PT5 WATER DIVERSION AND SEA-LEVEL RISE: POTENTIAL THREATS TO FRESHWATER SUPPLIES IN THE CHANGJIANG RIVER ESTUARY

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The densely-populated mega-city of Shanghai relies increasingly on freshwater from the Changjiang estuary (70% now). However, this strategy is facing potential threats due to extensive water diversion in the lower basin and future sea-level rise. The present study evaluates the ability of Shanghai to source its water from the estuary, especially in the dry season. Flow <15,000 m3 s-1 ca. 50% for dry seasons, represents the threshold for salinity 0.45 psu (chloride 250 mg/L) above which the estuary is unusable for freshwater. Correlating discharge and salinity, maximum salinity and related time duration, and taking the future water diversions and sea-level rise into consideration, we extrapolated salinity events into the future at intervals of 10 years until 2040. We estimate that water diversions of 56.2x109m3 (1800 m3s-1), 59.2x109m3 (1900 m3s-1) and 61.3x109 m3 (2000 m3s-1) will occur in 2020, 2030 and 2040, and a rise of sea level of 0.12 m by 2040 (from 2010), equivalent 506 m3s-1, ca. 19.4% of the total reducing discharge of 2040 into the estuary (ca. 28% projected to the worst case of February of 2040). Based on scenario building, the pattern of salinity distribution would remain >0.45 for 20-65, 75-90 and 120-128 days (in 2020, 2030, and 2040, respectively), for extreme low-flow conditions. These periods exceed the present 68-day maximum freshwater storage in Qingcaosha reservoir, which is meant to secure freshwater for Shanghai in the future.