



## **Principles for an interactive multi-scale assessment of sustainable production limits - lessons from the Limpopo river basin case, South Africa**

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About 7.2 billion people currently live on the Earth and the population is projected to reach 9.6 billion by 2050, that growth will be mainly in developing countries, with more than half in Africa (United Nations 2013).

Any local extension of irrigated agriculture in a region of scarce natural resources may potentially restrict the possibility to extend land and water use at another location of the same river basin. In order to support, develop and to assess such future interventions, it is important to define limits until which a sustainable production can take place at a given location, taking into account competing claims on natural resources, human welfare and impacts on environmental quality.

We define Sustainable production limits as limits for the possible resource use, within which a production can be extended without restricting the growth opportunities at a neighboured location.

The more threatened the natural resources become, the more important it is to consider the effect of other upcoming interventions within the same region. As a consequence, interventions for future resource use have to be assessed against the future available natural resources. This is of particular relevance for evaluating possible extensions of irrigation areas within a river basin.

Investigating possible limits for extending irrigated agriculture at local scale requires an understanding of the complexity, including boundaries, activities, stakeholders, and opportunities at river basin scale, and more. Switching between the scales in this information, in a participatory process, appears to be a challenge in its own.

Within the Limpopo River basin (South Africa), we analysed (i) possible interventions at local scale (trans-disciplinary innovation of irrigation by smallholders, launching of PPPs), (ii) restrictions for developing irrigation at the Letaba sub basin scale, and (iii) water balance at the scale of the Limpopo basin.

Experiences from the Limpopo case revealed, that within the field of socio-hydrology interventions affecting land and water use, depend for a large part on entrepreneurial or at least human initiatives and an enabling environment. Such variables cannot be included in quantitative deterministic models. Therefore we have to find other ways to anticipate future developments. Furthermore for the upscaling – downscaling of local interventions it is important to reduce complexity. Instead of providing a plethora of scenarios, which will only hinder decision making, the process of defining sustainable production limits have to cumulate in a jointly shared strategy for the most likely future use of land, water and biodiversity resources.

More experience must be gained how to facilitate such an interactive development of a jointly shared strategy best. Modern interactive IT tools can play a major role, but require a strong interaction with hydrological models and water balance calculation at the various scales.

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