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Spatially explicit assessment of water stress and potential mitigating solutions in a large water-limited basin: the Yellow River basin in China

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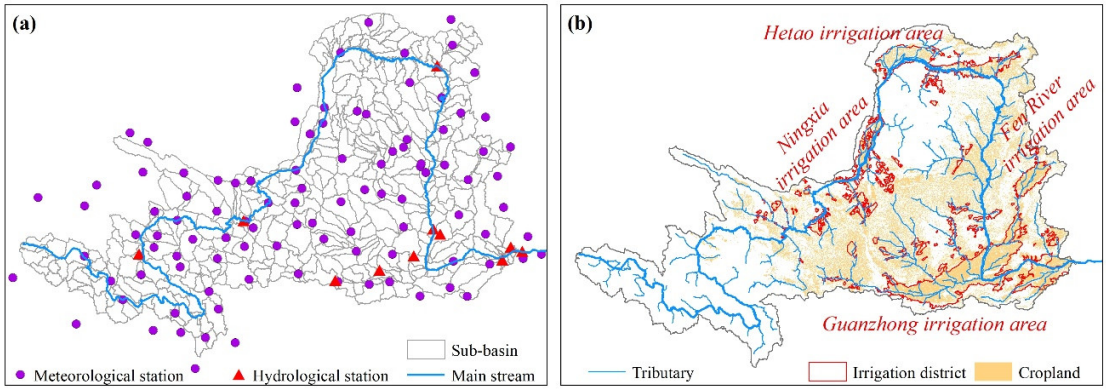

Figure S1. (a) Sub-basins generated by the SWAT model, along with meteorological and hydrological stations for driving and calibrating (validating) the model. (b) Large-scale irrigation district and croplands.

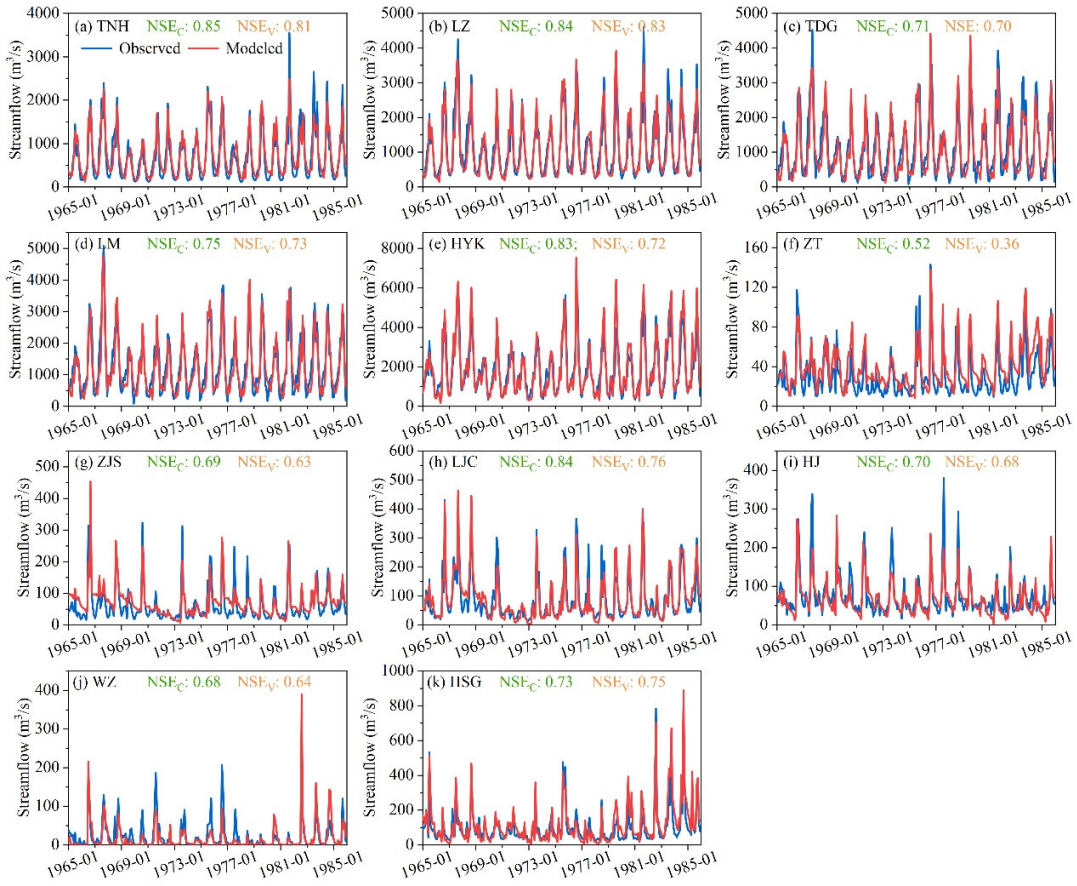

Figure S2. Comparison between the monthly natural streamflow and modeled streamflow in calibration (1965–1975) and validation (1976–1985) periods for 11 hydrological stations. NSE_C and NSE_V indicate the Nash-Sutcliffe efficiency values of calibration and validation period, respectively.

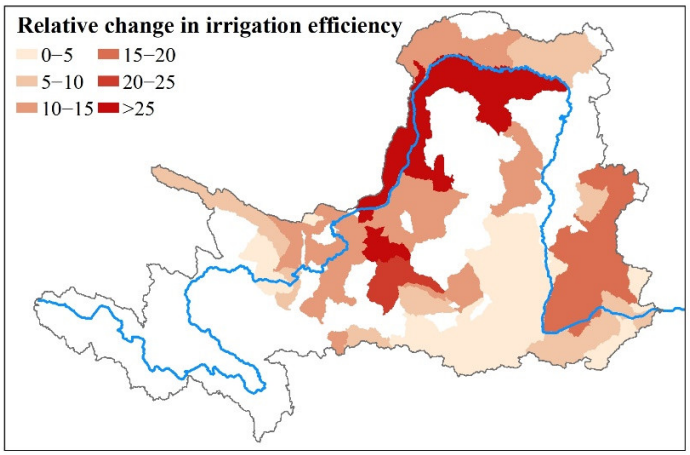

Figure S3. Relative change in irrigation efficiency from 2020 to the 2030s (%).

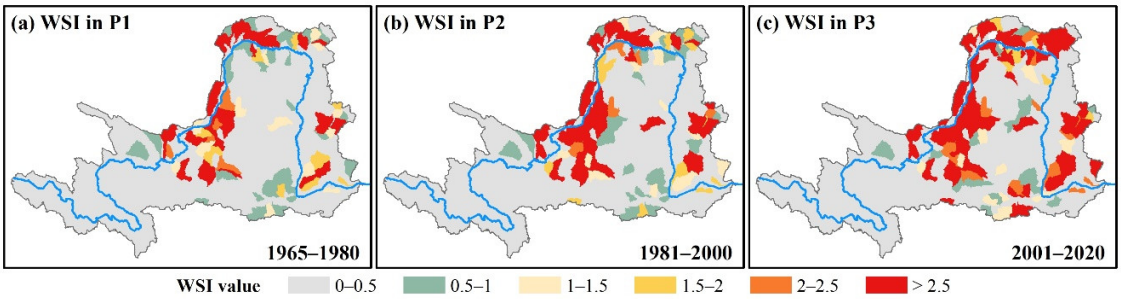

Figure S4. Spatial distribution of water stress index (WSI) value in different periods.

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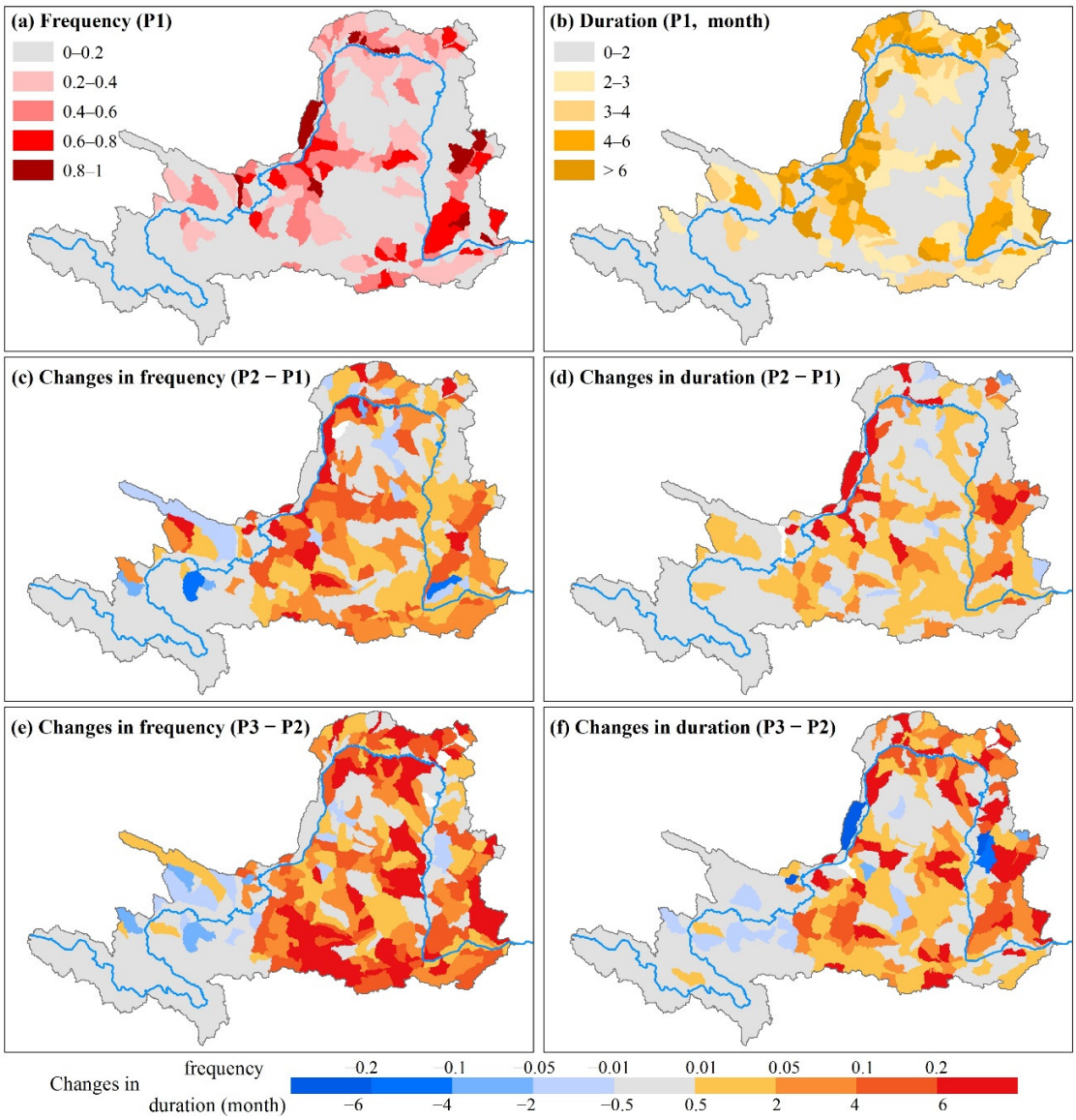

Figure S5. Spatial distribution of (a) frequency and (b) average duration (month) of water scarcity during P1. Changes in (c and e) frequency and (d and f) average duration of water scarcity between two consecutive decades.

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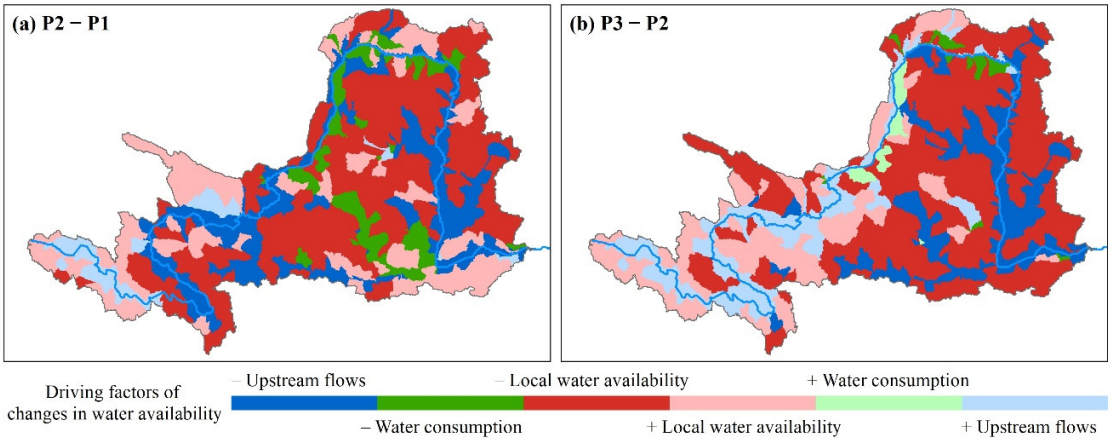

Figure S6. Spatial pattern of driving factors of changes in water availability between two consecutive periods. A '+' prefix indicates a positive effect on water availability, whereas a '–' indicates a negative effect.

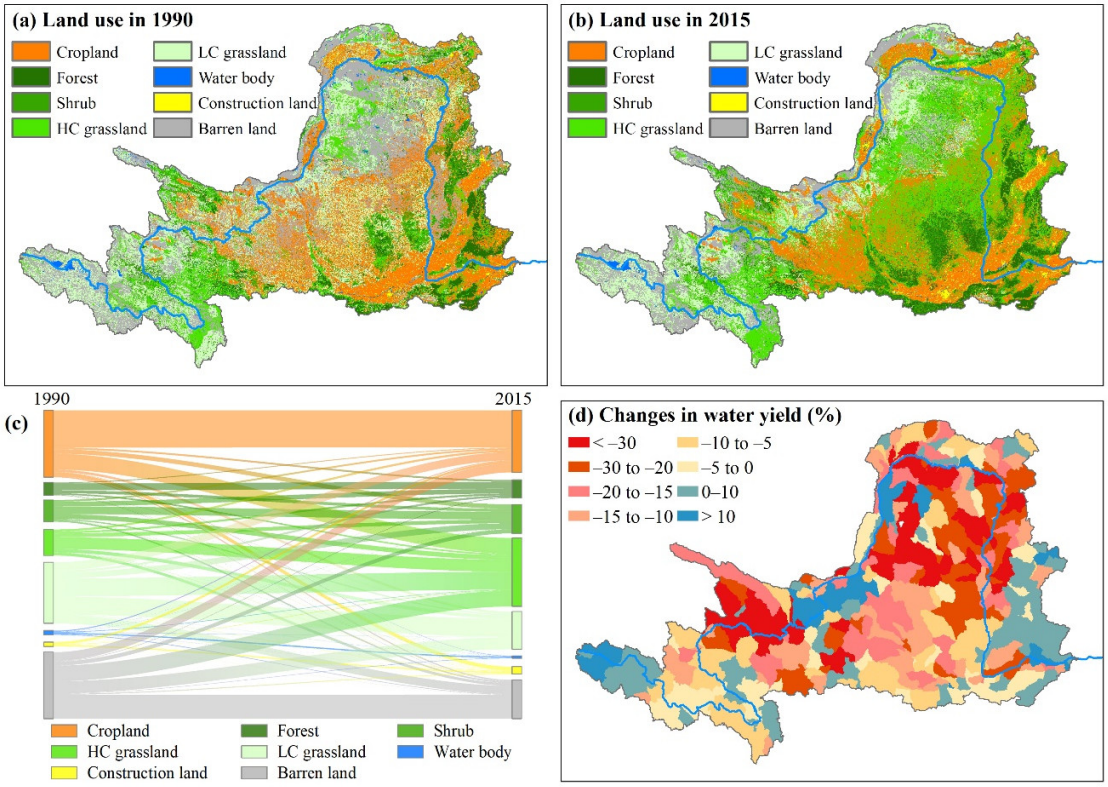

Figure S7. (a) Land use in 1990. (b) Land use in 2015. (c) Transition of land use between 1990 and 2015. (d) Changes in water yield with and without vegetation restoration (i.e., land use in 1990). HC grassland: high coverage grassland; LC: low coverage grassland.

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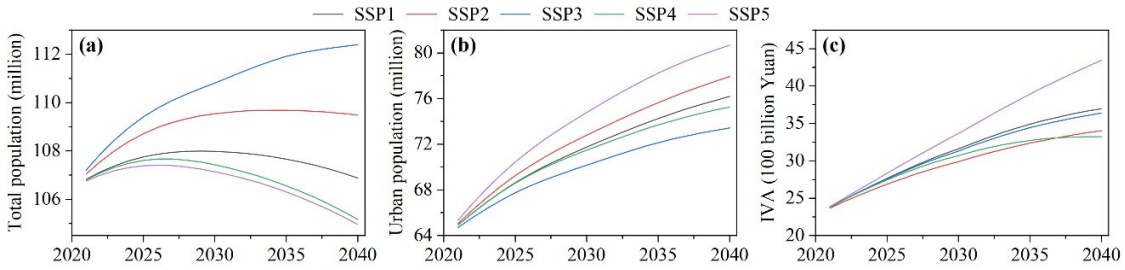

Figure S8. Population and industrial value added (IVA) from 2021 to 2040 in the YRB under different Shared Socioeconomic Pathways (SSP1–SSP5).

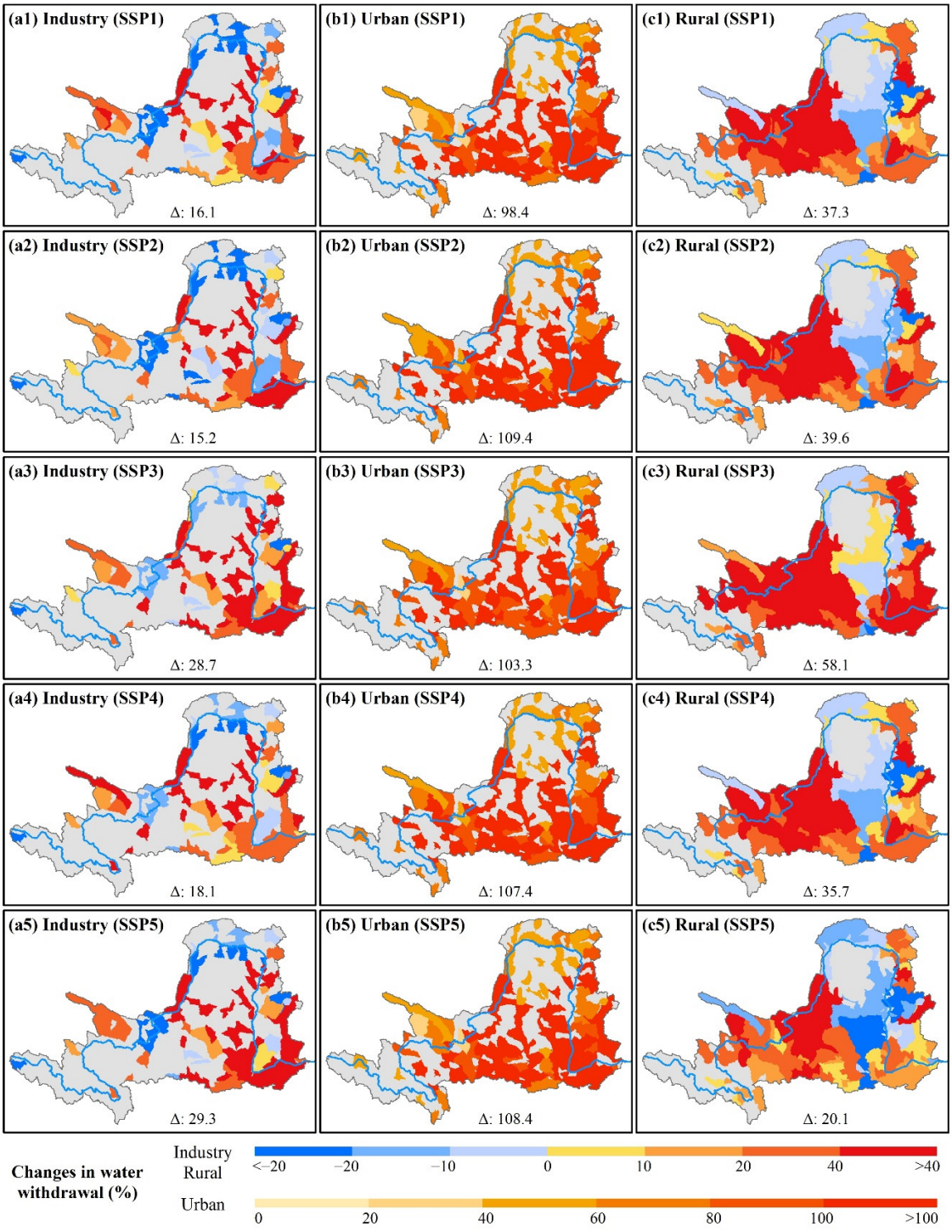

Figure S9. Spatial pattern of relative changes in industry, urban, and rural water withdrawal from the recent two decades (2001–2020) to the 2030s under different SSPs (%). The numbers at the bottom indicate the values at the regional scale.

Table S1. Changes of the domestic water use intensity (liter per day per person) (Hanasaki et al., 2013).

SSPs	SSP1 and SSP5	SSP2	SSP3 and SSP4
Change rate	-2 (WUI_{dom}≥200)	0	2 (WUI_{dom}<800)
	2 (WUI_{dom}<200)	2 (WUI_{dom}<300)	2 (WUI_{dom}<400)