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Global water marginal cost curves to battle the future water gap

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Water scarcity affects a major part of the globe, and is expected to increase significantly until 2100 as a result of climate change and socioeconomic developments. Yet, global projections are unavailable on the effectiveness and costs of adaptation measures to close the future water gap under global change. Here, we present a 21st century projection of the closure of the water gap under two contrasting climate and socio-economic scenarios: RCP2.6/SSP1(s1) and RCP8.5/SSP5(s5). We coupled a global hydrological model to water demand and redistribution model, and forced them with five General Circulation Models (GCMs) to assess the future water gap for 1604 water provinces covering most of the global land mass. Subsequently, we determined the water gap reduction that could be achieved by adaptation measures aimed at improving agriculture, increasing water supply, and reducing water demands. Our results show that for s1, the water gap peaks around 2050 and declines towards 2100. Contrastingly, for s5, the gap increases linearly. Hotspots in water scarcity are found in the USA, India, and China. The adaptations reduce the water gap, but are not sufficient to close the water gap completely. The median annual adaptation costs amount to less than 2% of the GDP of the affected water provinces. Given the low toll on GDP, we conclude that there is certainly room for unorthodox measures to close the water gap.