



Proactive Drought and Extreme Event Preparedness: Seasonal Climate Forecasts offer Benefit for Decision Making in Water Management in Semi-arid Regions

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Semi-arid regions are the regions mostly affected by drought. In these climatically sensitive regions, the frequency and intensity of drought and hot extremes is projected to increase. With increasing precipitation variability in semi-arid regions, sustainable water management is required. Proactive drought and extreme event preparedness, as well as damage mitigation could be provided by the use of seasonal climate forecasts. However, their probabilistic nature, the lack of clear action derivations and institutional conservatism impedes their application in decision making of the water management sector. Using the latest global seasonal climate forecast product (SEAS5) at 35 km resolution and 7 months forecast horizon of the European Centre for Medium-Range Weather Forecasts, we show that seasonal-forecast-based actions offer potential economic benefit and allow for climate proofing in semi-arid regions in the case of drought and extreme events. Our analysis includes 7 semi-arid, in parts highly managed river basins with extents from tens of thousands to millions of square kilometers in Africa, Asia and South America. The value of the forecast-based action is derived from the skill measures of hit (worthy action) and false alarm (action in vain) rate and is related to economic expenses through ratios of associated costs and losses of an early action. For water management policies, forecast probability triggers for early action plans can be offered based on expense minimization and event maximization criteria. Our results show that even high lead times and long accumulation periods attain value for a range of users and cost-loss situations. For example, in the case of extreme wet conditions (monthly precipitation above 90th percentile), seasonal-forecast-based action in 5 out of 7 regions can still achieve more than 50 % of saved expenses of a perfect forecast at 6 months in advance. The utility of seasonal forecasts strongly depends on the user, the cost-loss situation, the region and the concrete application. In general, seasonal forecasts allow decision makers to save expenses, and to adapt to and mitigate damages of extreme events related to climate change.