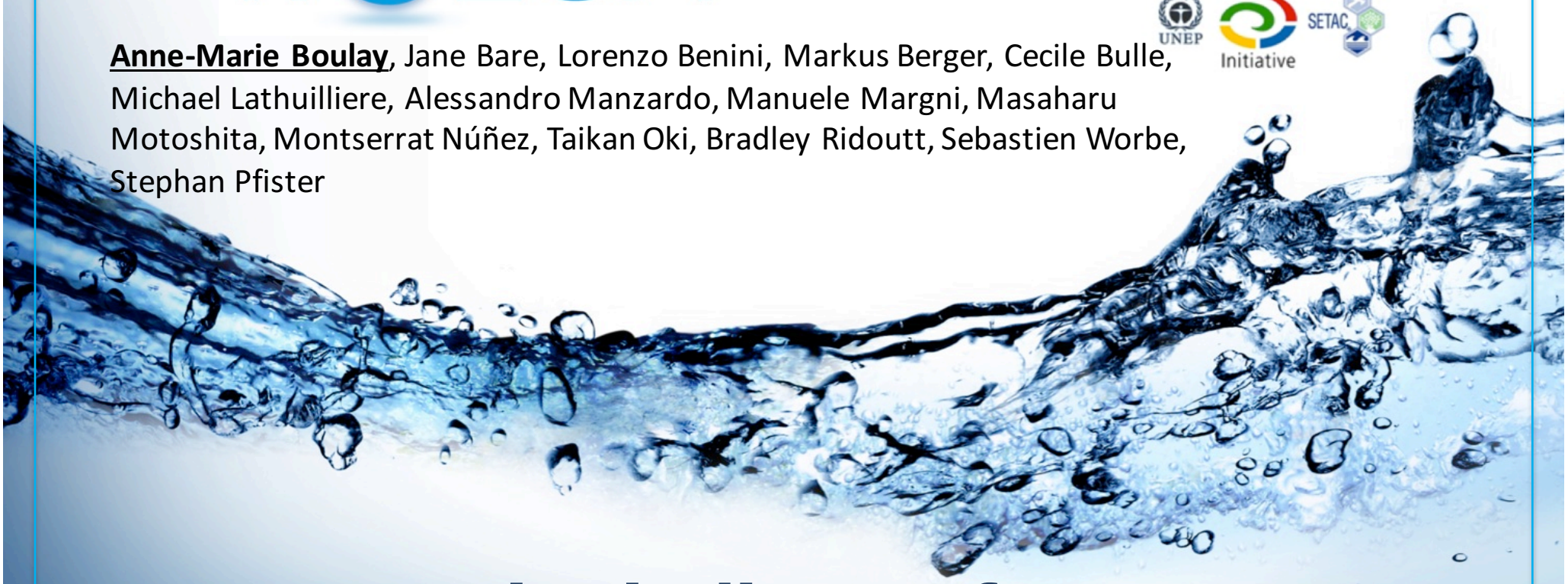


WULCA

A LIFE CYCLE INITIATIVE PROJECT

Anne-Marie Boulay, Jane Bare, Lorenzo Benini, Markus Berger, Cecile Bulle, Michael Lathuilliere, Alessandro Manzardo, Manuele Margni, Masaharu Motoshita, Montserrat Núñez, Taikan Oki, Bradley Ridoutt, Sebastien Worbe, Stephan Pfister

New scarcity indicator from WULCA: consensus to assess potential user deprivation

Vancouver, October 7th, 2015

Outline

- WULCA and consensus building within the Life Cycle Initiative
- First steps – setting the scene
- Three (3) proposals and analysis
- One (preliminary) recommendation

Timeline and progress of WULCA work

Framework on how to assess water use in LCA (Bayart et al, 2010)

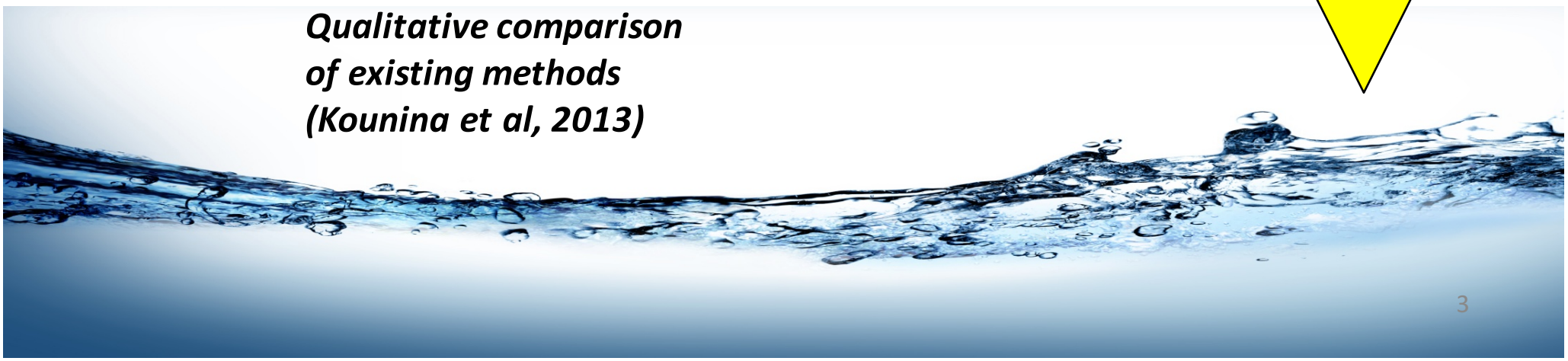
Development of several new methods

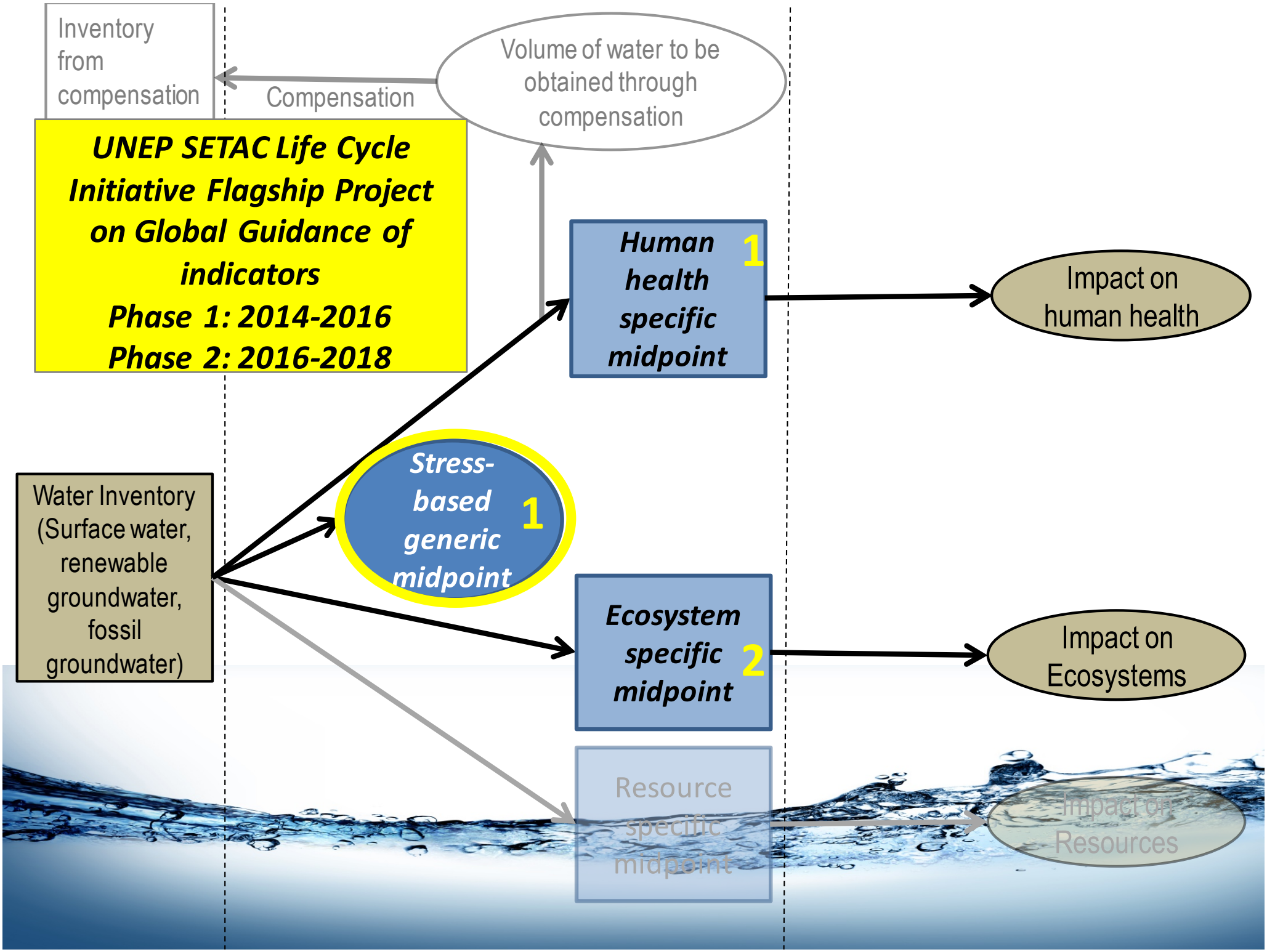
Quantitative comparison of existing methods (Boulay et al, 2015a,b)

2008 **2012** **2013**

Development of a consensual method (2015)

Qualitative comparison of existing methods (Kounina et al, 2013)




Inventory from compensation
Compensation
Volume of water to be obtained through compensation
UNEP SETAC Life Cycle Initiative Flagship Project on Global Guidance of indicators
Phase 1: 2014-2016
Phase 2: 2016-2018
Human health specific midpoint
1
Impact on human health
Water Inventory (Surface water, renewable groundwater, fossil groundwater)
Stress-based generic midpoint
1
Ecosystem specific midpoint
2
Impact on Ecosystems
Resource specific midpoint
Impact on Resources

Generic stress-based midpoint

- No true common midpoint for human health and ecosystems

- Consistent (proportional) results cannot be obtained between a midpoint indicator and the endpoint indicators
  → Regionalization affects both midpoint and endpoint models

- Desire to develop a stress-based midpoint indicator
  →not necessarily correlated to HH and EQ,
  →Provides a simple single indicator to support decision
  → In compliance with ISO 14046

Evolution of scarcity indicators in LCA

At the Expert workshops:
1- question to answer is confirmed
2- inclusion of ecosystem

The question the indicator aims to answer

"What is the *potential of depriving* another user of water (human *or* ecosystems) when consuming water in this area"

WTA

WTA: Wi
CTA: Con
DTA: Dem
AMD: Av

deve

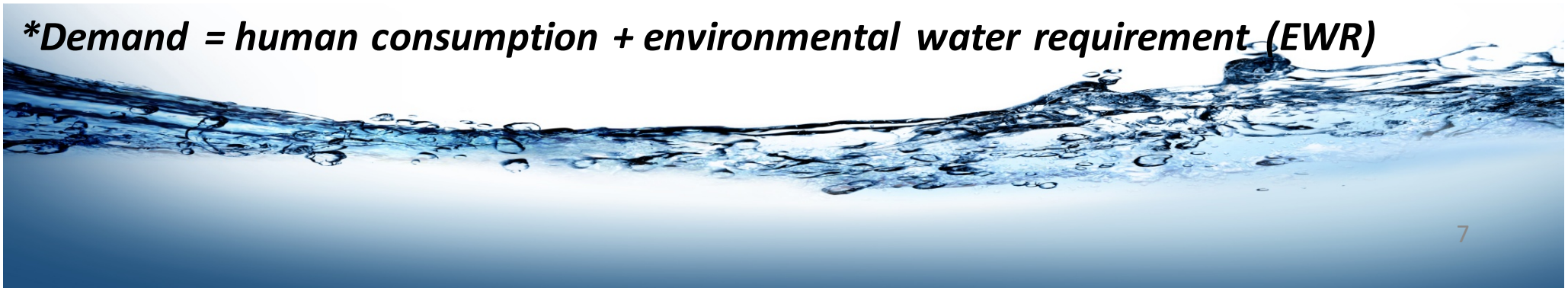
2006

Three indicator options

1

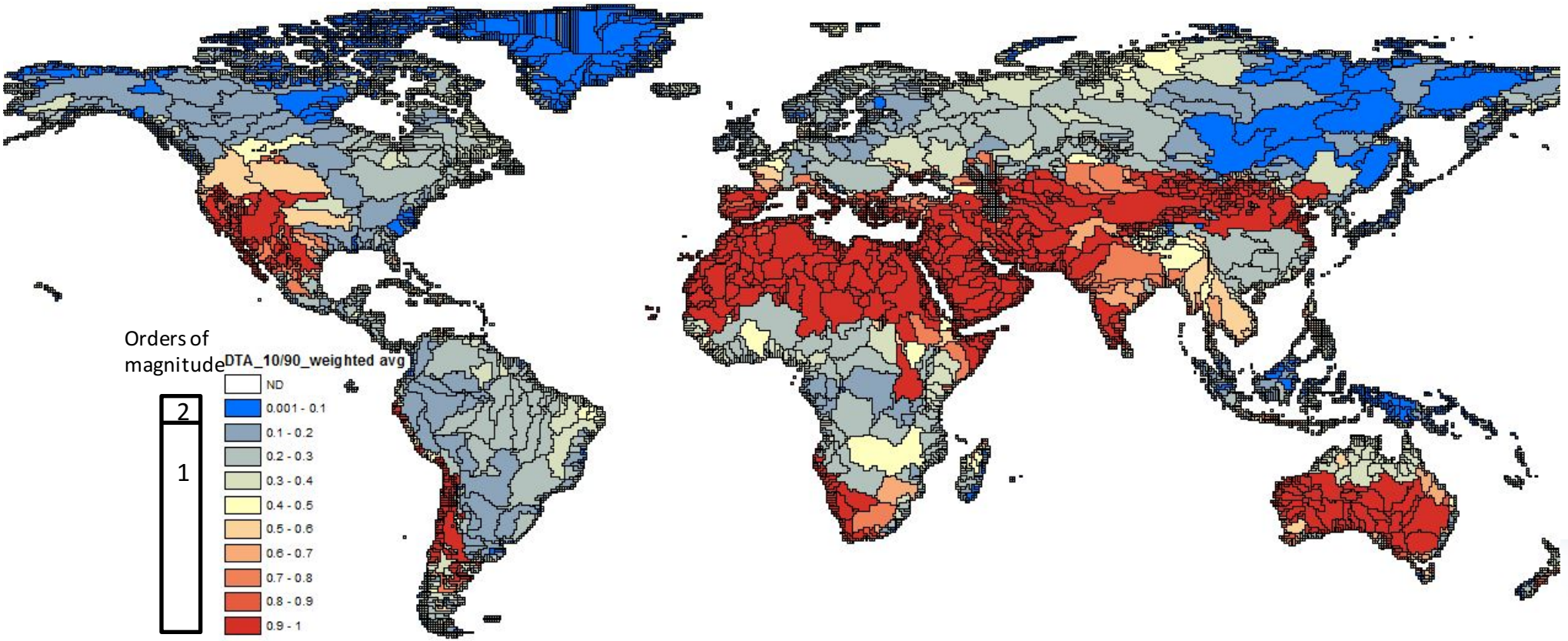
$$DTA = \frac{\text{Demand}}{\text{Availability}}$$

Indicator is maximal for arid regions
Modelled between 0.001 and 1



1 DTA

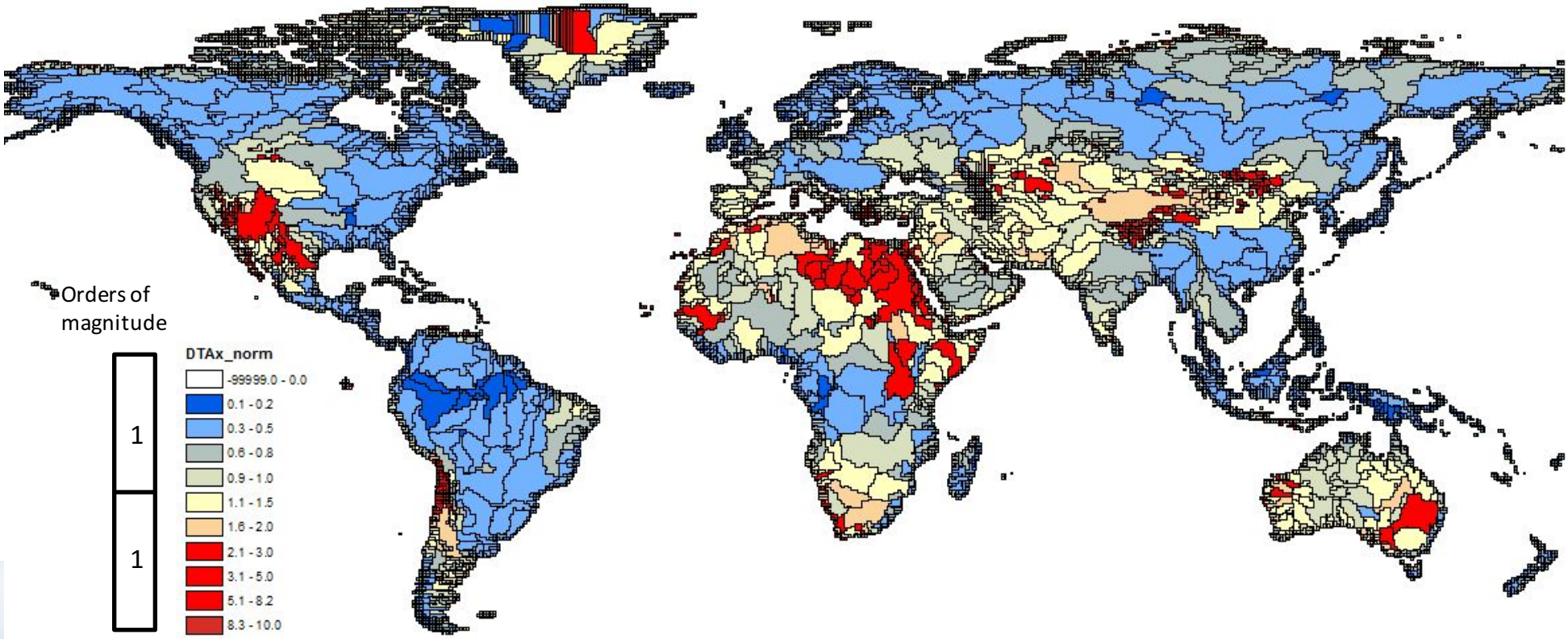
$$DTA = \frac{Demand}{Availability}$$



2

DTAx(0.34)

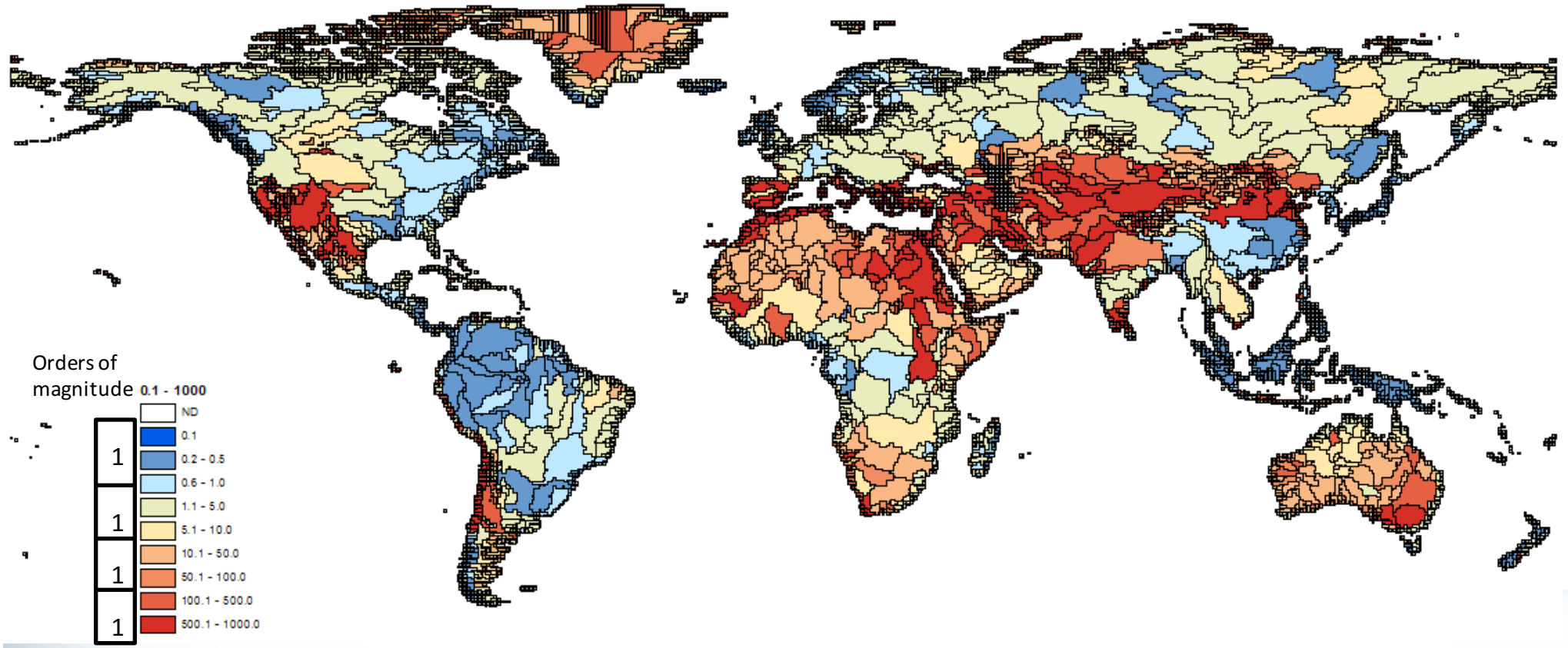
$$DTAx = \frac{Demand}{Availability} \times \left[\frac{Area}{Availability}\right]^{x}$$



3 AMD – range 0.1 - 1000

$$AMD = \frac{\text{Unused water (per area)}_{\text{world avg}}}{\text{Unused water (per area)}}$$

Unused water = Availability - Demand

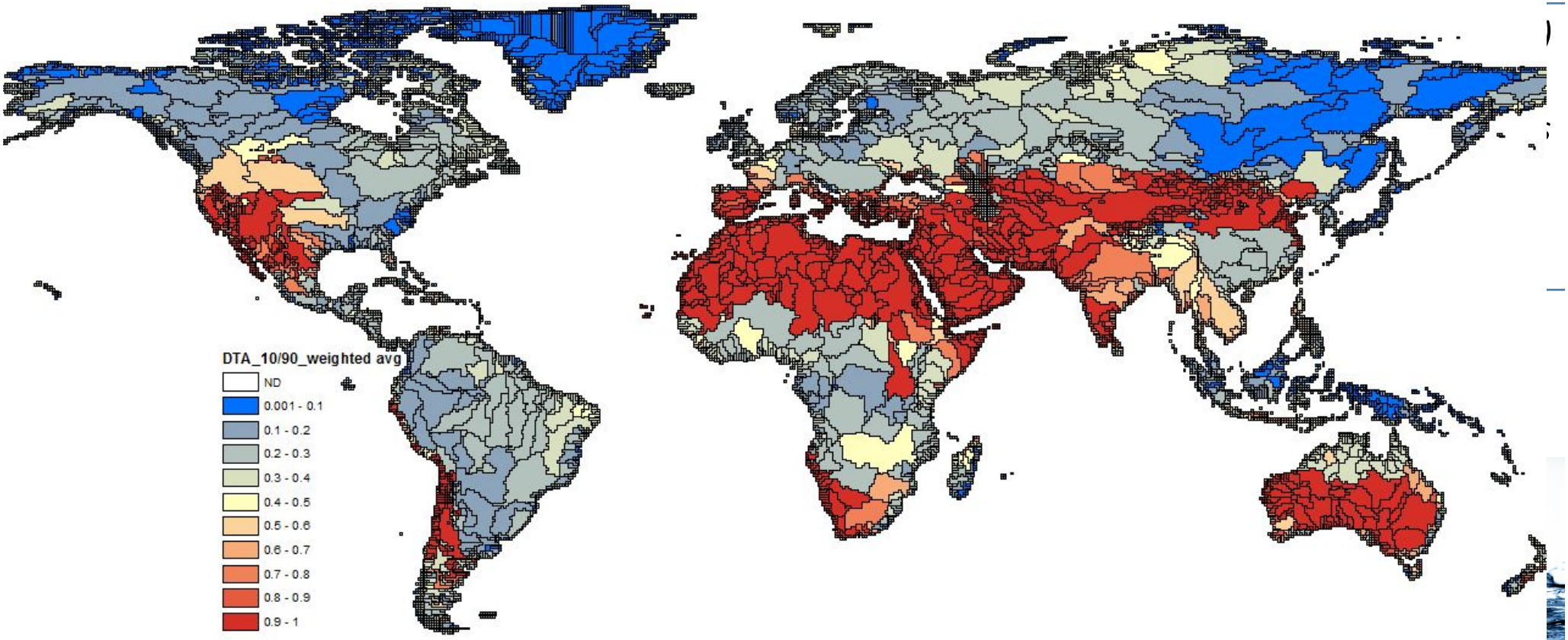


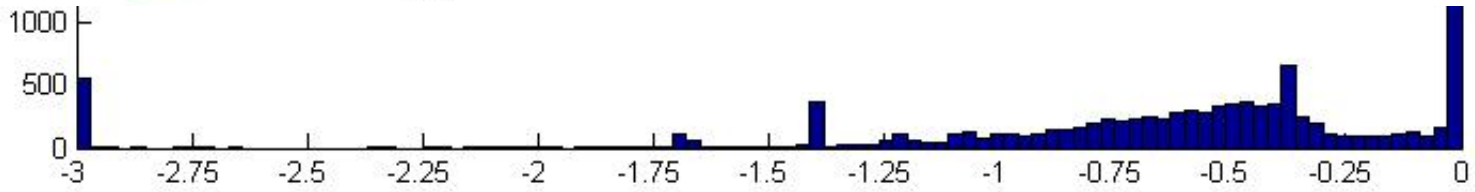
DTA indicator is eliminated first

1

$$DTA = \frac{Demand}{Availability}$$

→Strong influence of arbitrary value choice for arid regions
→ 1 order of magnitude → low discriminatory power



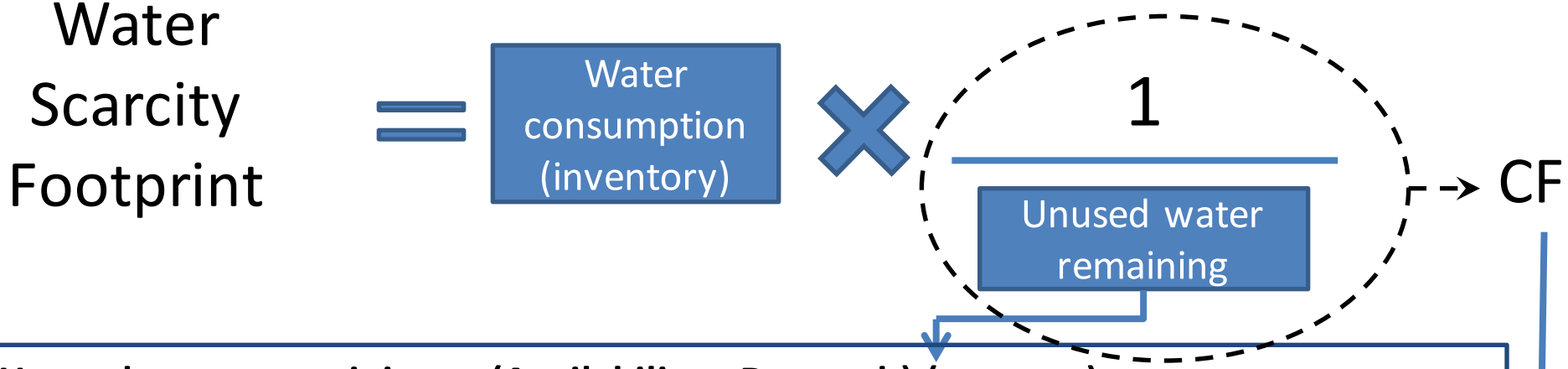


Evaluation Criteria

Criteria	2 - DTAx	3- AMD
Stakeholders acceptance (in pa	Low (4/23)	Good (13/23)
Ro ca (A		
M		
	(x=0.34)	*(equation is discontinuous)*
Physical meaning	Two relatively physical quantities, combined empirically: result is an index with no physical meaning	Physical meaning (available water remaining), up to the point where demand = availability

Which one do we recommend?

New method for water scarcity footprint: AWaRe (Available Water Remaining)



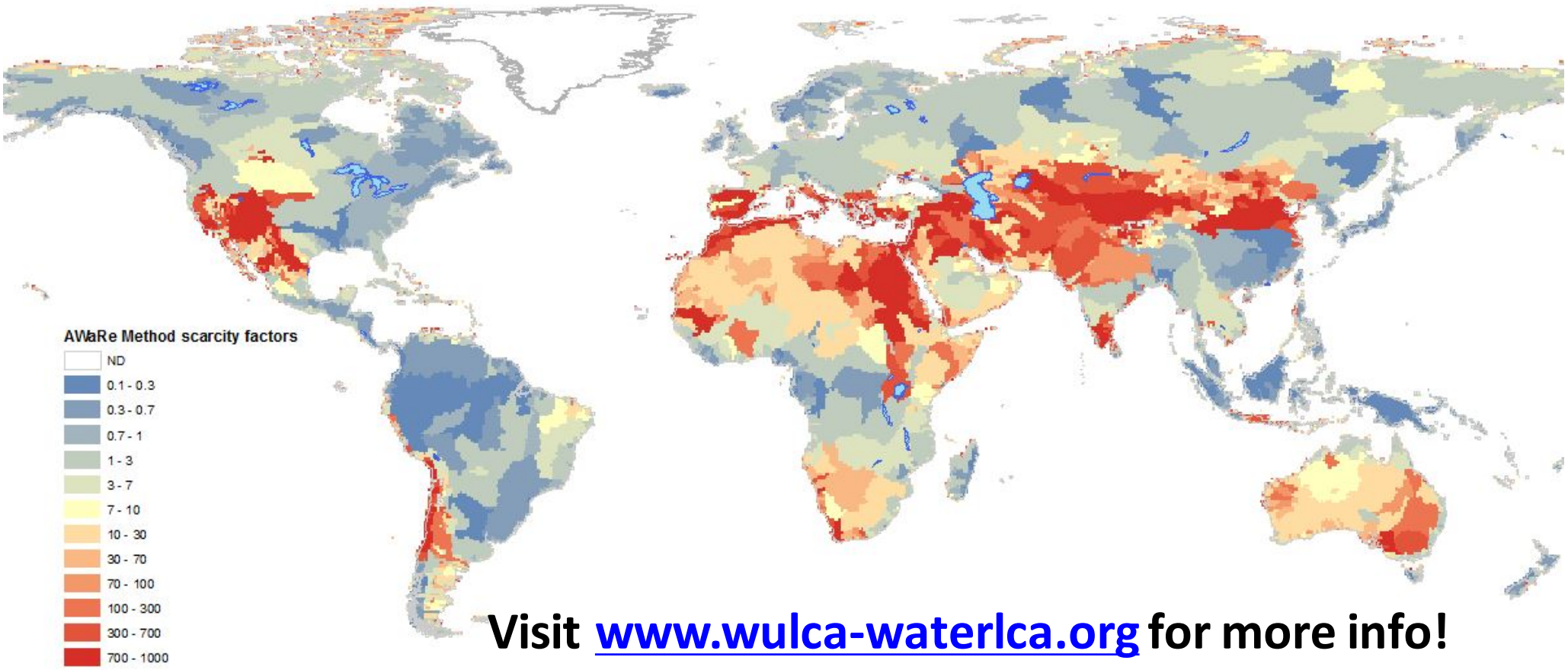
- **Unused water remaining = (Availability – Demand) (per area)**
- Demand includes human and aquatic ecosystems
- The value is normalized with the reference flow of the world weighted value
- Maximal value when Demand ≥ Availability

→ A value of 10 (denominator) means that there is 10 times more unused water available in this region than where the average m^3 of water is consumed in the world.

- **CF is the inverse of unused water remaining**

→ The more unused water available in an area, the lower the potential to deprive other users!

New indicator for water scarcity footprint AWaRe, from 0.1 to1000



Visit www.wulca-waterlca.org for more info!

Limits of both indicators

- Environmental water requirements implies a normative choice on the status of ecosystems to be maintained ("fair (i.e. average) condition with respect to pristine conditions", which is taken as a proxy for current state)
- Normative choices in the modeling of the indicator: cut-off values for min and max
- Aquatic ecosystems only (not terrestrial ecosystems)

Regional / temporal resolution

- Indicators calculated at the **sub-basins scale**, available also at the **country scale**
- Indicators calculated at the **monthly scale**, available also at the **annual scale**

→ Aggregation made to represent agricultural use or industrial/domestic uses (one value for each, as well as a default value, aggregating both)

Example	Agricultural use	Non agricultural use	Default
Douero, June	…	…	…
Douero, Annual	…	…	…
Spain, June	…	…	…
Spain, Annual	…	…	…

Conclusion

- Preliminary recommendation for consensus-based indicator on water use impact assessment in one midpoint
- ~ 70 persons involved at some point of the process
- Describes the potential to deprive users (humans and **ecosystems**) based on **available water remaining** after demand has been met
- Allows to calculate a “water scarcity footprint” as per ISO 14046

Next steps

→ Results already available online for testing!

→ Preliminary recommendation to be used and tested until next January (Pellston workshop: End of phase 1 of Flagship project)

→ Publication to be submitted soon!

→ Operationalisation and integration of recommendation in tools

Stay in touch: anne-marie.boulay@polymtl.ca

www.wulca-waterlca.org

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QUESTIONS?

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www.wulca-waterlca.org

Global Guidance on LCIA indicators
Chairs: Olivier Jolliet and Rolf Frischknecht

- Consensus on global warming indicator
- Consensus on other indicators

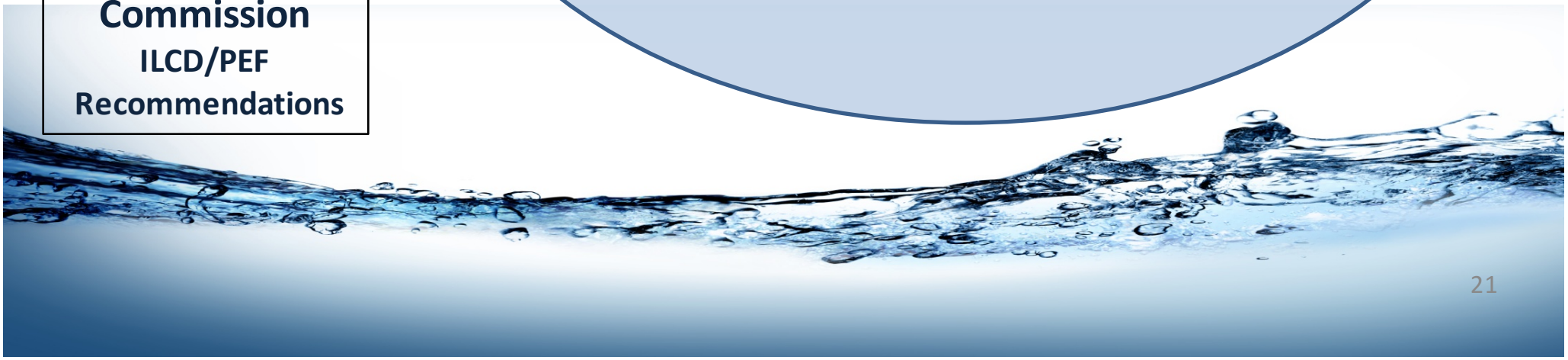
- Consensus on water use indicator

- Education and training
- Scientific support to other initiatives and events (e.g. ISO TR 14073)

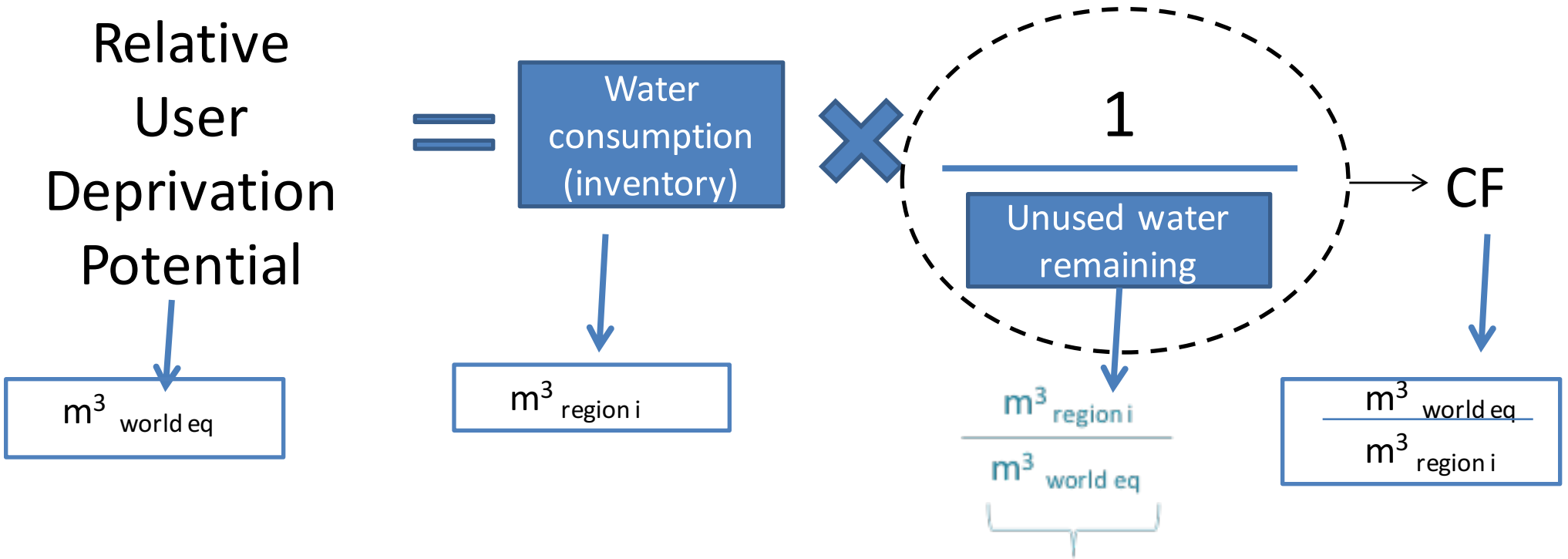
WULCA
Chair: Anne-Marie Boulay
Co-chair: Stephan Pfister

- Guidance to practitioners and researchers

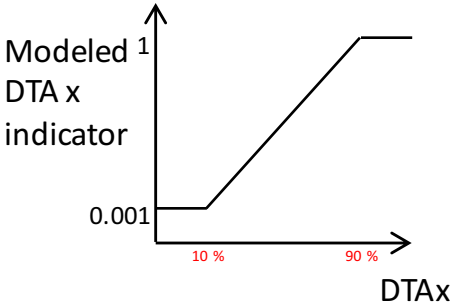
Collaboration with European Commission
ILCD/PEF Recommendations



New indicator for water scarcity footprint: Units



Both calculated for the same fixed area



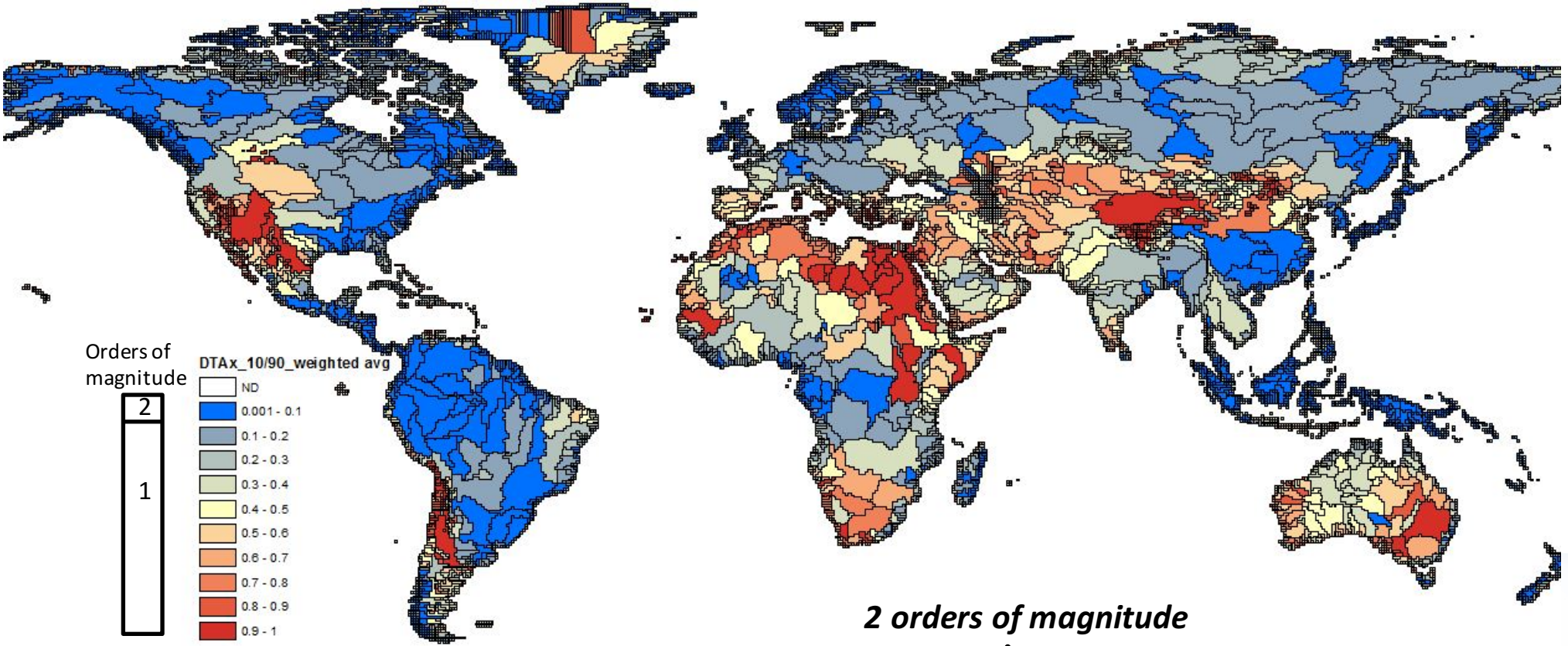
$$DTAx = \frac{Demand}{Availability} \times \left[\frac{Area}{Availability}\right]^{x}$$

2 DTAx(0.34)

Cutoff 10 and 90 % area

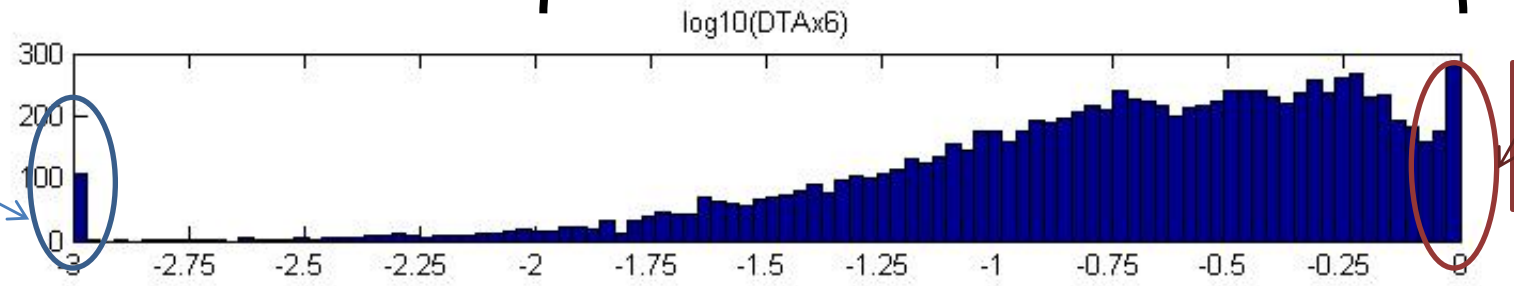
(choice to validate/justify/finalize)

Weighted average

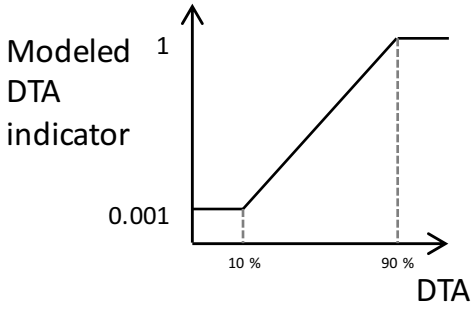


2 orders of magnitude

Min value of 0.001



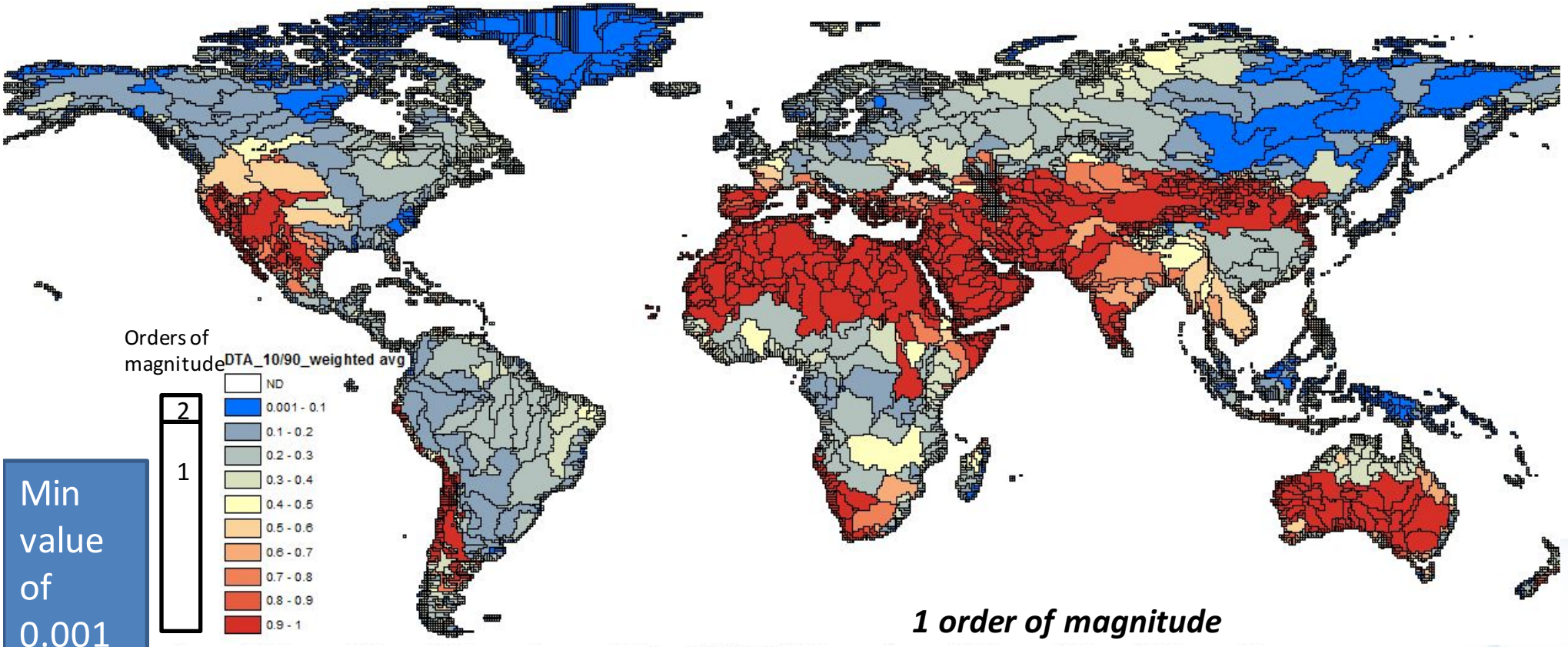
Max value of 1



1 DTA

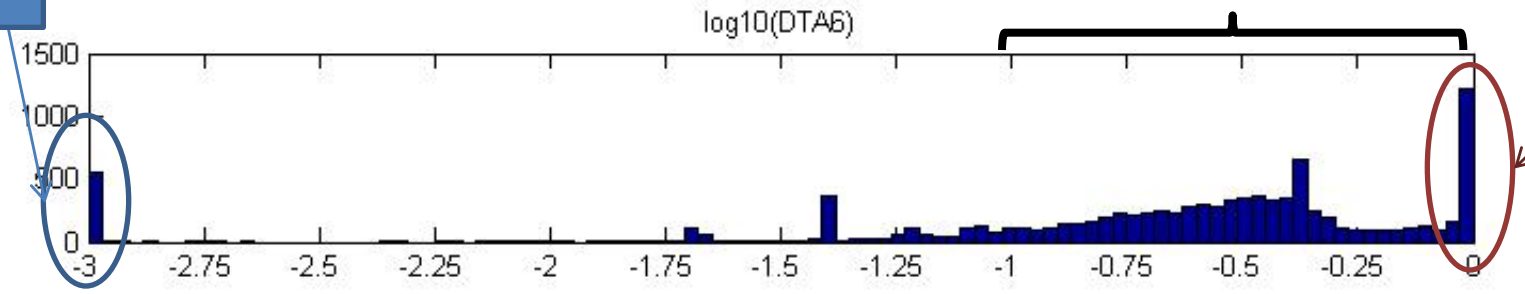
$$DTA = \frac{Demand}{Availability}$$

Cutoff 10 and 90 % area
Weighted average



Min value of 0.001

1 order of magnitude



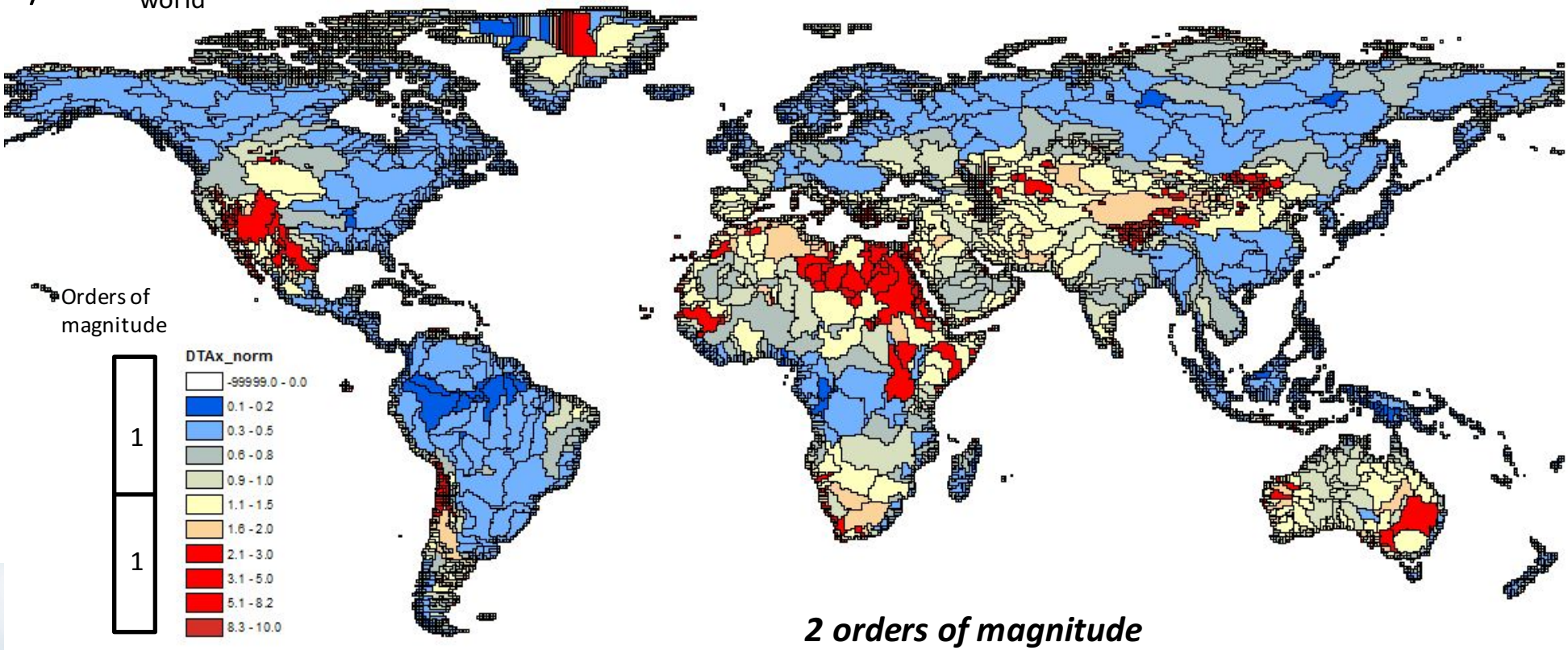
Max value of 1

2 DTAx(0.34) – normalized (world average)

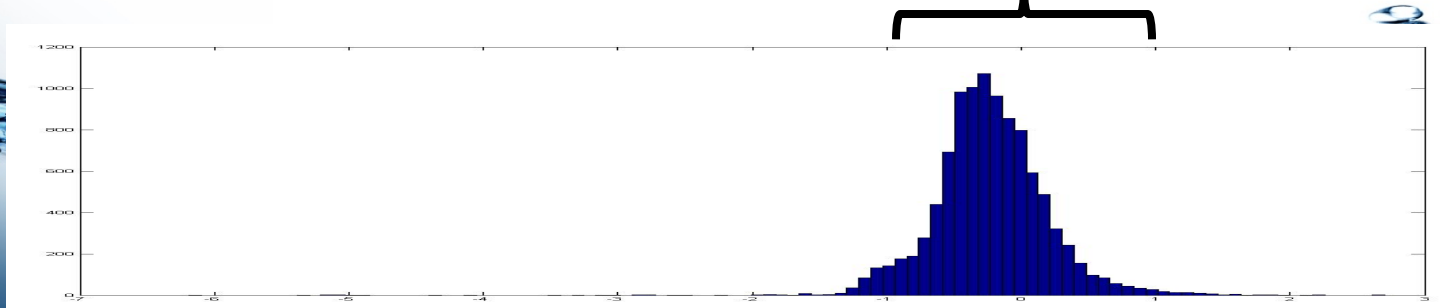
$$DTAx = \frac{Demand}{Availability} \times \left[\frac{Area}{Availability}\right]^{x}$$

Weighted average

DTAx indicator = DTAx /DTAx $_{world}$



2 orders of magnitude

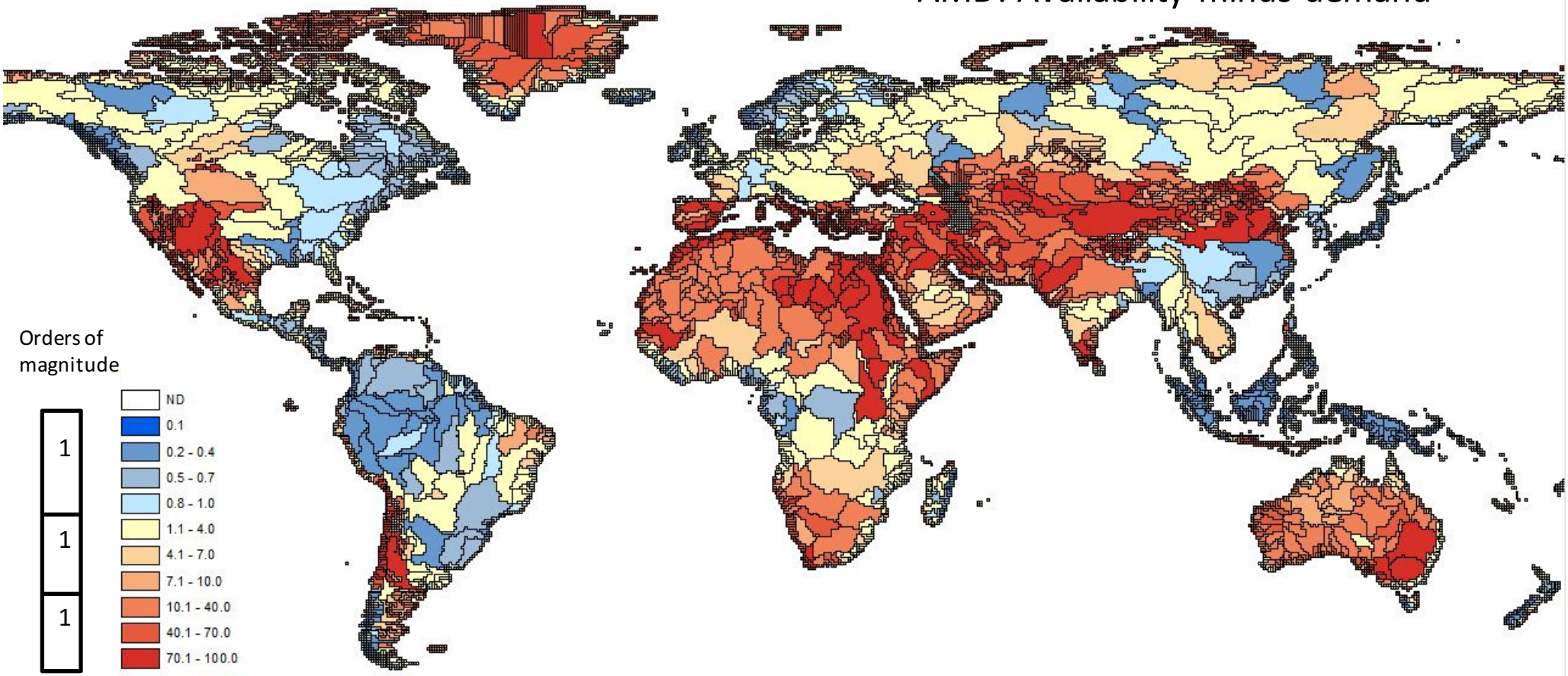


3 AMD – range 0.1 - 100

$$AMD = \frac{\text{Unused water (per area)}_{\text{world avg}}}{\text{Unused water (per area)}}$$

Unused water = Availability - Demand

AMD: Availability minus demand



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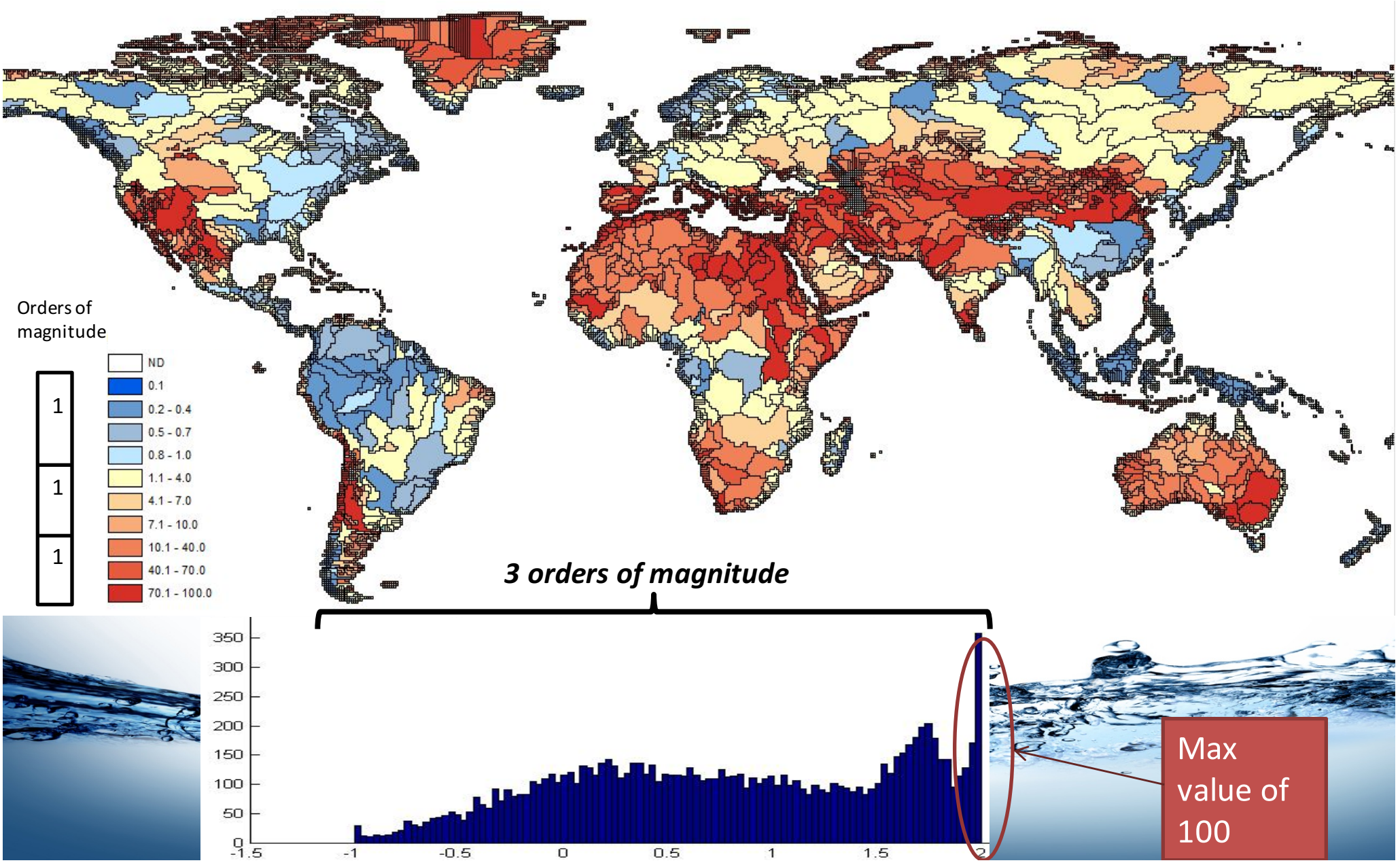

3 AMD – range 0.1 - 1000

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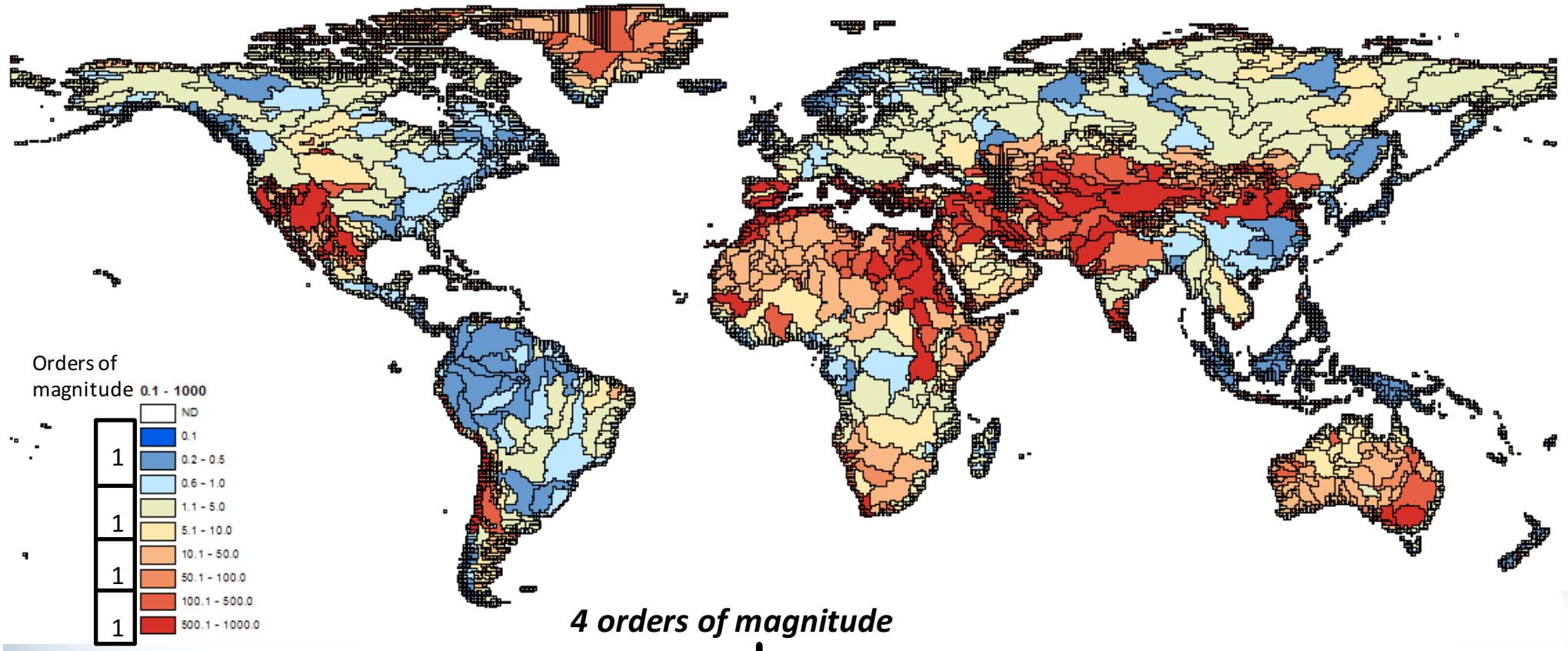
Unused water = Availability - Demand



4 orders of magnitude