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# Characterization of performance of water resources systems under climate change scenarios

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In recent decades, water scarcity problems have become worse in almost the whole planet. This is because water resources, viewed as a finite and vulnerable resource, are subject to intensive use by society, besides withstanding a constant pressure from pollution and climate change effects. This shortage has led to the search for tools to improve management of water resources and mitigate water scarcity problems. In water-scarce countries like Spain, studies to evaluate the performance of water resources systems are preformed routinely at the time scale of river basin planning, where the effects due to climate change are minimal. However, for long-term time horizons (50-100 yr) that do consider significant impacts of climate change on water resources, there are no well-established methodologies that can reveal either the future ability of systems to meet their demands or the degree of intensification of water scarcity problems. To that purpose, in the methodology presented in this paper four indices are applied in order to diagnose water scarcity problems, to quantify the intensity of these problems and to propose solutions. These indices, previously developed for river basin planning time horizons (10-20 yr), have been evaluated in three Spanish River Basin Districts: Guadalquivir, Duero and Ebro, under two climate change scenarios (A2 and B2) and two sets of projection methodologies (CEDEX and PRUDENCE) for a total of 26 different climate projections. Most of these projections imply a significant reduction of natural runoff (between 25% and 50% of current values) and therefore produce important impacts on water resources systems, although different systems exhibit different degree of impact do to their different configurations (water resources, demands and storage capacity). We assessed the ability of these indicators to characterize the performance of water resources systems under climate change conditions, evaluating the sensitivity of each of them to different factors and selecting those that best characterize the impacts of climate change on water resources.