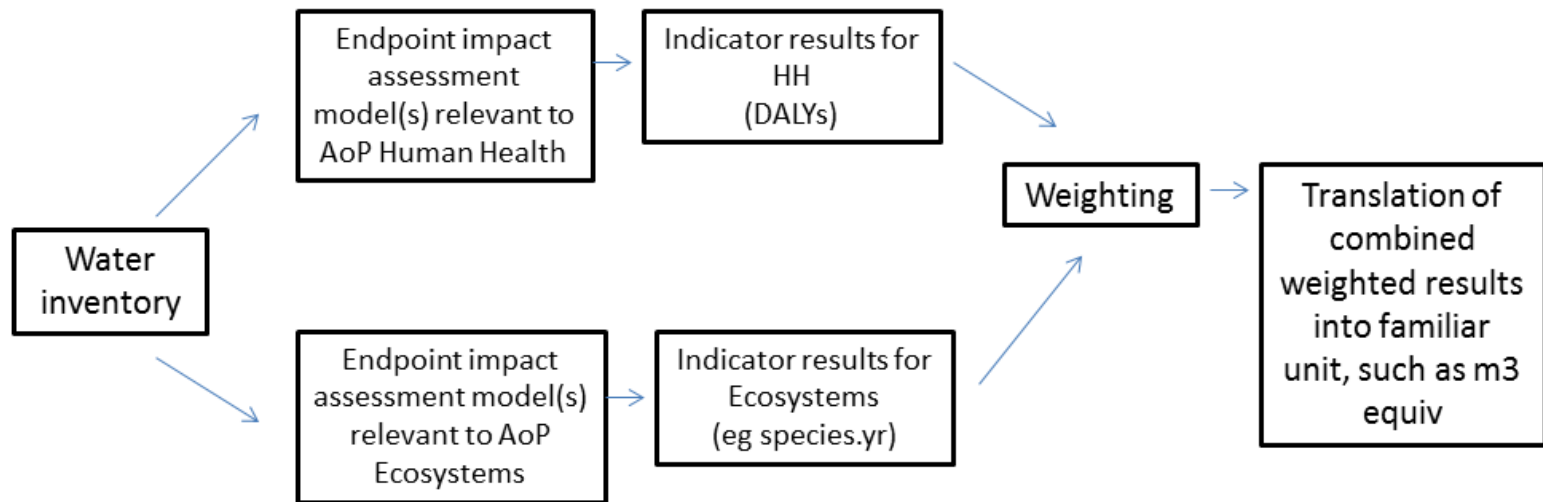
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Reminder: Proposal from Brad

Single indicator for water use

(see Ridoutt and Pfister 2013 IJLCA 18:204-207 for example, also discussion in Ridoutt and Pfister 2013 JIE 17:337-339)



Note: consensus needed on which model(s) are preferred (where more than one model exists for a particular impact pathway) and whether models for new impact pathways are mature enough to include. This fits in with other WULCA activity to reach consensus on models for HH impact of water use, etc

Note on weighting and ISO (14040/44 and 14046): weighting is permitted on the results of category indicators, and these need to be made available along with the weighted results

Reminder: Approach (b1) generic midpoint

Include Vulnerability Factors for HH (VF_{HH}) and EQ (VF_{EQ}) based on endpoint modelling

The general structure could be:

$$WIF_{\text{midpoint}} = f \left[\frac{\text{Consumption}}{\text{Availability}} \times VF_{HH} \times VF_{EQ} \right]$$

The factors need to account for regional specific circumstances

PROS: Represents elements of both ecosystems and human health impacts

CONS: care should be used to avoid implicit weighting



Reminder: Approach (b1) generic midpoint

- Existig ideas for VF can be
 - For VF_{EQ}
 - Based on environmental water requirements (EWR):
 $VF_{EQ} = 1/(1-EWR)$
 - Based on ecosystem vulnerability (EV):
 $VF_{EQ} = EV$
 - The result would be combination:
 $VF_{EQ} = EV/(1-EWR)$
 - For VF_{HH}
 - Based on GDP or human development index (HDI):
 $VF_{EQ} = (1-HDI)$ or $1/HDI$ or more complex

- Simplified first approach:

$$WIF_{midpoint} = f \left[\frac{\text{consumption} \times (1 - HDI^x)}{\text{availability} \times (1 - EWR^y) \times EV^z} \times c \right]$$

x, y, z, c = factor for adjusting impact function

- WSI functions could be applied as done by Boulay et al. 2011 and Pfister et al.

Reminder: Approach (b2) stress based on the ratio of all water user's needs to available water

$$\text{STRESS} = F \left(\frac{\text{Water needs (humans + ecosystems)}}{\text{Renewable water availability}} \right)$$

Water needs- humans: water consumption

Water needs -ecosystems: needs to be investigated how this can be done with reliable science

Renewable water availability: considering only renewable water allows to reflect aquifer overuse

PROS: Generic – no weighting – simple

CONS: Challenge of representing ecosystems water needs in a reliable way, consult with ecologists?

Reminder: Approach (b2) stress based on the ratio of all water user's needs to available water

$$\text{STRESS} = F \left(\frac{\text{Water use (green + blue)}}{\text{Renewable water availability + green water availability}} \right)$$

Water needs- humans: water consumption

Water needs -ecosystems: needs to be investigated how this can be done with reliable science

Renewable water availability: considering only renewable water allows to reflect aquifer overuse

PROS: Generic – no weighting – simple

CONS: Challenge of representing ecosystems water needs in a reliable way, consult with ecologists?

Mike:

Green water should not be included as a resource but rather as a change in runoff

Green water is related to terrestrial ecosystems

Blue water is related to aquatic ecosystem

Inga:

If greenwater is included in human needs, then any agricultural activities – even if not irrigated – would lead to scarcity, and this would be an overestimation

Montse: difference of green water consumption vs green water consumption of natural vegetation, quantifying an environmental intervention which could lead to a scarcity



Water scarcity (ISO 14046)

Human point of view:

Human water use

Water available

Ecosystem point of view:

Human water use

Water available – ecosystem requirements



Water scarcity (ISO 14046)

“extent to which demand for water compares to the replenishment of water in an area, e.g. a drainage basin”

Human point of view:
$$\frac{\text{Human water use}}{\text{Water available}}$$

Ecosystem point of view:
$$\frac{\text{Human water use}}{\text{Water available} - \text{ecosystem requirements}}$$

Water available – ecosystem requirements



Global approach

- Considering that 1 m³ of water has the same value if used by human or ecosystems, then:

Human water use + ecosystem requirements

Scarcity/stress = $\frac{\text{Human water use + ecosystem requirements}}{\text{Water available}}$

- Example if: HWU = 10, EWR = 50, and WA=100

Human point of view = $10/100 = 0.1$

Ecosystem point of view = $10/(100-50) = 0.2$

Global approach = $(10+50)/100 = 0.7$



Ecosystem water requirements

- Smathkin et al (2004) assessed the discharge % necessary to maintain ecosystem in 1) same, 2) good or 3) fair condition. This is regionalized per watershed (ranges from 20-50%), considering flow variability and sensitivity



Smathkin et al 2004

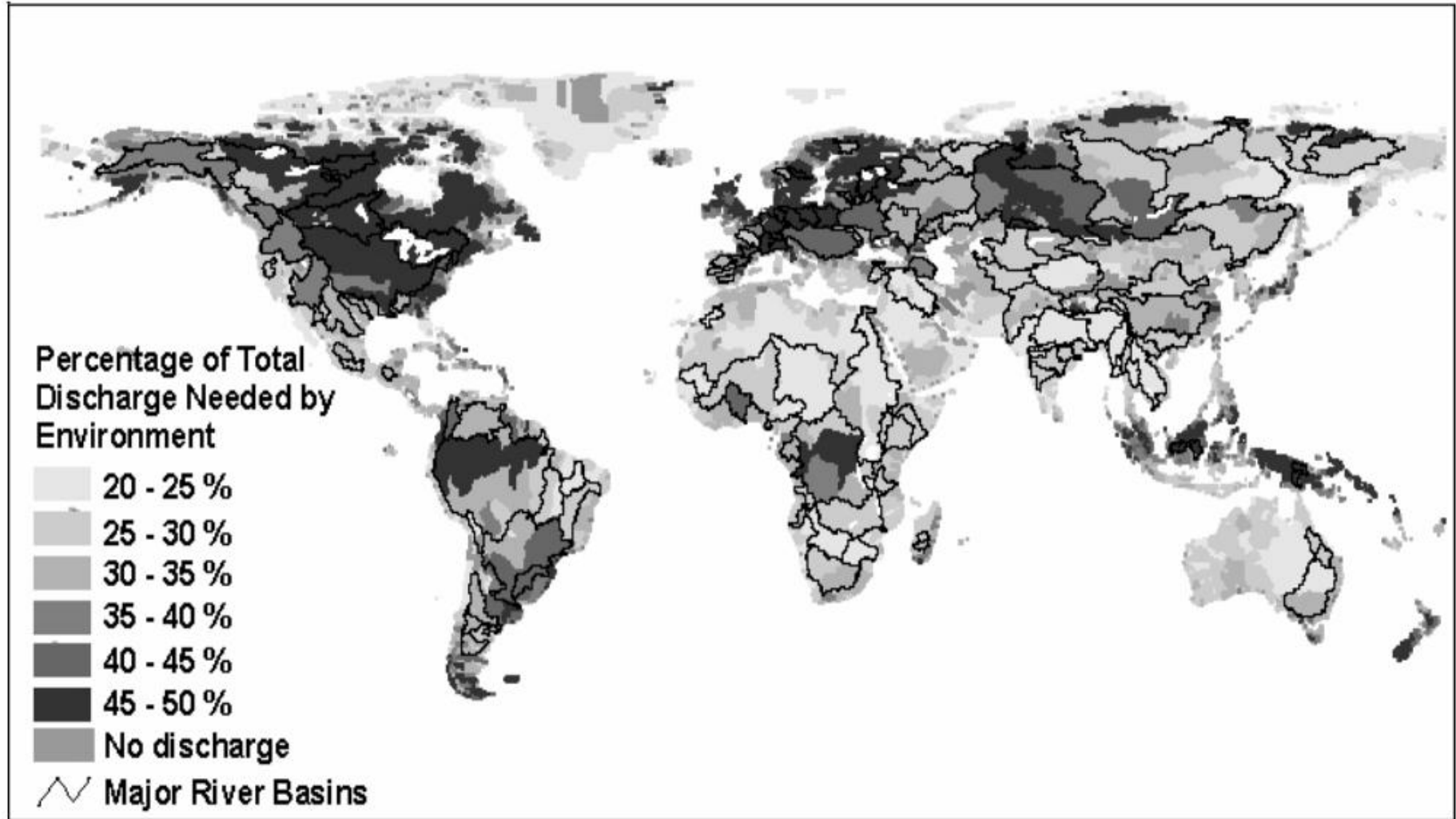


Figure 2. A global distribution of estimated total EWR, which would be required to maintain the freshwater-dependent ecosystems in fair condition

Points to discuss

- Value choices and integration
- Potential disagreement with Global Guidance
- Additional parameters?
- Comments, questions, proposals...
 - Water dependent ecosystems? How about terrestrial?
 - Philippe: Richter 2011, criticizes approach of Smathkin
 - SP: possibly South African context only
 - watershed management at the European level: Montse to send
 - SP: Compare Hannafiah with Smathkin? Near future



Jane's work



Discussion
Action points
Next meeting



- SP: compare Smathkin with Hannafiah
- AMB: look into Smathkin application data, and contact P.Döll
- Discussion on source of data (Jane, AMB)
- Philippe: Richter 2011 and cirirc of Smathkin
- watershed management at the European level: Montse to send
- Mike: to check with local ecologists on work on environmental flow requirement
- Inga and Montse: to look into studies that consider EWR

Jane brings the point that human and ecosystem do not necessarily have to be included and wants to re-open this question at the next meeting when Other members not present will attend.

