



## **Climate change, livelihoods and the multiple determinants of water adequacy: two approaches at regional to global scale**

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Inadequate access to water is already a problem in many regions of the world and processes of global change are expected to further exacerbate the situation. Many aspects determine the adequacy of water resources: beside actual physical water stress, where the resource itself is limited, economic and social water stress can be experienced if access to resource is limited by inadequate infrastructure, political or financial constraints. To assess the adequacy of water availability for human use, integrated approaches are needed that allow to view the multiple determinants in conjunction and provide sound results as a basis for informed decisions. This contribution proposes two parts of an integrated approach to look at the multiple dimensions of water scarcity at regional to global scale. These were developed in a joint project with the German Development Agency (GIZ).

It first outlines the AHEAD approach to measure Adequate Human livelihood conditions for wEll-being And Development, implemented at global scale and at national resolution. This first approach allows viewing impacts of climate change, e.g. changes in water availability, within the wider context of AHEAD conditions. A specific focus lies on the uncertainties in projections of climate change and future water availability. As adequate water access is not determined by water availability alone, in a second step we develop an approach to assess the water requirements for different sectors in more detail, including aspects of quantity, quality as well as access, in an integrated way. This more detailed approach is exemplified at region-scale in Indonesia and South Africa.

Our results show that in many regions of the world, water scarcity is a limitation to AHEAD conditions in many countries, regardless of differing modelling output. The more detailed assessments highlight the relevance of additional aspects to assess the adequacy of water for human use, showing that in many regions, quality and infrastructure are the main limitations to water security.