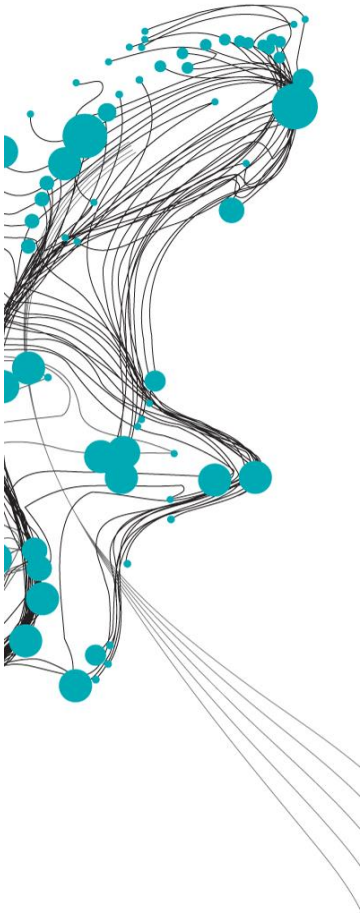
Developing caps for the world's basins



Global hydrological models (GHM) give the possibility to compute the natural blue water runoff (BWR) on a 0.5ºx0.5º resolution on global scale. Here, we use H08, PCR-GLOBWB and WATERGAP in combination with the DDM30 flow direction model to compute the natural blue water runoff for each basin in the world. By subtracting the environmental flow requirements (EFR) by using three different EFR methods (Smakthin, Richter and Pastor's VMF) the blue water availability (BWA) is found. This is done for a monthly resolution for the period of 1970-2005. An example for the Rhine basin is given in figure 1.

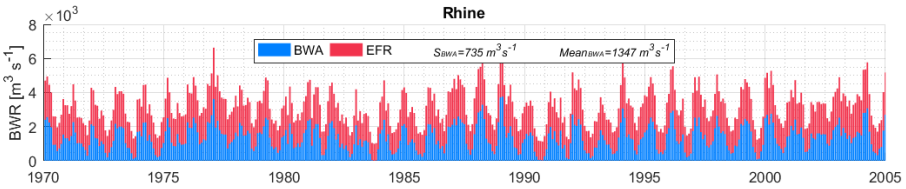


Figure 1: BWR/BWA/EFR of Rhine basin for monthly spatial resolution for Rhine basin for 1970-2005

The spatial, temporal and model variability are analysed and the annual planetary boundaries are explored. With the data set three caps are developed by setting three different thresholds on the water footprint of a basin (monthly averaged, Q25, and the minimum blue water availability). The higher the threshold of the cap, the higher and the more severe the EFR violations are as shown in figure 2 when Rhine basin is analysed. But when a safe threshold is chosen, like the minimum level of BWA as cap, the unutilized potential of total annual blue water increases to a share between 70-90% of the annual BWR. Especially basins with a high inter-annual variability gives severe and long during EFR violations, when the threshold is set as average BWA. And high unused potential when set as Q25 or minimum BWA.

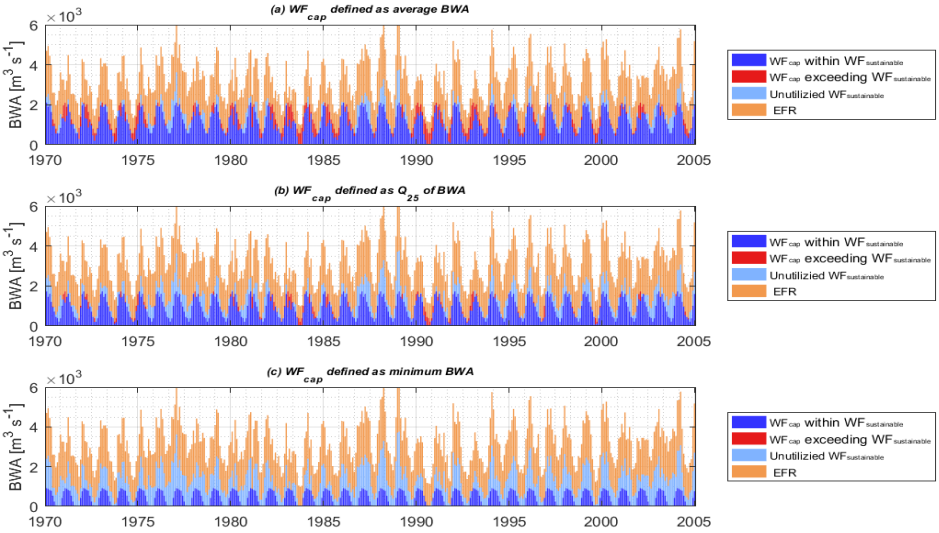


Figure 2:

For now the contemporary BWA data set show a high model variability, because different GHM and EFR methods. Local measurements and ecological data must be added before a cap could be implemented in practice, because the highest estimation of BWA differs a factor 5-10 from the lowest estimation. When this data is added, a cap could lead to local water solutions, when there is overexploitation of blue water. The cap could be transformed into guidelines for policymakers and river managers to reduce their water footprint to the basins capacity. And thus could be a part of the solution to oppose water scarcity and degradation of human and ecological environments.

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