Supplementary Information

The Impacts of Climate Change on the Hydrological Process and Water Quality in the Three Gorges Reservoir Area, China

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1. The sources of foundation database for SWAT model

As a GIS-based watershed model, the SWAT model requires the Digital Elevation Model (DEM), land use, soil types, and observed meteorological and hydrological data to run. In the present study, the basic data of the SWAT model are shown in Table S1.

Table S1. The sources of the foundation database for the SWAT model

Data	Data type	Spatial/Temporal resolution	Source
Weather data	DBF	Point/Daily	National Meteorological Information Center
Hydrology and water quality data	Text	Point/Daily	Hydrographical station and water quality monitoring station
DEM	GDEM	30×30 m	Geospatial Data Cloud Site, Computer Network Information Center, Chinese Academy of Sciences. (http://www.gscloud.cn)
Land use	SHAPE	1:250,000	National Earth System Science Data Sharing Infrastructure
Soil types	SHAPE	1:500,000	Nanjing Institute of Soil Science (OFNISS), Chinese Academy of Science
Point source pollution	SHAPE	Yearly	Chongqing Academy of Environmental Science Hydrographical station and water quality monitoring station
Social and economic	Text	-	Spot investigation; statistics yearbooks

2. The sensitivity of the parameters of the SWAT model

In addition to the calibration and uncertainty analysis, the sensitivity analysis is also embedded into the SUFI-2 algorithm. Considering the unrealizability of adjusting all parameters in the calibration process, sensitive parameters affecting the simulation of runoff and sediment—such as the number of runoff curves in SCS method, effective soil water content, and factors of soil and water conservation measures—were selected for calibration by referring to relevant research results. The results could partly reveal and rank the sensitivity of the parameters and their corresponding processes, which were useful to understand and diagnose the model. The sensitivity of the parameters is divided into four grades: high-grade, middle-grade, primary-grade, and low-grade, which are shown in Table S2.

Table S2. The sensitivity values of the grading standard of the SWAT model.

Grade	Range	Level of sensitivity
IV	$\lvert RS_i \rvert \geq 1.0$	High-grade
III	$0.2 \leq \lvert RS_i \rvert < 1.0$	Middle-grade
II	$0.05 \leq \lvert RS_i \rvert < 0.2$	Primary-grade
I	$\lvert RS_i \rvert < 0.05$	Low-grade

3. The description, sensitivity value, and sensitivity level of the parameters which related to the runoff, total nitrogen, and total phosphorus.

Table S3. The description and calibrated value of the parameters which related to the runoff, total nitrogen, and total phosphorus.

	Parameter	Definition	Level	Calibrated Value
Runoff	CN2	Moisture condition II curve number	IV	36–92
	CH_K2	Effective hydraulic conductivity, (mm/h)	IV	0.1–0.5
	SOL_AWC	Soil's available moisture content	IV	0.14–0.18
	ALPHA_BF	Baseflow alpha factor, (days)	III	0.01–0.048
	ESCO	Soil evaporation compensation factor	III	0.33–0.83
	GW_DELAY	Groundwater delay, (days)	III	5–15
	GWQMN	Threshold depth of water in the shallow aquifer required for return flow to occur	III	0–0.014
	REVAPMN	Threshold depth of water in the shallow aquifer for revaporization to occur	III	400–460
	CH_N2	Manning's value for main channel	III	0.014–0.16
	SOL_BD	Soil moisture bulk density, (mm)	III	1.27–1.49
TN	RCN	Concentration of nitrogen in rainfall, (mg/kg)	IV	0.5–4.0
	SOL_ORGN	Initial organic N concentration in the soil layer, (mg/kg)	IV	5–10
	SDNCO	Denitrification threshold water content	III	0.5–0.8
	BC1	Rate constant for biological oxidation of NH_3	III	0.3–0.5
	BC2	Rate constant for biological oxidation of NO_2 to NO_3	III	1.1–1.3
TP	FILTERW	Width of the edge of field filter strip, (m)	IV	3–5
	SOL_ORGP	Initial humic organic phosphorus in soil layer, (mg/kg)	IV	5–10
	PHOSKD	Phosphorus soil partitioning coefficient	IV	101–175
	BC4	Rate constant for decay of organic phosphorus to dissolved phosphorus	III	0.35–0.80
	PSP	Phosphorus sorption coefficient	III	0.7

4. Classification methods of climate extreme indicators

In order to further explore the characteristics of extreme climate change in the Three Gorges Reservoir area, the internationally recognized extreme climate indicators (i.e., precipitation index and temperature index) were selected to reflect the changes in the intensity of extreme climate events in the Three Gorges Reservoir area. The specific classification methods were shown in Table S4.

Table S4. Classification methods of climate extreme indicators

Type	Indicator	Abbreviation	Meaning
Extreme Precipitation	Severe torrential rain days	P100	Daily precipitation>100 mm
	Torrential rain days	P50	Daily precipitation>50 mm
	Heavy rain days	P25	Daily precipitation>25 mm
	Moderate rain days	P10	Daily precipitation>10 mm
Extreme Temperature	Frost days	FD	Daily minimum temperature<0℃
	Summer night days	SND	Daily minimum temperature＞20℃
	High temperature days	HTD	Daily maximum temperature≥35℃
	Freezing days	FRD	Daily maximum temperature<0℃