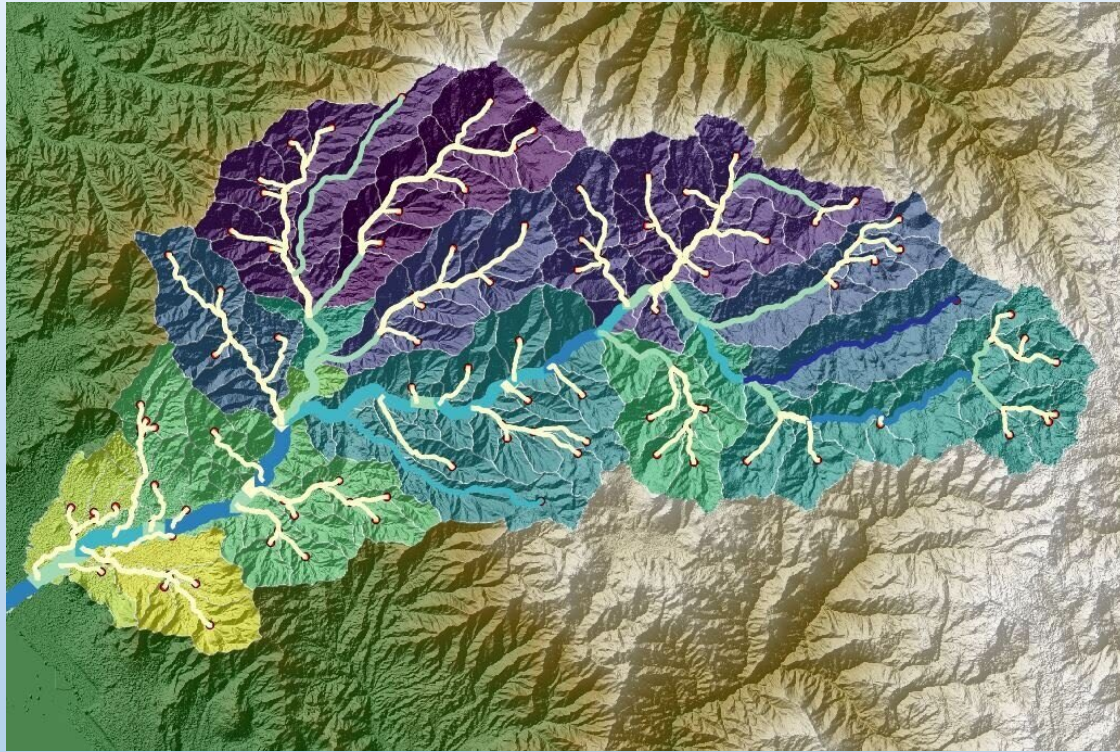


Soil, water, carbon and biocultural diversity – challenges for SWAT



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ENGEES
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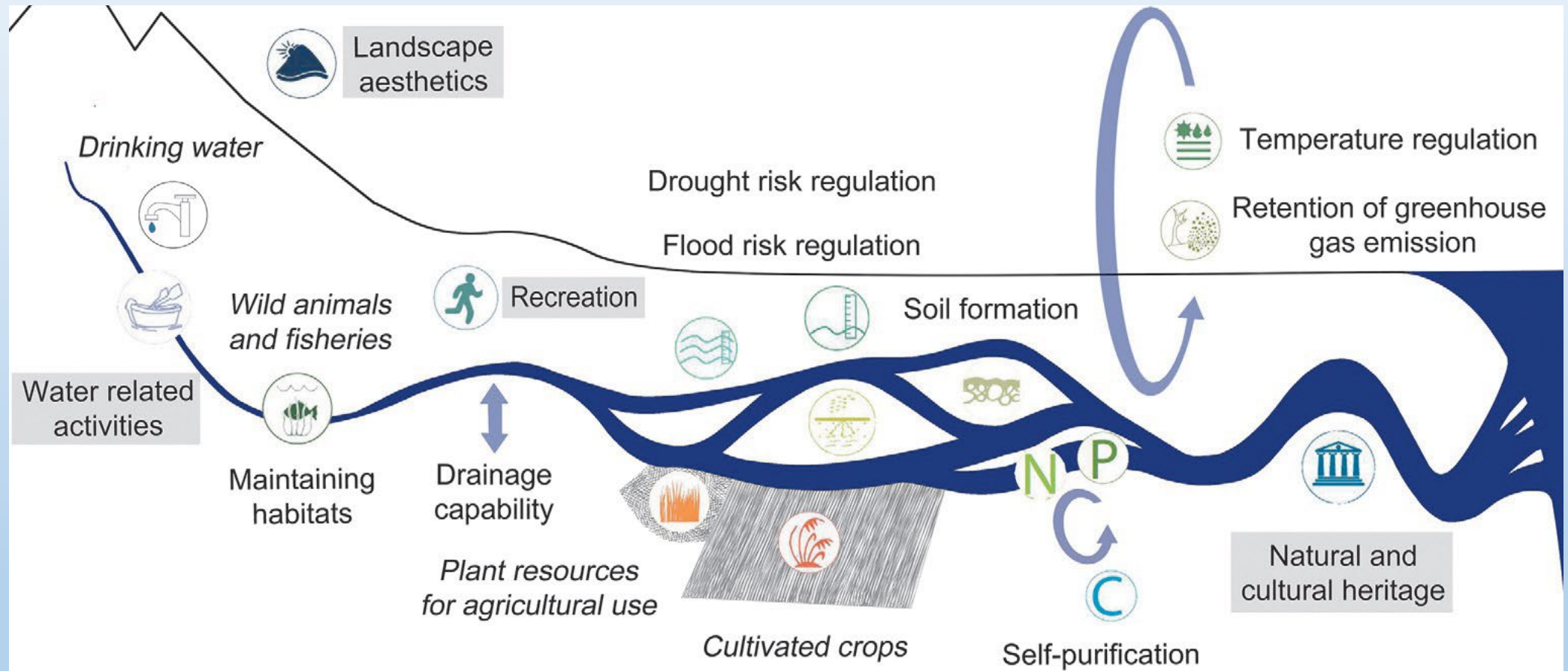
Strasbourg.eu
eurométropole

unesco
Chair Fleuves et Patrimoine
River Culture

 **KIT** eu cor
Karlsruher Institut für Technologie
The European Campus

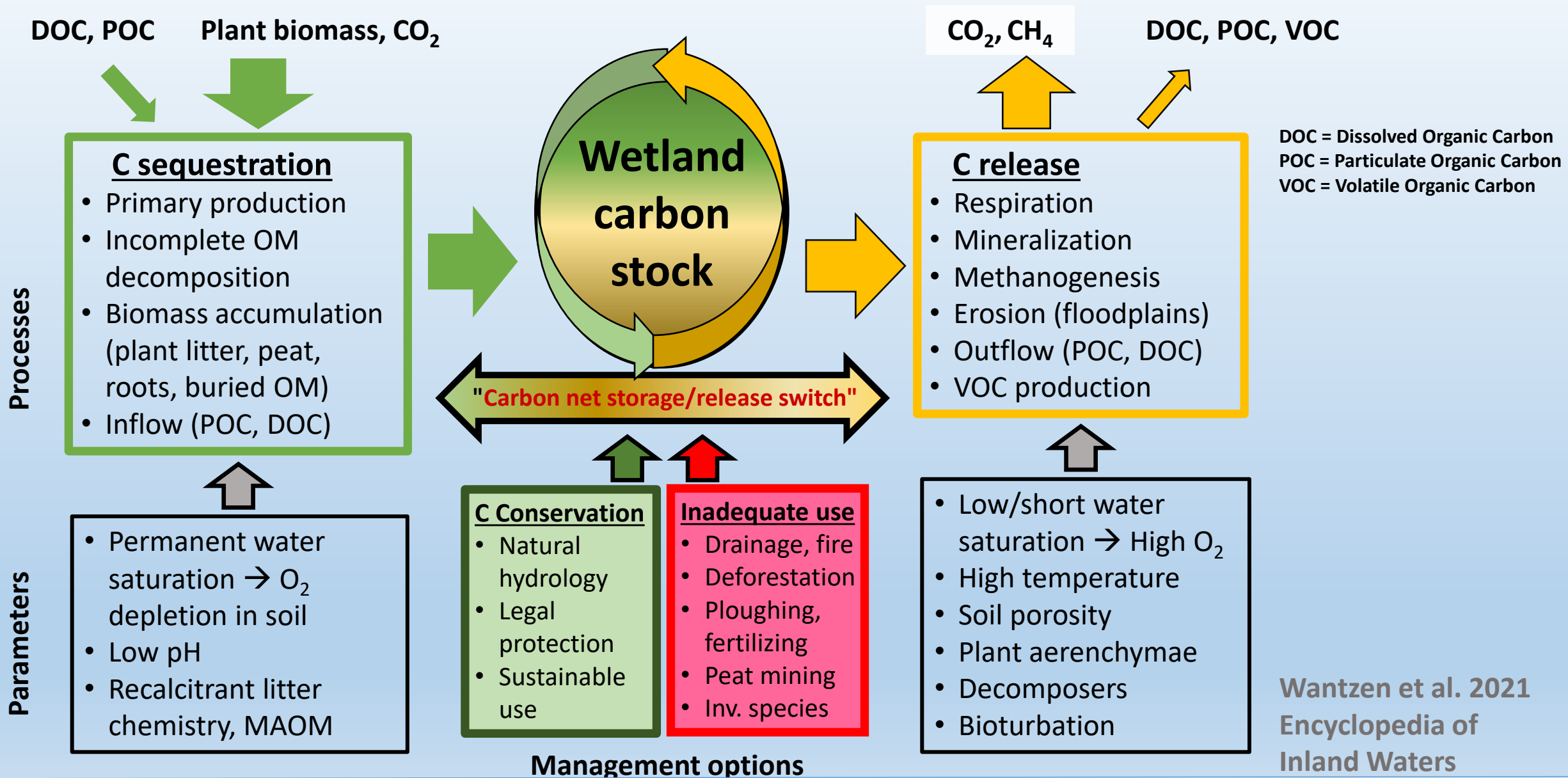
Ce projet est soutenu au titre du Fonds Recherche du Contrat Triennal 2021-2023 "Strasbourg Capitale européenne"

"Ecosystem services" from rivers and lakes: ... essential for survival of humans (and non-humans!)

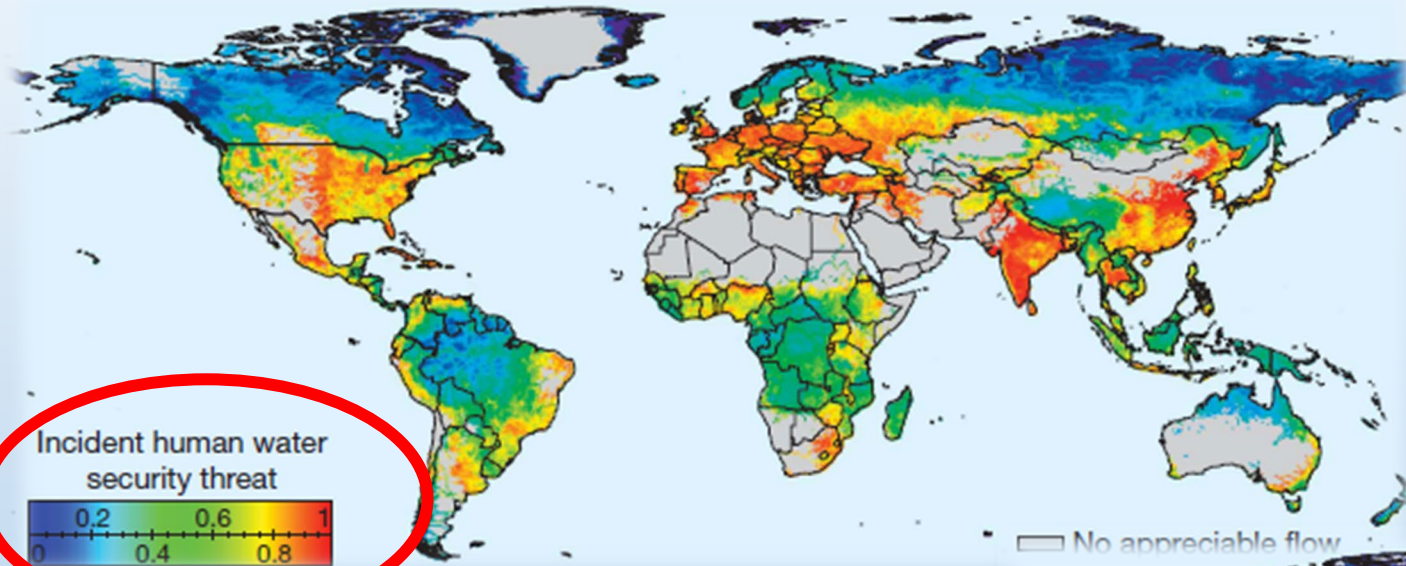


Jähnig, Sonja C.; Wantzen, Karl M.; et al.. (2022): *Ecosystem services of river systems - undervalued, irreplaceable, and at risk*. In Tockner, K. & Mehner, T. (eds). Encyclopedia of Inland Waters, 2nd ed.

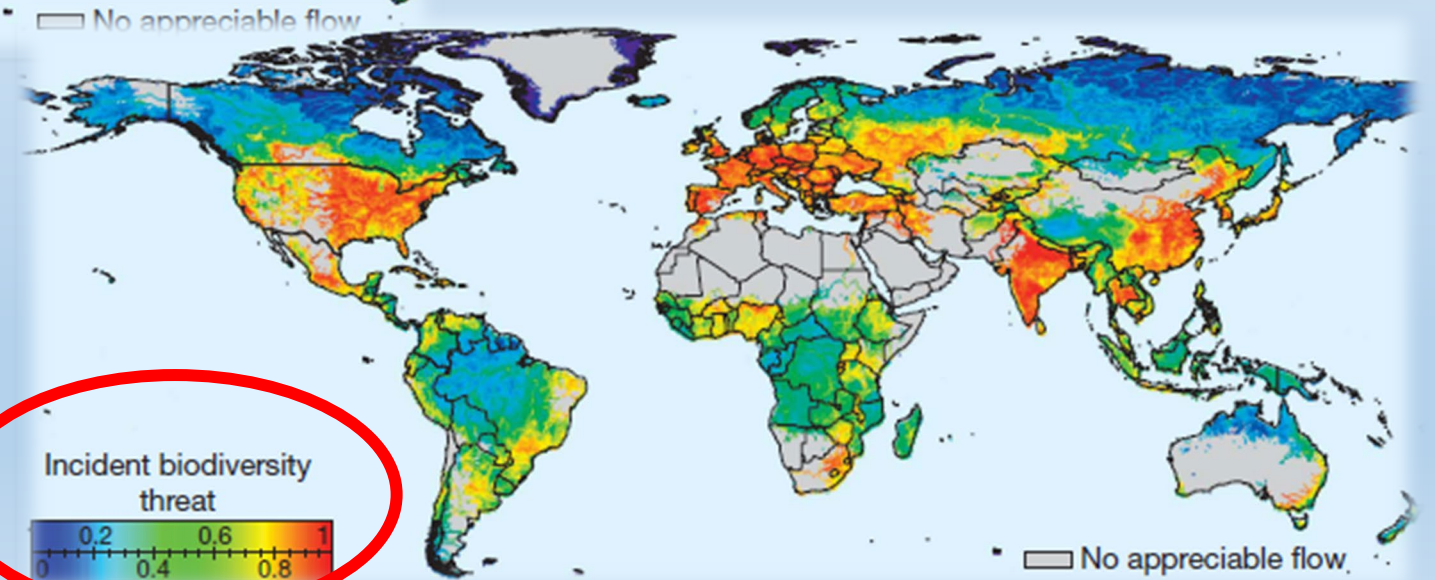
Carbon dynamics in wetlands: *what can we do* (and what *should we avoid*)?



Do you see any difference between these two maps??

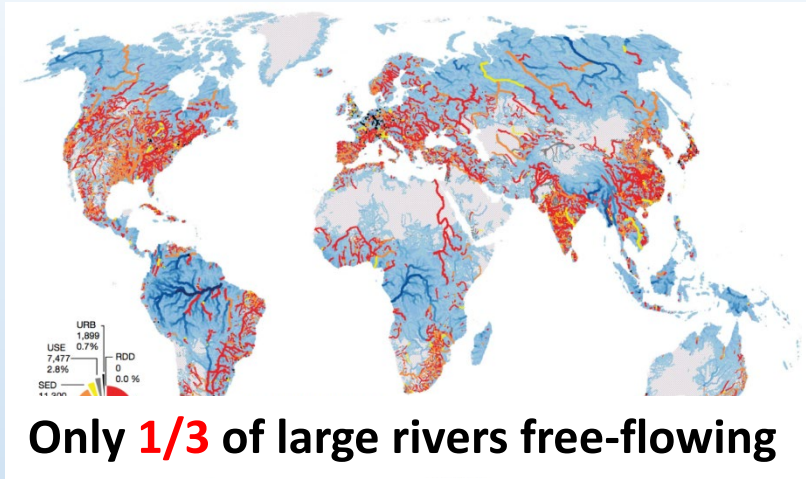


... quod erat demonstrandum

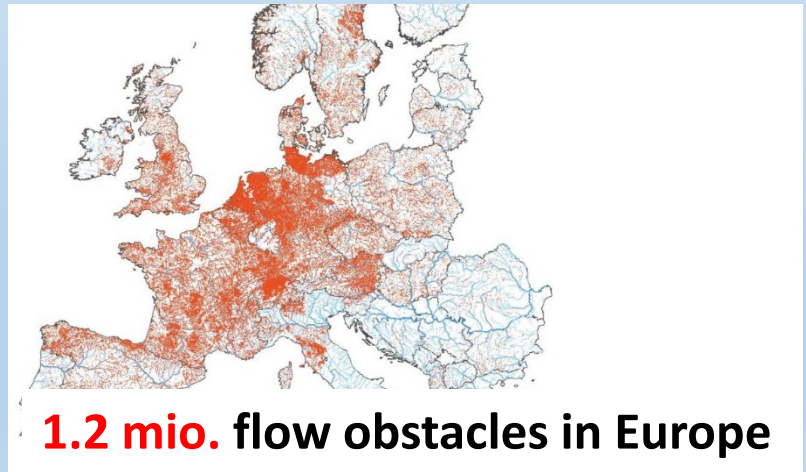


Vorösmarty et al. 2010, Nature

Massive decline in hydrosystem health: tipping points!



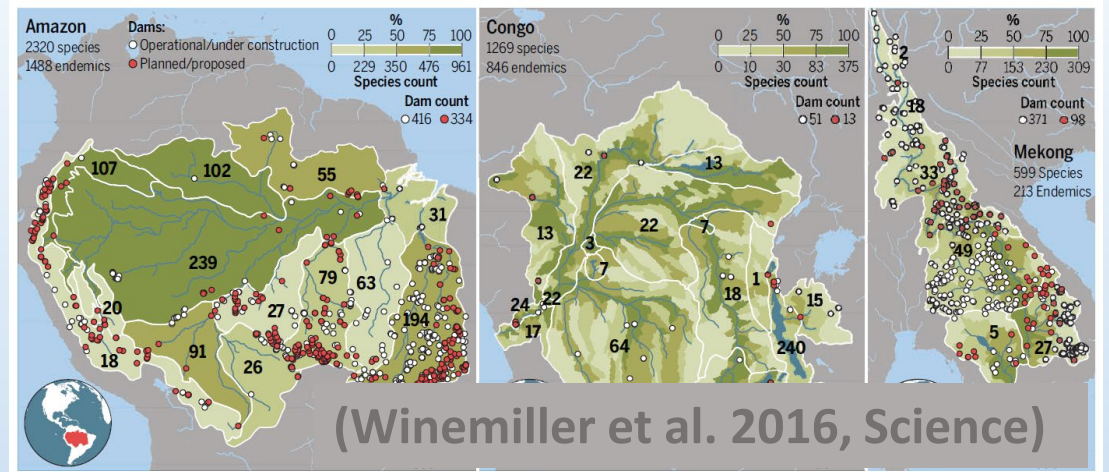
Only **1/3** of large rivers free-flowing
(Grill et al. 2019, Nature)



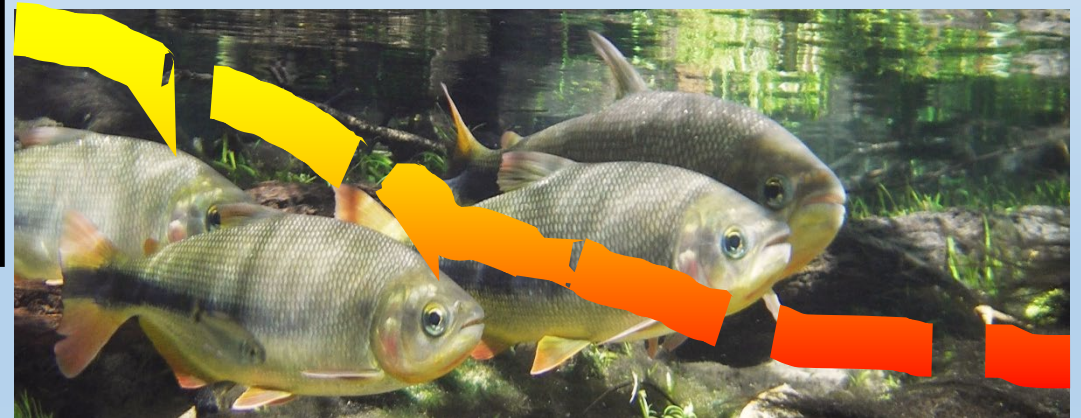
1.2 mio. flow obstacles in Europe
(Belletti, Wantzen et al. 2021, Nature)



Only **1%** of fertile Mekong sediments reach the sea
(Kondolf et al. 2014 WRR)



(Winemiller et al. 2016, Science)
1/3 of global fish biodiversity at risk in 3 rivers alone
97% loss palaeartic megafauna (He et al. 2019, GBC)



Global freshwater fauna: **84% loss** since 1970
(WWF Living Planet index 2022)

How to overcome *acedia**? What causes the *katharsis*?

Do we really, always, need a dramatic wake-up call? (This may be too late in some cases!)



The SANDOZ accident (Basel) 1.
November 1986: fire → pesticide
spill → fish kills → public awareness
→ Finally, international policies!!!



Photos:
<https://www.welt.de/img/wirtschaft/mobile101175858/6432502107-ci1021-w1024/Sandoz-DW-Wirtschaft-Basel-jpg.jpg>

**a state of listlessness or torpor, of not caring or not being concerned with one's position or condition in the world*

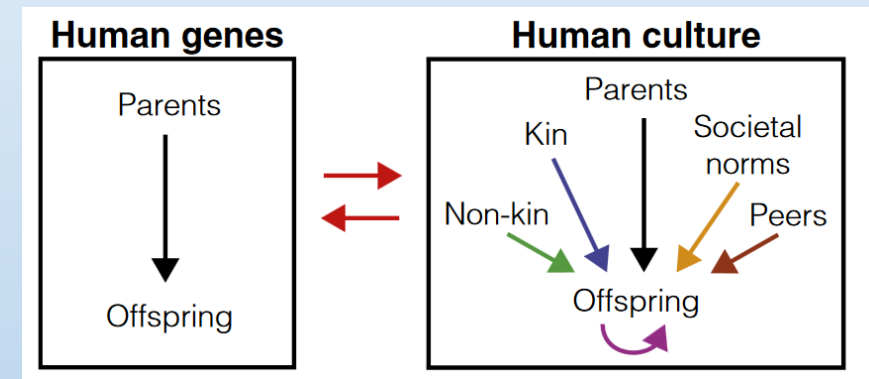
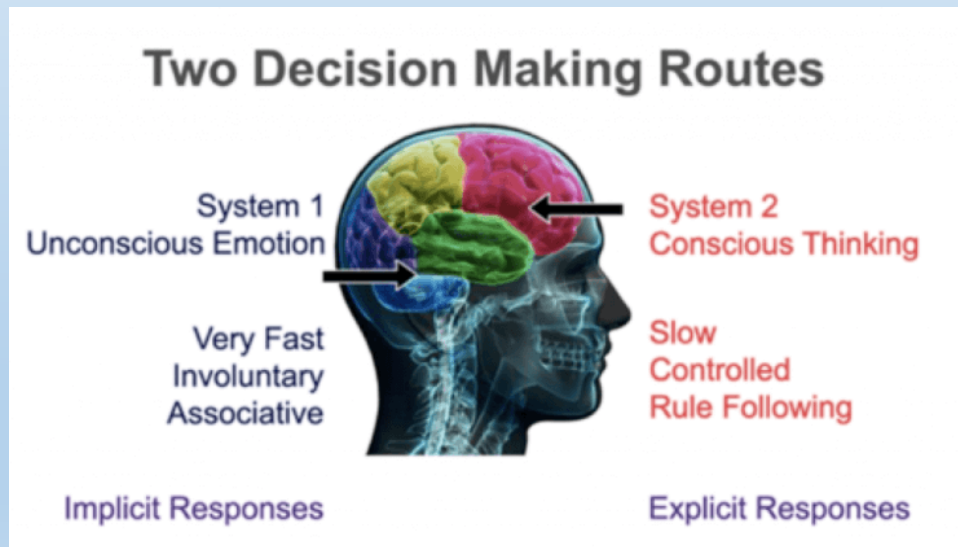


Photo: Donald Iain Smith / Blend Images / Tetra Images / Getty Images

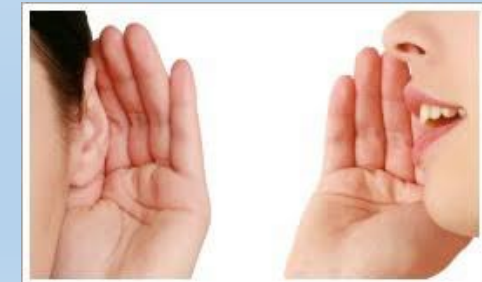
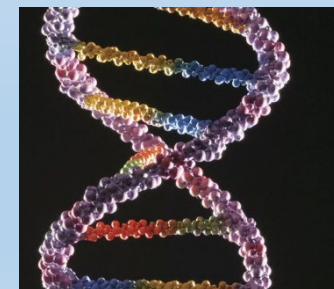
Wantzen K.M., Uehlinger U., Van der Velde, G., Leuven R. S.E.W., Schmitt, L., Beisel, J.N. (2021): *The Rhine River Basin*. PP 331-389 in: Tockner K., Zarfl, C. and Robinson C.T. (eds.) *Rivers of Europe* 2nd ed. Academic Press, London
<https://doi.org/10.1016/B978-0-08-102612-0.00006-7>

Human perception and communication :

- highly individualized
- result of sensory perception (mostly optical)... (↑ J. von Uexküll)
- ... filtered by previous experiences
- ... influenced by peers and kin
- much faster than gene flow!



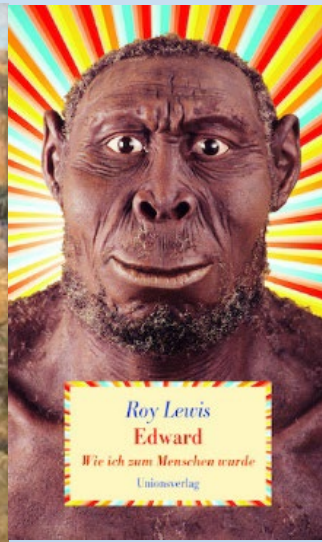
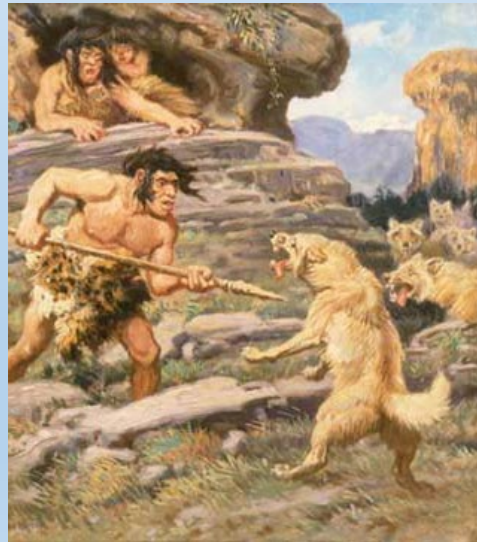
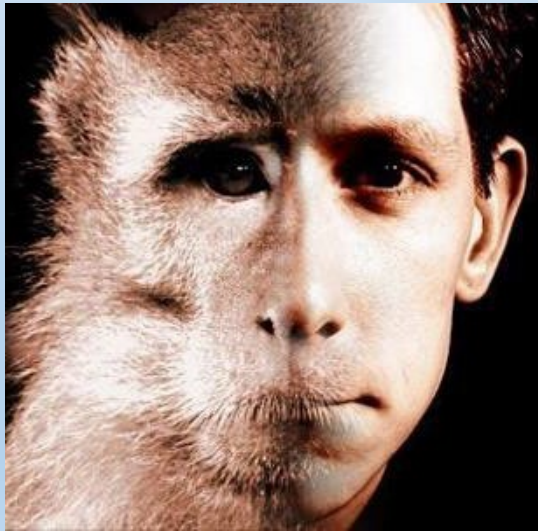
Creanza et al. PNAS 2017



Dreadful legacies from evolution:

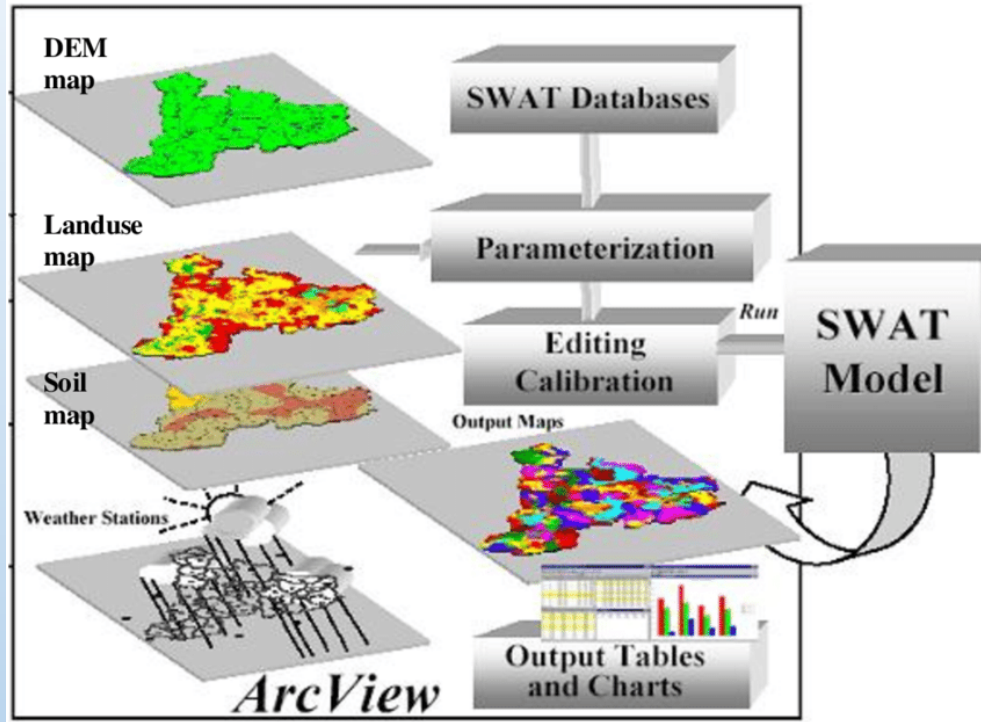
- (1) *we are pleistocenic survival machines.* Our mental hardware is millions of years old, only reacting to immediate threats (ex.: smokers)
- (2) There is *no evolutive feed-back mechanism from the future to the present*, but we are permanently modifying our future (and still want to become stronger, richer,...)!

→ **Sustainability transformation requires a profound change in our mindset, humanity-wide: include the future into current decisions!**



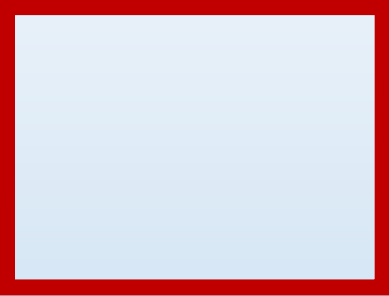
charleroi.blogs.sudinfo.be, <http://psychoutblog.com>

How can remote sensing and modeling (SWAT) help?



- simplify complexity without losing precision (using layers)
- neutral (only hard-core reality deniers would/will contest)
- excellent visualization, non-verbal communication
- global compatibility

Southern Urban Hydrosystem Syndrome: the perfect storm



Wantzen et al. Sustainability, 2019

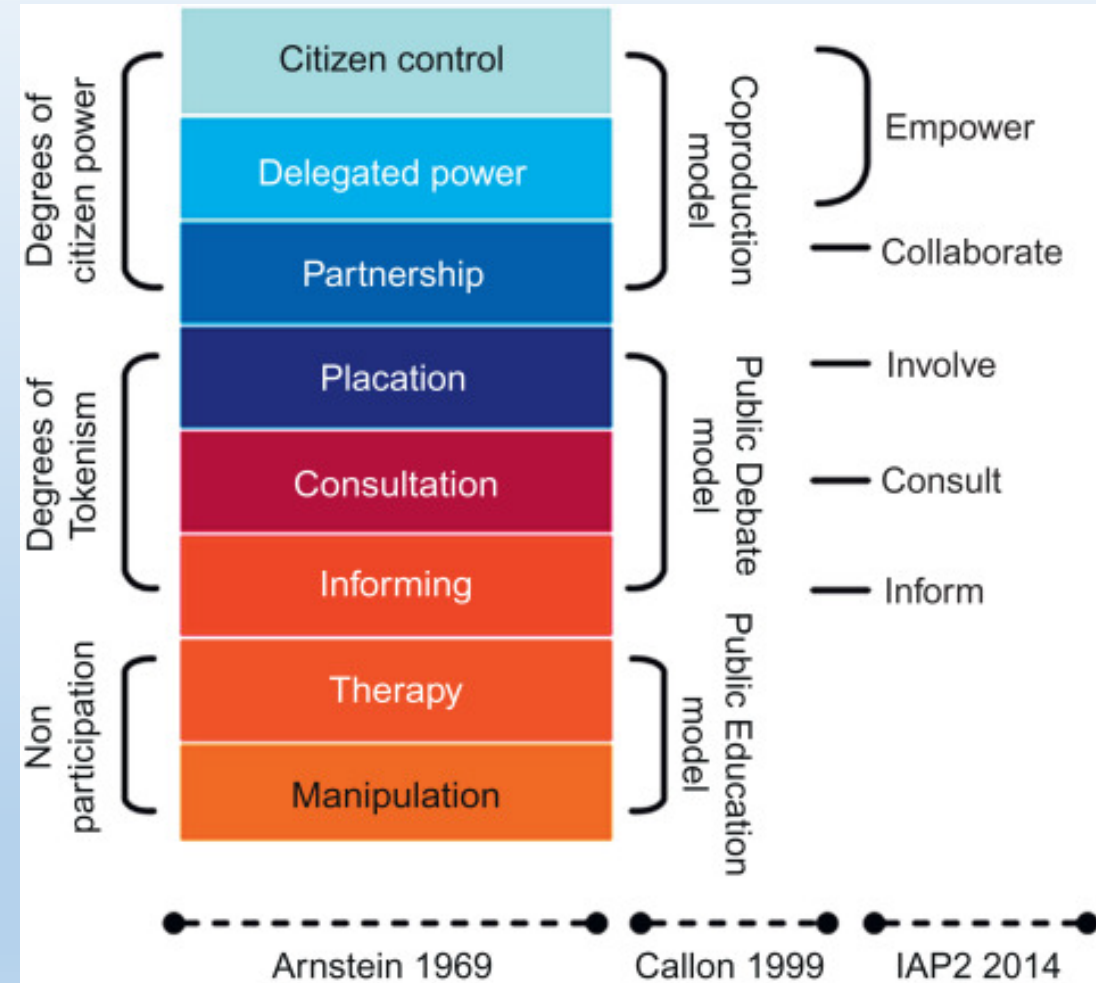
 sustainability 

Review

Urban Stream and Wetland Restoration in the Global South—A DPSIR Analysis

Wantzen M. Karl ^{1,*}, Alves Carlos Bernardo Mascarenhas ², Badiane Sidia Diaouma ³, Bala Raita ⁴, Blettler Martin ⁵, Callisto Marcos ⁶, Cao Yixin ^{1,7}, Kolb Melanie ⁸, Kondolf G. Mathias ⁹, Leite Marina Fernandes ¹⁰, Macedo Diego Rodrigues ¹¹, Mahdi Obaidulla ⁴, Neves Moana², Peralta M. Elfritzson ¹², Rotgé Vincent ¹, Rueda-Delgado Guillermo ¹³, Scharager Andres ¹⁴, Serra-Llobet Anna ⁹, Yengué Jean-Louis ¹⁵ and Zingraff-Hamed Aude ^{1,16}

How do people take action to revert/mitigate the situation?



Bottom-up: India

Community Based Conservation Initiatives

(Vazhayil & Wantzen, in press)



Society-meets government

Rhine/Loire (Wantzen et al. 2021, in press)

Isar (Zingraff-Hamed et al. 2017, in press)

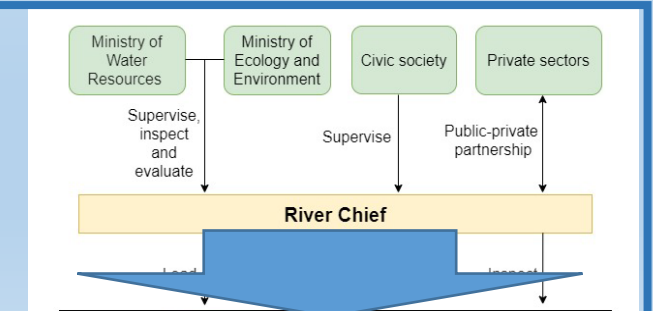
Manuelzão, Brazil (Wantzen et al. 2019)



Top-Down: China

River/Lake Chief System

(Cao & Wantzen, in press)

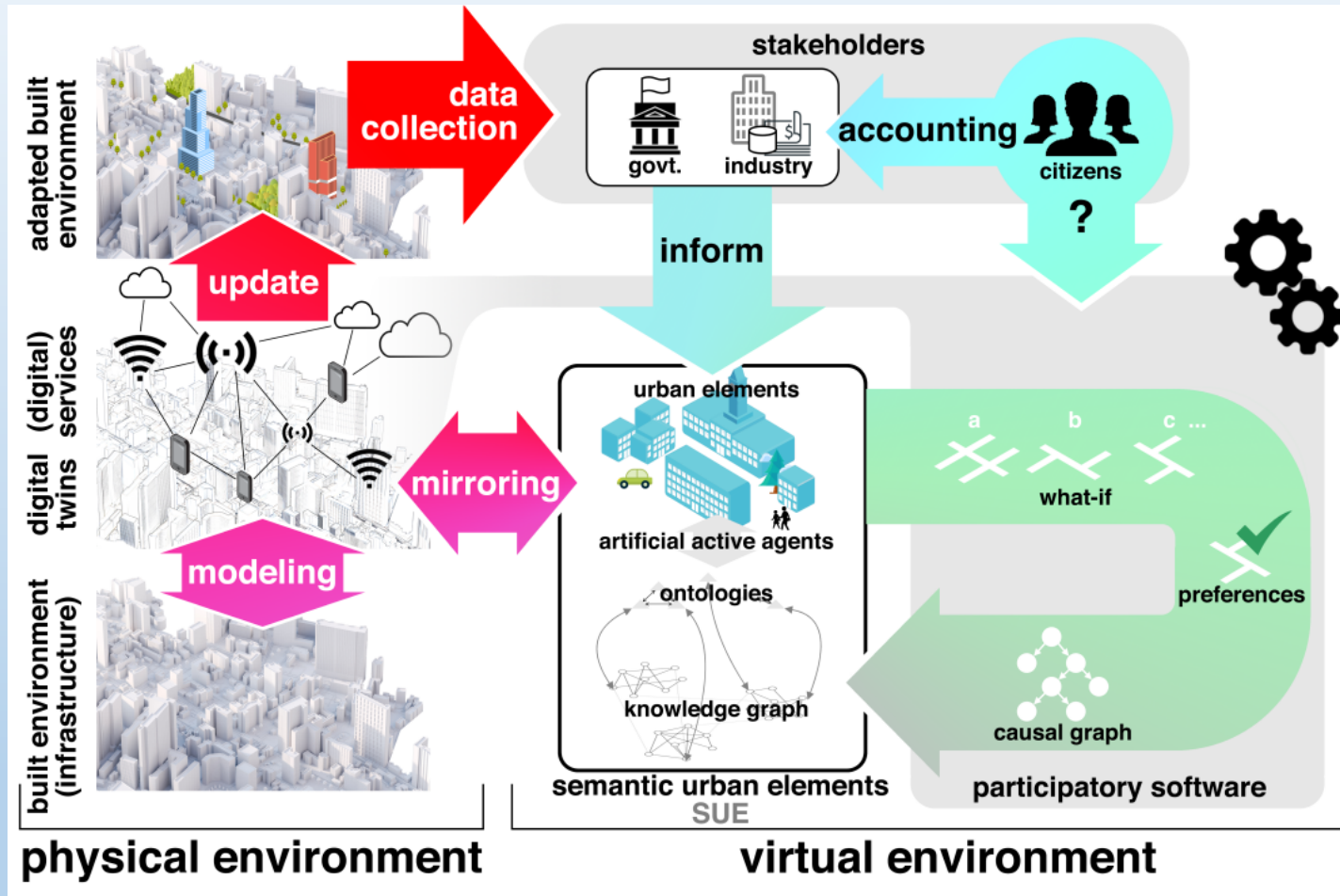


Global similarities in patterns, processes, threats ... and initiatives!



map: [https://en.wikipedia.org/wiki/File:World_location_map_\(equirectangular_180\).svg#file](https://en.wikipedia.org/wiki/File:World_location_map_(equirectangular_180).svg#file)

Enhanced digital representation: an interactive process

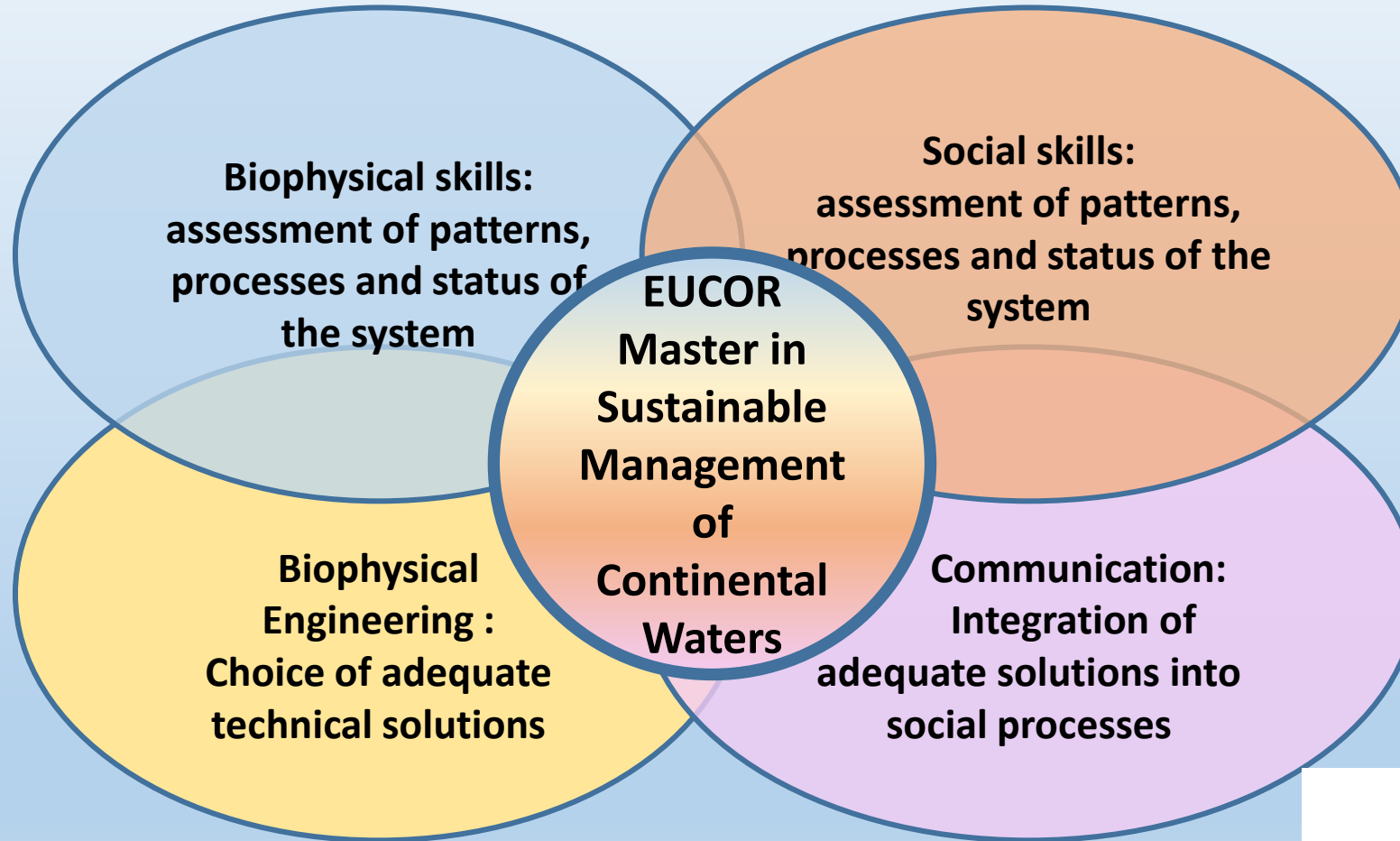


Adrienne Grêt-Regamey

<https://futurecitieslab.world/module/EPP>

"How to tackle complex water problems?"

→ *EUCOR Master in Continental Water Sustainability' (2026)*



Thank you for your attention...flash your free book...

kmwantzen@unistra.fr

