Incorporation of a seawater desalination scheme into a global hydrological model

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Seawater desalination is a technology for providing fresh water to coastal arid regions. A model was developed to estimate the areas where seawater desalination is likely to be used as a major water source and the likely volume of production. The model was applied to the year of 2005 and showed fairly good reproduction of the historical geographical distribution and national production of desalinated water in the world. The model was applied globally to two periods in the future (2011-2040 and 2041-2070) under three distinct socioeconomic conditions, i.e., SSP1, SSP2, and SSP3. The results indicate that the usage of seawater desalination will have expanded in geographical extent, and that production will have increased by 1.4-2.1-fold in 2011-2040 compared to the present (from 2.8×10^9 m3 yr-1 in 2005 to $4.0-6.0 \times 10^9$ m3 yr-1), and 6.7-17.3-fold in 2041-2070 (from 18.7 to 48.6×10^9 m3 yr-1). The estimated global costs for production for each period are USD 1.1 10.6×10^9 (0.002-0.019 % of the total global GDP), USD $1.6-22.8 \times 10^9$ (0.001-0.020 %), and USD $7.5-183.9 \times 10^9$ (0.002-0.100 %), respectively. The large spreads in these projections are primarily attributable to variations within the socioeconomic scenarios and technological assumptions.

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