Table 1. Information of the eight General Circulation Models (GCMs) used in this study.

Model	Institution	Resolution (Lon × Lat)	Time Period
CanESM2	CCCMA, Canada	2.8°× 2.8°	2006-2100
CNRM-CM5	CNRM-CERFACS, France	1.4°×1.4°	2006-2100
GFDL-CM3	GFDL, America	2.0°× 2.5°	2006-2100
GFDL-ESM2G	GFDL, America	2.0°× 2.5°	2006-2100
MIROC-ESM	AORI-NIES-JAMSTEC, Japan	2.8°× 2.8°	2006-2100
MPI-ESM-LR	MPI-M, Germany	1.9°× 1.9°	2006-2100
MRI-CGCM3	MRI, Japan	0.6°× 0.6°	2006-2100
NorESM1-M	NCC, Norway	1.9°×2.5°	2006-2100

Table 2. Calibrated parameter values for the headwater area of the Yellow River Basin.

Parameter	Description	Range	Calibrated value/change
CN2	SCS curve number for moisture condition II	-10% – 10%	9.7%
ALPHA_BF	Baseflow alpha factor (day)	0.03 – 0.09	0.043
GW_DELAY	Groundwater delay (day)	2.0 – 6.0	4.717
GW_REVAP	Groundwater revap coefficient	0.01 – 0.02	0.018
ESCO	Soil evaporation compensation factor	0.5 – 0.99	0.987
SOL_K	Saturated hydraulic conductivity (mm/h)	-5% – 20%	1.40%
SOL_AWC	Available water capacity of soil layer (mm)	-13% – 10%	9.6%
CH_K2	Main channel conductivity (mm/h)	4.0 – 10.0	9.057
SMTMP	Snowmelt temperature (℃)	-0.5 – 1.28	0.646
SFTMP	Snowfall temperature (℃)	1.51 – 3.13	1.967
TLAPS	Temperature lapse rate	-7.43 – -6.11	-6.37
SOL_Z	Depth from soil surface to the bottom of the layer (mm)	-10% – 5%	-6.1%

Table 3. Evaluation of model performance in monthly streamflow simulation at the Tangnaihai gaging station during the twenty-year (1981–2000) calibration and twenty-year (1971–1980, 2001–2010) validation periods.

Period	Average runoff (m^3/s)		R^2	NSE	PBIAS (%)
	Observed	Simulated			
Calibration (1981–2000)	652.72	650.99	0.86	0.85	-0.3
Validation I (1971–1980)	658.34	656.39	0.88	0.87	-0.3
Validation II (2001–2010)	564.14	627.4	0.89	0.82	11.3

Table 4. Area percentage of the changing trends of the three key hydrological components during 1976–2015.

	Percent area of significant decrease (%)	Percent area of insignificant decrease (%)	Percent area of insignificant increase (%)	Percent area of significant increase (%)
AET	3.95	11.85	10.2	74
Soil water	25.6	25.1	34.3	15
Water yield	0	48.2	51.8	0

Table 5. Variations in annual precipitation, maximum air temperature (TMAX), and minimum air temperature (TMIN) during the near future (NF, 2020–2059) and far future (FF, 2060–2099) periods under RCP 2.6, RCP 4.5, and RCP 8.5 compared with the baseline period (1976–2015). CV denotes the coefficient of variation of model annual averages.

Scenario	RCP 2.6		RCP 4.5		RCP 8.5	
Period	NF	FF	NF	FF	NF	FF
Precipitation change (%)	7.3	9.0	7.6	12.9	7.8	17.9
CV (Precipitation %)	6.2	7.4	6.4	8.9	5.9	11.1
TMAX change (℃)	1.3	1.5	1.6	2.6	1.9	4.5
CV (TMAX %)	8.4	10.5	7.8	10.7	8.1	9.7
TMIN change (℃)	1.2	1.3	1.5	2.4	1.8	4.5
CV (TMIN %)	13.9	17.3	14.6	26.9	17.8	229.2

Table 6. Variations in annual AET, soil water, and water yield during the near future (NF, 2020–2059) and far future (FF, 2060–2099) periods under RCP 2.6, RCP 4.5, and RCP 8.5 compared with the baseline period (1976–2015). CV denotes the coefficient of variation of model annual averages.

Scenario	RCP 2.6		RCP 4.5		RCP 8.5	
Period	NF	FF	NF	FF	NF	FF
AET change (%)	32	33.5	33.3	41.8	35.3	54.3
CV (AET %)	6.7	8.5	6.6	8.8	6.5	9.6
Soil water change (%)	-3.1	-4.2	-6.1	-9	-6.1	-13.3
CV (Soil water %)	5.6	5.8	3.2	4.2	3.3	5.3
Water yield change (%)	-16.5	-15	-17.8	-16	-20.1	-19.5
CV (Water yield %)	12.3	11.3	13.2	16.3	12	21.8