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Intergenerational justice and trade-off analysis in water resources management of the Nile

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Water management involves optimizing the allocation of 'enough' water, a limited resource, to meet demands from competing actors and/or sectors such as agriculture, energy, ecosystems, and water supply. Although such demands are often associated only with current or existing generations, it's understandable that future generations will have their own demands for these resources. There is, therefore, a moral dilemma and a question of justice regarding how much current generations must account for and be concerned with the generations to come with respect to managing resources in general and water resources in particular. Questions of intergenerational justice, i.e., the extent to which we should be concerned about future generations, are becoming increasingly common particularly due to a changing climate and growing population both of which require longer term planning and resources optimization. However, only limited suggestions are available in the literature for the practical implementation of intergenerational justice theories in the water resources literature to address such questions.

Operationalization of justice principles in general, and intergenerational justice principles in particular is hard because different conceptualizations may exist concerning the same moral value. As a result, it's often difficult to arrive at common understanding, schemes, and/or commitment levels for water resources management, particularly during negotiations in transboundary rivers involving multiple states, socio-political landscapes, and different possible ethical underpinnings.

In this study, we present a novel scheme for operationalizing intergenerational justice which involves analysis and visualization of a range of commitment levels for future generations and trade-off analysis to existing generations. We implemented ranges of discount on current and potential utilization of water resources for various services. These discounts are then applied on water related services, which include water needs for hydropower generation, food production, and for various other human and ecological needs in water basins. By doing so, we present a mechanism for stakeholders in water resources management where they can assign different weights, depending on possibly different ethical underpinnings, to conserving water resources for future generation and evaluate the potential trade-off of such alternatives. We think that this is particularly important to tame negotiations in transboundary water resources management where multiple states, socio-political landscapes, and different ethical underpinnings often lead to escalated disputes. Here, we present our operationalization scheme for the Nile in light of existing

disputes in this transboundary water basin. Although our scheme may not escape the challenge of, and hence did not attempt to, quantitative standardized values across the various stakeholders involved, it provides the opportunity for all stakeholders to put their own value for future generations in water resources management and weigh the implications of their considerations in terms of intergenerational trade-offs. We think this study adds value to the current literature on ethically-informed optimization in water resources management.