WULCA

A LIFE CYCLE INITIATIVE PROJECT

WULCA stress meeting

June 16th, 2014

Agenda

- Start recording!
- Work planning
- Work advancement:
  - Review of issues to address
  - VMF method from Pastor et al (Inga)
  - Stephan's proposal

Work planning

- Definition of work inside and outside of WULCA
- Timeline and expected deliverables
- Collaboration with JRC/European Commission
- Timing related to Pellston workshop
- Work leader and contributors
- Expert workshops

Generic stress-based midpoint

$$Scarcity_{hydrocentric} = Fn\left(\frac{Total\ water\ demand}{Renewable\ water\ availability}\right)$$

- Discussion points and work to be pursued:
  - Research on better data source for Ecosystem water demand (aquatic and terrestrial)
  - Possible inclusion of green water
  - Neutrality between human demand and ecosystem demand (actual? pristine?)
  - Modeling function, limits and thresholds
  - Temporal and geographical resolution
  - Clear definition of indicator's meaning
  - Change of names "hydrocentric, anthropocentric…"

EWR: Variable Monthly Flow Method (Inga)

- A hydrological method to assess the water requirements of ecosystems
- Was evaluated against local case studies where EFR were calculated and showed best overall suitability compared to other global methods (e.g. Smakthin, Tessmann)
- Assessment based on ‘Pristine’ conditions, that were modeled with a global vegetation model (LPJml model by Potsdam Climate Institute)

VMF – Definition of Ecological Flow requirements

Flow Season	Definition of flow season	Run-off allocation to ES [in % of MMF] for 'fair' conditions
Low-flow season	MMF < 40% of MAF	60
Intermediate flow season	MMF is 40-80% of MAF	45
High-flow season	MMF > 80% of MAF	30
Extremely dry conditions	MMF < 1 $m^3 s^{-1}$	No flow allocation to ES

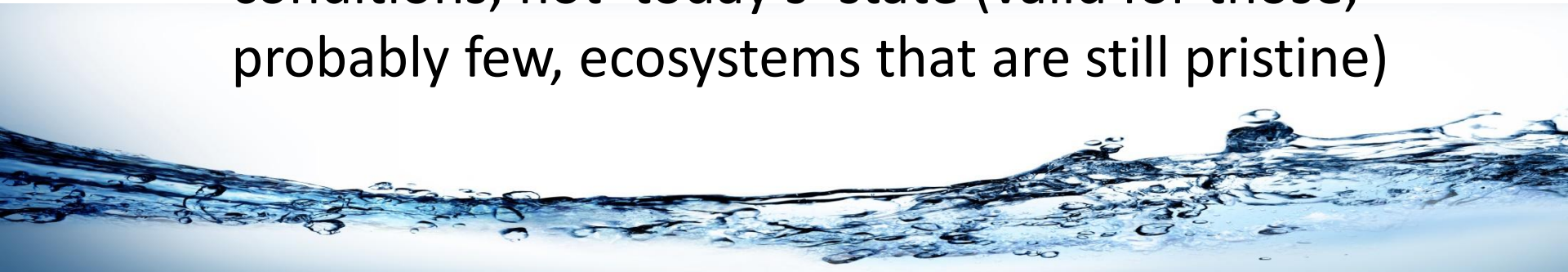
MMF= Mean Monthly flow, MAF= Mean Annual Flow

VMF - Evaluation

- VMF showed coefficient of correlation $r^2 = 0.91$
- VMF was about 10% above calculated case-study recommended EFR
- Author is willing to share data but has to confirm with project partners
- Data in R CRAN format (0,5° grid), conversion to ASCII/GIS-file should be possible

Variable Monthly Flow Method

- Problems
  - No validation of run-off model (pristine conditions, therefore validation not possible)
  - Unclear how ecosystem condition ‘fair’ is defined (checking with author)
  - Flow allocation based on pristine run-off conditions, not ‘today’s’ state (valid for those, probably few, ecosystems that are still pristine)



Note: Concept of Carrying capacity, also looking to include EWR, and looking into Pastor et al's method

Inclusion of green water?

$$\text{Scarcity} = \frac{\text{Blue water demand + green water demand}}{\text{Precipitation - evaporation}}$$

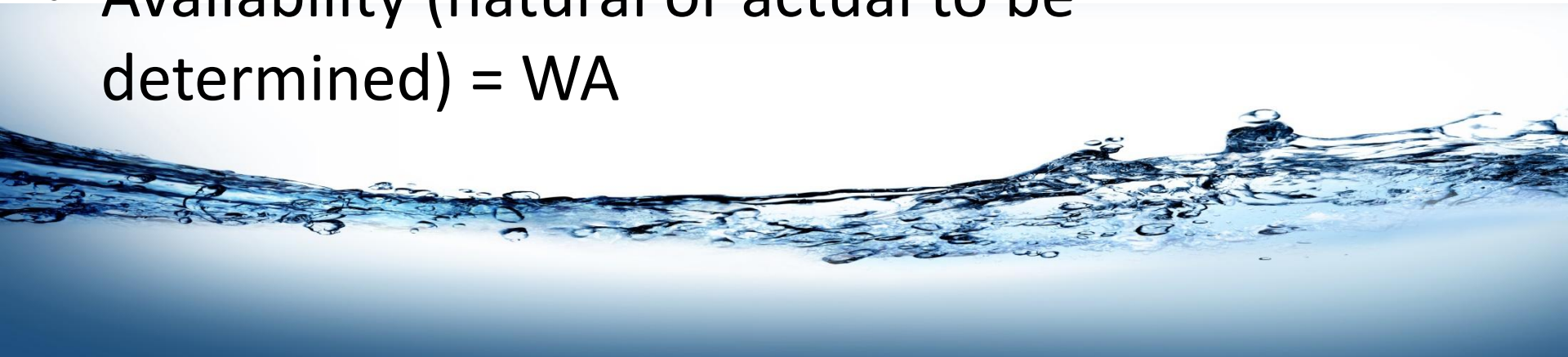
- Total green water or delta green water?

Blue and green water demand = WC industry + WC domestic + WC agriculture + WC actual vegetation (– WC potential vegetation?)

(WC agriculture + WC actual vegetation = ETc actual)

Stephan‘s suggestion

- Stress is characterized by current demand to availability (DTA)
  - Ecosystem demand: EWR (incl. Water dependent terrestrial water demand) = EWD
  - Human demand:
    current consumption (C) minus «luxury» conusmption = HWD
- Availability (natural or actual to be determined) = WA



Equations (A)

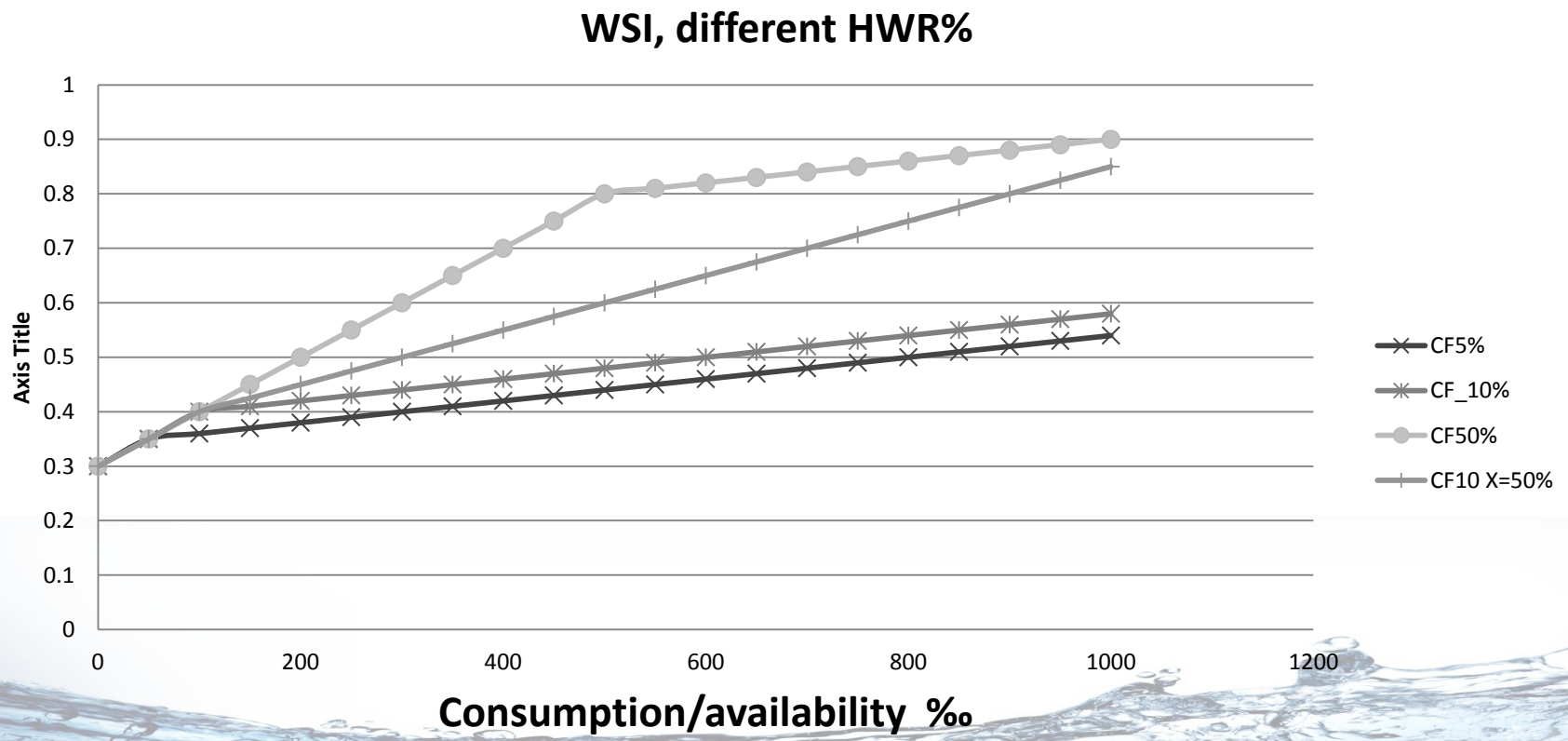
- $CF = f\left(\frac{EWD+HWD}{WA}\right)$
- $HWD = \begin{matrix} HWR + (C - HWR) * X & if\ C > HWR \\ C & if\ C < HWR \end{matrix}$

or

- $HWD = \begin{matrix} C * X + HWR(1 - X) & if\ C > HWR \\ C & if\ C < HWR \end{matrix}$
- X is the share of «luxury» water actually required (X might be a function of C/population and might get higher with higher water consumption per capita)
- HWR = human water requirements for basic needs = for irrigation and doemstic use -> a function of space (irrigation demand) and population density
- Alternatively, HWR could be used as minimum, but generally it is not

Results; X functions not tested

- Assumption: X = 20% (except last case = 50%)
- HWR = 5, 10 and 50% of available water, EWR = 30%



Next step, work to be done

- Correlation Hannahfiah et EWR/Avail ?
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