

<b>Title of the project:</b> Blue water footprint caps for Iran's aquifers and river basins	
<b>Assignment no.:</b> 29.18	<b>Internal/external:</b> External (Iran)
<b>Head graduation committee:</b> Prof.dr.ir. Arjen Y. Hoekstra	<b>Daily advisor:</b> Rick Hogeboom
<b>Name(s) of participating institute:</b> Dr Fatemeh Karandish, Zabol University, Iran	<b>Start of the project:</b> Flexible
<p><b>Short description and objective of the project:</b> In many regions of Iran, blue water footprints exceed sustainable levels, either part of the year or year-round. This leads to a decline in groundwater tables, shrinking lakes (notably Lake Urmia) and rivers drying up. A sustainable groundwater footprint can be defined per aquifer on annual basis as the natural groundwater replenishment rate minus the groundwater flow that needs to be maintained (given that rivers that depend on a stable groundwater outflow). A sustainable overall blue water footprint can be defined per catchment on monthly basis as the total runoff minus an environmental flow requirement (EFR). The formulation of groundwater footprint caps per aquifer and overall blue water footprint caps per catchment depends on estimates of groundwater recharge or runoff and on estimates of minimum groundwater flow / minimum EFRs. Different methods/models exist to estimate natural groundwater recharge and runoff; and also different methods exist to estimate minimum stable groundwater runoff and EFRs.</p> <p><b>Objective</b> The objective of this research is to estimate annual groundwater footprint caps for Iran's aquifers and monthly overall blue water footprint caps for Iran's river basins based on one or a few alternative hydrological models and three different EFR estimation methods, and estimate the extent to which current groundwater footprints and overall blue water footprints exceed these caps.</p> <p><b>Method</b></p> <ul style="list-style-type: none"> <li>• Monthly simulated natural groundwater recharge and natural runoff will be retrieved for a historical multi-year period, e.g. 1980-2015, based on either datasets or model simulations.</li> <li>• Minimum stable runoff from groundwater and environmental flow requirements will be estimated based on three different methods, including e.g. the method of Pastor et al (2014).</li> <li>• Groundwater availability and overall blue water availability estimates will be made for all aquifers / river basins in Iran. Ensemble-average water availability plus spread around mean (measure for model uncertainty) will be calculated.</li> <li>• Blue water footprint estimates will be taken from available studies.</li> <li>• It will be analysed to which extent current blue WFs exceed the WF caps.</li> </ul> <p><b>References</b></p> <p>Hoekstra, A.Y. and Mekonnen, M.M. (2012) The water footprint of humanity, Proceedings of the National Academy of Sciences, 109(9): 3232–3237. Karandish, F. and Hoekstra, A.Y. (2017) Informing national food and water security policy through</p>	

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