Supplementary information for:

Potential suitability and spatial dynamics of land use under climate change

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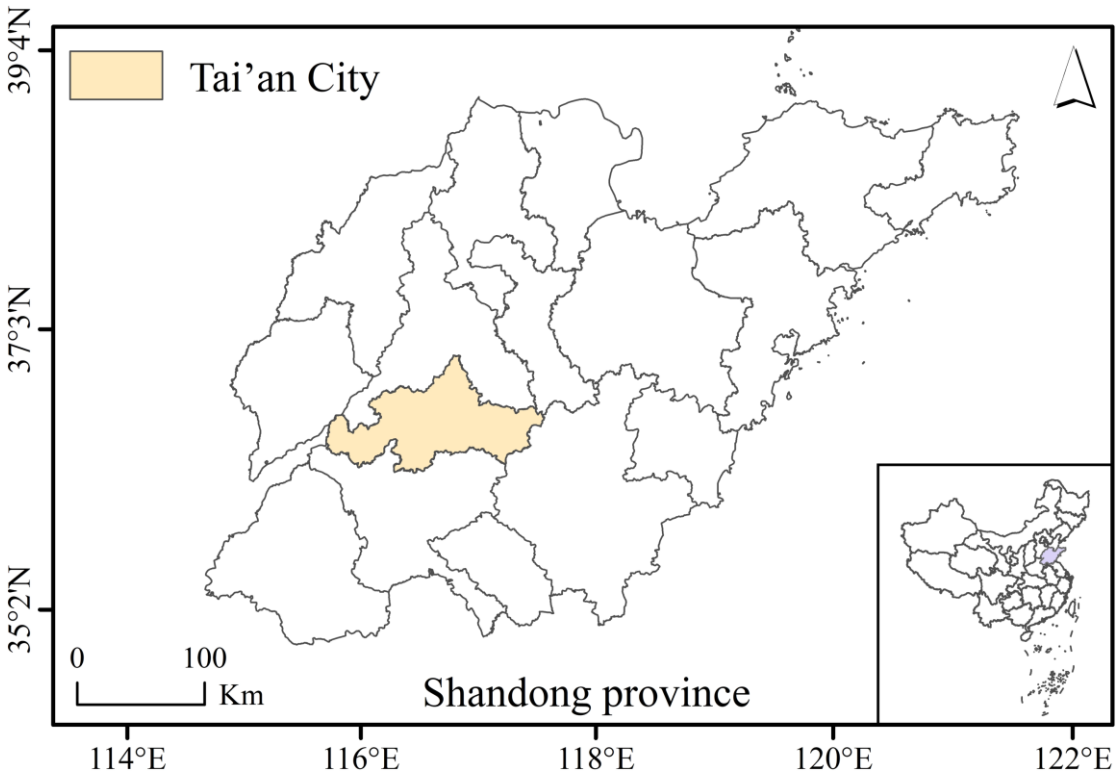


Figure S1 The study area of this study in China

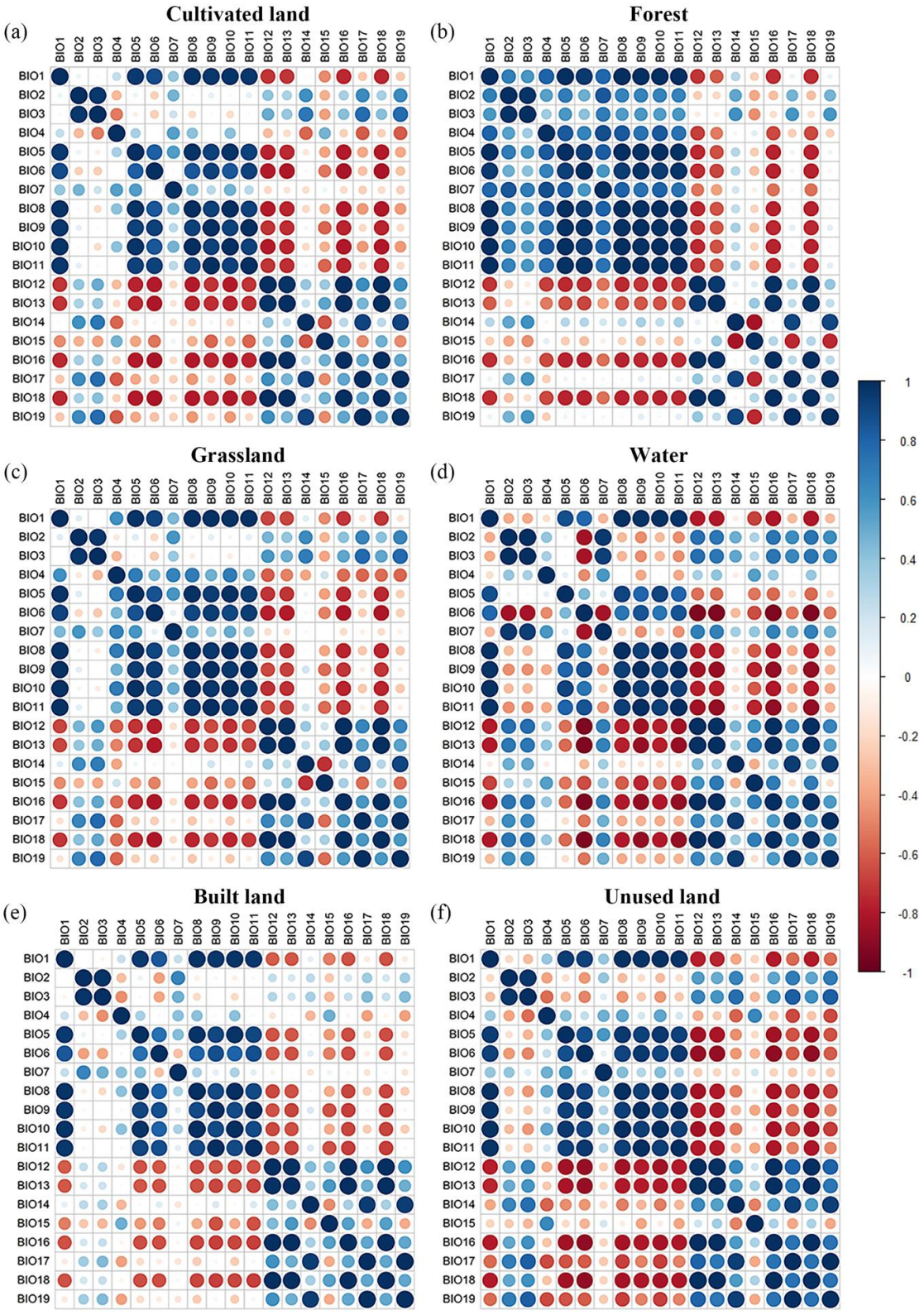


Figure S2 Pearson's correlation analysis for 19 bioclimatic factors of cultivated land, forest, grassland, water, built land, and unused land, respectively

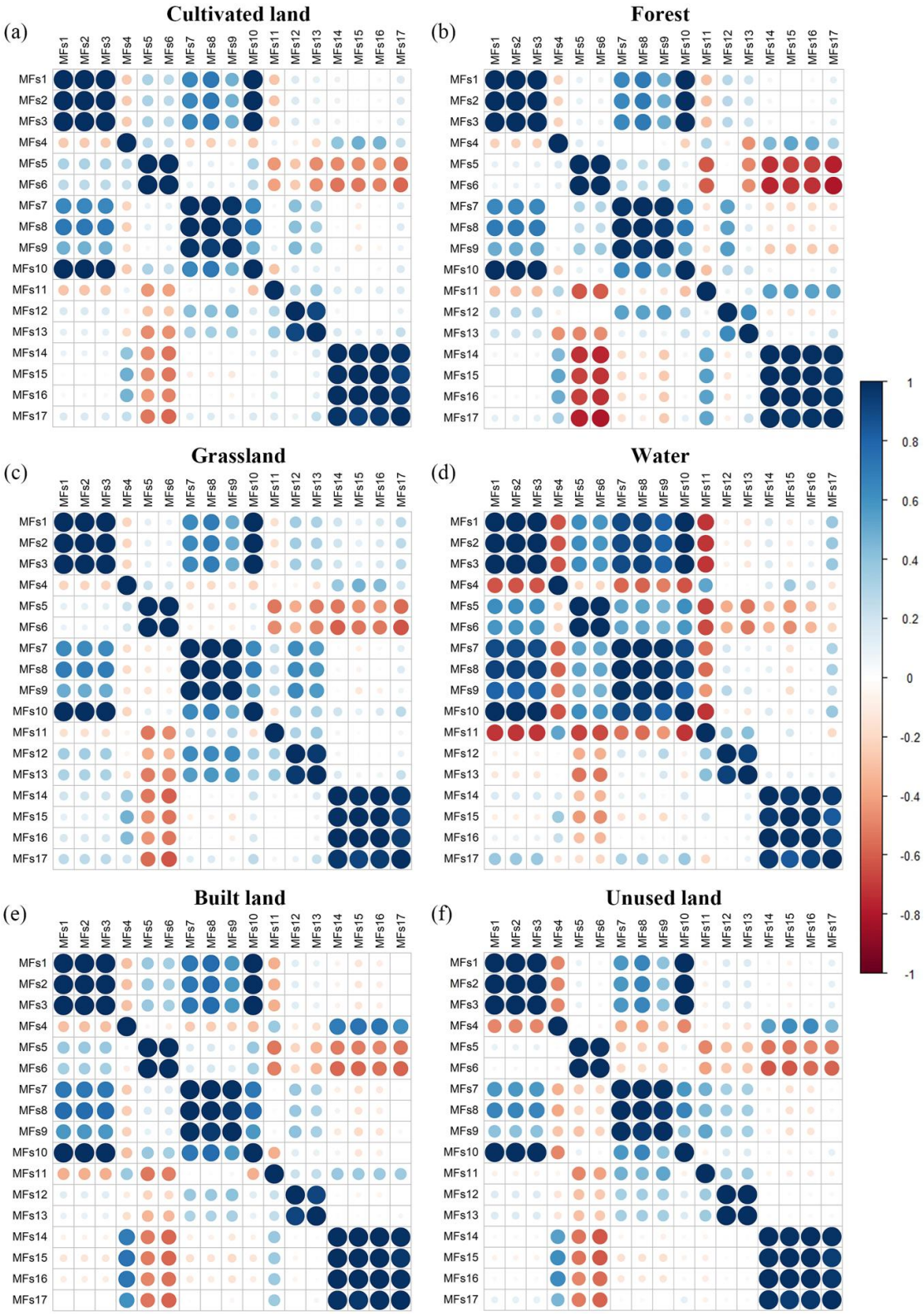


Figure S3 Pearson's correlation analysis for meteorological factors of cultivated land, forest, grassland, water, built land, and unused land, respectively

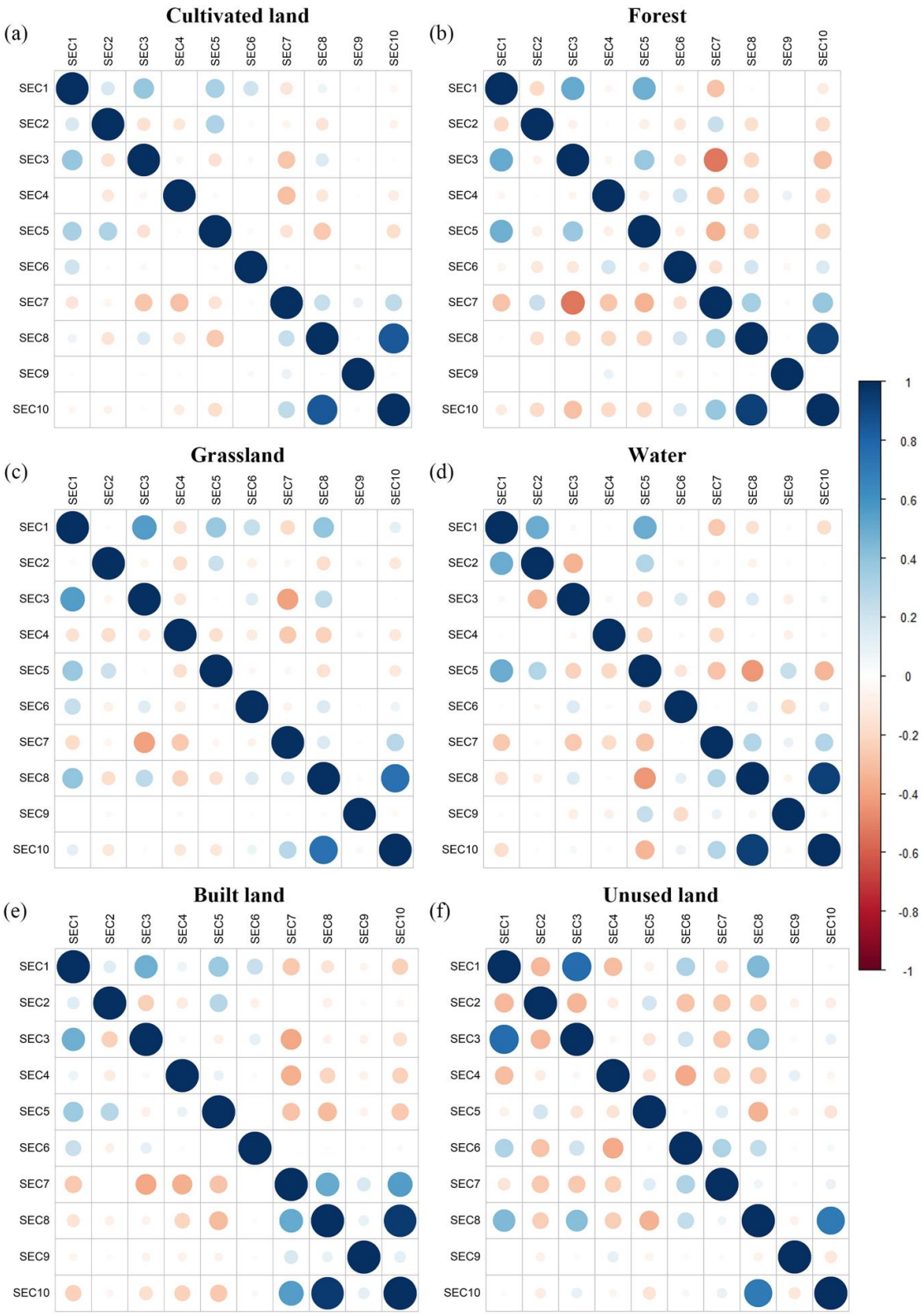


Figure S4 Pearson's correlation analysis for social environmental factors of cultivated land, forest, grassland, water, built land, and unused land, respectively

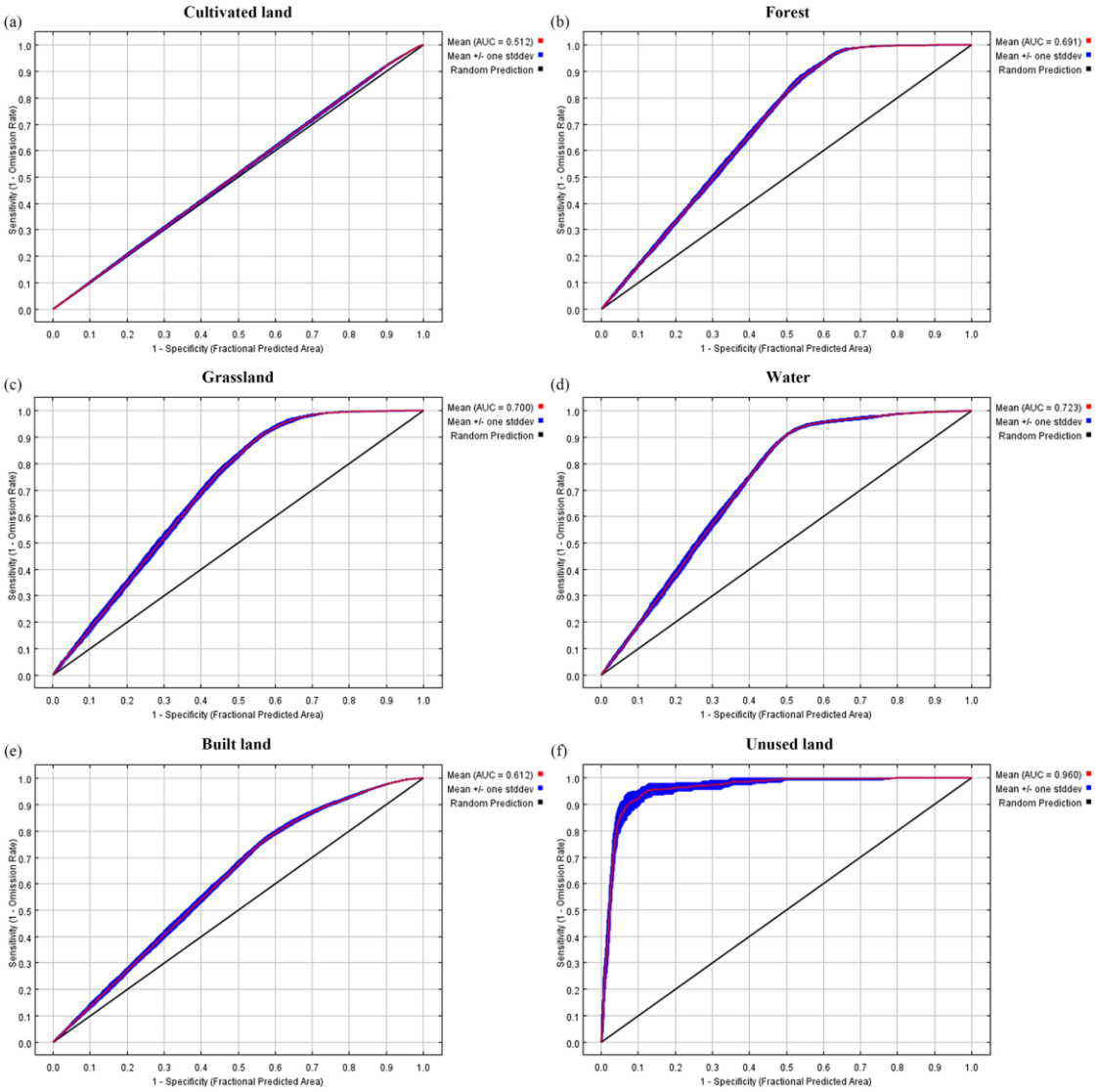


Figure S5 The AUC values for cultivated land, forest, grassland, water, built land, and unused land, respectively

Table S1 Environmental variables used in CLUE-S model

Class	Code	Variable	Resolution	Unit	Year	Source
Land use	land use	Land use	30 m	/	2018/2020	https://www.resdc.cn/
Natural environmental factors	sc1gr0.fil	Altitude	12 m	m	2020	https://www.resdc.cn/
	sc1gr1.fil	Aspect	12 m	°	2020	https://www.resdc.cn/
	sc1gr2.fil	Annual mean temperature	1 km	℃	1970-2000	https://www.worldclim.org/
	sc1gr3.fil	Annual precipitation	5 km	mm	1970-2000	https://www.worldclim.org/
	sc1gr4.fil	Net primary productivity	500 m	$gCm^{-2}a^{-1}$	2020	https://www.resdc.cn/
	sc1gr5.fil	Nomralized difference vegeattion index	30 m		2020	https://www.resdc.cn/
	sc1gr6.fil	Slope	12 m	°	2020	https://www.resdc.cn/
Social environmental factors	sc1gr7.fil	Distance to the expressways	/	/	2022	https://www.resdc.cn/
	sc1gr8.fil	Distance to the county highways	/	/	2022	https://www.resdc.cn/
	sc1gr9.fil	Distance to the national roads	/	/	2022	https://www.resdc.cn/
	sc1gr10.fil	Distance to the provincial roads	/	/	2022	https://www.resdc.cn/
	sc1gr11.fil	Distance to the railways	/	/	2022	https://www.resdc.cn/
	sc1gr12.fil	Distance to the rivers	/	/	2022	https://www.resdc.cn/
	sc1gr13.fil	Night-time lighting data	1 km	/	2013	https://www.resdc.cn/
	sc1gr14.fil	Gross domestic product	1 km	billion	2019	https://www.resdc.cn/
	sc1gr15.fil	Population density	1 km	people	2020	https://www.resdc.cn/

Table S2 Total environmental variables used in MaxEnt model

Class	Code	Variable	Resolution	Unit	Year	Source
Bioclimatic factors	BIO1	Annual Mean Temperature	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO2	Mean Diurnal Range	1km	°C	1979-2013	http://www.paleoclim.org/
	BIO3	Isothermality	1km	/	1979-2013	http://www.paleoclim.org/
	BIO4	Temperature Seasonality	1km	/	1979-2013	http://www.paleoclim.org/
	BIO5	Max Temperature of Warmest Month	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO6	Min Temperature of Coldest Month	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO7	Temperature Annual Range	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO8	Mean Temperature of Wettest Quarter	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO9	Mean Temperature of Driest Quarter	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO10	Mean Temperature of Warmest Quarter	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO11	Mean Temperature of Coldest Quarter	1km	°C*10	1979-2013	http://www.paleoclim.org/
	BIO12	Annual Precipitation	1km	mm/year	1979-2013	http://www.paleoclim.org/
	BIO13	Precipitation of Wettest Month	1km	mm/month	1979-2013	http://www.paleoclim.org/
	BIO14	Precipitation of Driest Month	1km	mm/month	1979-2013	http://www.paleoclim.org/
	BIO15	Precipitation Seasonality	1km	/	1979-2013	http://www.paleoclim.org/
	BIO16	Precipitation of Wettest Quarter	1km	mm/quarter	1979-2013	http://www.paleoclim.org/
	BIO17	Precipitation of Driest Quarter	1km	mm/quarter	1979-2013	http://www.paleoclim.org/
	BIO18	Precipitation of Warmest Quarter	1km	mm/quarter	1979-2013	http://www.paleoclim.org/
	BIO19	Precipitation of Coldest Quarter	1km	mm/quarter	1979-2013	http://www.paleoclim.org/
Meteorological factors	MFs1	Pressure	1km	hPa	2022	https://data.cma.cn/

	MFs2	Maximum air pressure	1km	hPa	2022	https://data.cma.cn/
	MFs3	Minimum air pressure	1km	hPa	2022	https://data.cma.cn/
	MFs4	Sea level pressure	1km	hPa	2022	https://data.cma.cn/
	MFs5	Relative humidity	1km	%	2022	https://data.cma.cn/
	MFs6	Minimum relative humidity	1km	%	2022	https://data.cma.cn/
	MFs7	Temperature	1km	℃	2022	https://data.cma.cn/
	MFs8	Maximum temperature	1km	℃	2022	https://data.cma.cn/
	MFs9	Minimum temperature	1km	℃	2022	https://data.cma.cn/
	MFs10	Perceived temperature	1km	℃	2022	https://data.cma.cn/
	MFs11	Average wind direction of 2 minute (angle)	1km	°	2022	https://data.cma.cn/
	MFs12	Wind direction with maximum wind speed (angle)	1km	°	2022	https://data.cma.cn/
	MFs13	Wind direction with maximum wind speed (angle)	1km	°	2022	https://data.cma.cn/
	MFs14	Average wind speed of 2 minute	1km	m/s	2022	https://data.cma.cn/
	MFs15	Maximum wind speed	1km	m/s	2022	https://data.cma.cn/
	MFs16	Maximum wind speed	1km	m/s	2022	https://data.cma.cn/
	MFs17	Windpower	1km	nm/h	2022	https://data.cma.cn/
Social environmental factors	SEC1	Distance to the expressways	/	m	2022	https://www.resdc.cn/
	SEC2	Distance to the county highways	/	m	2022	https://www.resdc.cn/
	SEC3	Distance to the national roads	/	m	2022	https://www.resdc.cn/
	SEC4	Distance to the provincial roads	/	m	2022	https://www.resdc.cn/
	SEC5	Distance to the railways	/	m	2022	https://www.resdc.cn/
	SEC6	Distance to the rivers	/	m	2022	https://www.resdc.cn/
	SEC7	Night-time lighting data (DMSP)	1km	/	2013	https://www.resdc.cn/

Other	SEC8	Gross domestic product	1km	billion	2019	https://www.resdc.cn/
	SEC9	Land use	30m	/	2018	https://www.resdc.cn/
	SEC10	Population density	1km	people	2020	https://www.resdc.cn/
	ALT	Altitude	12m	m	2020	https://www.resdc.cn/
	Aspect	Aspect	12m	°	2020	https://www.resdc.cn/
	Slope	Slope	12m	°	2020	https://www.resdc.cn/
	NPP	Net primary production	500m	$gCm^{-2}a^{-1}$	2020	https://www.resdc.cn/
	NDVI	Normalized difference vegetation index	30m	/	2020	https://www.resdc.cn/

Table S3 Environmental variables used in MaxEnt model for cultivated land, forest, grassland, water, built land, and unused land, respectively

Class	Code	Cultivated land	Forest	Grassland	Water	Built land	Unused land
Bioclimatic factors	BIO1	/	/	/	/	/	/
	BIO2	√	/	√	√	/	√
	BIO3	/	/	/	/	√	/
	BIO4	√	/	√	√	√	√
	BIO5	/	/	/	√	/	/
	BIO6	/	/	/	/	/	/
	BIO7	√	/	√	/	√	√
	BIO8	/	/	/	/	/	/
	BIO9	/	/	/	/	/	/
	BIO10	/	√	√	/	√	√
	BIO11	√	/	/	/	/	/
	BIO12	/	/	/	/	√	/
	BIO13	/	√	√	√	/	√
	BIO14	√	/	√	/	√	√
	BIO15	√	/	√	√	√	√
	BIO16	/	/	/	/	/	/
	BIO17	/	√	/	√	/	/
	BIO18	/	/	/	/	√	/
	BIO19	/	/	/	/	/	/
Meteorological factors	MFs1	/	/	/	/	/	/

	MFs2	/	/	√	√	√	√
	MFs3	√	√	/	/	/	/
	MFs4	√	√	√	√	√	√
	MFs5	√	/	√	/	/	√
	MFs6	/	√	/	√	√	/
	MFs7	√	√	√	/	/	/
	MFs8	/	/	/	/	√	/
	MFs9	/	/	/	/	/	√
	MFs10	/	/	/	/	/	/
	MFs11	√	√	√	√	√	√
	MFs12	/	√	√	/	/	√
	MFs13	√	√	/	√	√	/
	MFs14	/	/	√	/	/	/
	MFs15	√	/	/	√	√	/
	MFs16	/	/	/	/	/	√
	MFs17	/	/	/	/	/	/
Social environmental factors	SEC1	√	√	√	√	√	/
	SEC2	√	√	√	√	√	/
	SEC3	√	√	√	√	√	√
	SEC4	√	√	√	√	√	√
	SEC5	√	√	√	√	√	√
	SEC6	√	√	√	√	√	√
	SEC7	√	√	√	√	√	√

Other	SEC8	/	/	√	√	/	√
	SEC9	√	√	√	√	√	√
	SEC10	√	√	√	/	√	√
	ALT	√	√	√	√	√	√
	Aspect	√	√	√	√	√	√
	Slope	√	√	√	√	√	√
	NPP	√	√	√	√	√	√
	NDVI	√	√	√	√	√	√

Table S4 Current and future areas of land use types using the MaxEnt model. SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5 represent three representative concentration pathways between 2021 and 2040

Land use types	Climate change	Suitable area (× 10^3 km^2)	Highly (× 10^3 km^2)	Moderately (× 10^3 km^2)	Poorly (× 10^3 km^2)
Cultivated land	Current	127.49	93.78	21.97	11.74
	SSP1-2.6	128.09	93.88	22.16	12.05
	SSP2-4.5	128.97	93.53	22.38	13.06
	SSP3-7.0	129.17	93.92	22.89	12.36
	SSP5-8.5	128.24	93.84	22.16	12.24
Forest	Current	45.2	11.28	9.71	24.21
	SSP1-2.6	42.83	11.08	9.66	22.09
	SSP2-4.5	44.26	11.16	9.58	23.52
	SSP3-7.0	43.06	11.09	9.62	22.35
	SSP5-8.5	42.29	11.04	9.42	21.83
Grassland	Current	70.87	10.94	23.38	36.55
	SSP1-2.6	63.64	9.02	17.56	37.06
	SSP2-4.5	62.71	8.82	16.67	37.22
	SSP3-7.0	58.96	8.64	14.19	36.13

	SSP5-8.5	63.99	9.11	19.55	35.33
Water	Current	106.4	9.72	24.18	72.5
	SSP1-2.6	104.11	9.58	21.77	72.76
	SSP2-4.5	111.49	9.88	24.69	76.92
	SSP3-7.0	109.65	9.8	25.88	73.97
	SSP5-8.5	102.01	9.68	19.99	72.34
Built land	Current	118.73	19.76	56.02	42.95
	SSP1-2.6	117.68	19.95	56.34	41.39
	SSP2-4.5	119.55	19.89	62.84	36.82
	SSP3-7.0	118.37	19.31	58.06	41
	SSP5-8.5	118.32	20.18	55.96	42.18
Unused land	Current	28.29	0.41	4.01	23.87
	SSP1-2.6	20.43	0.31	1.49	18.63
	SSP2-4.5	25.47	0.34	2.62	22.51
	SSP3-7.0	38.72	1.26	8.19	29.27
	SSP5-8.5	18.53	0.15	0.2	18.18

Table S5 Spatial dynamics of land use types under current conditions

Land use types	Climate change	Increase area ($\times 10^3$ km^2)	Stable area ($\times 10^3$ km^2)	Decrease area ($\times 10^3$ km^2)
Cultivated land	SSP1-2.6	0.52	4.07	1.48
	SSP2-4.5	0.52	4.07	1.48
	SSP3-7.0	0.52	4.07	1.48
	SSP5-8.5	0.52	4.07	1.48
Forest	SSP1-2.6	0.07	0.5	0.13
	SSP2-4.5	0.07	0.5	0.13
	SSP3-7.0	0.07	0.5	0.13
	SSP5-8.5	0.07	0.5	0.13
Grassland	SSP1-2.6	0.12	0.3	0.25
	SSP2-4.5	0.12	0.3	0.25
	SSP3-7.0	0.12	0.3	0.25
	SSP5-8.5	0.12	0.3	0.25
Water	SSP1-2.6	0.13	0.36	0.11
	SSP2-4.5	0.13	0.36	0.11
	SSP3-7.0	0.13	0.36	0.11

	SSP5-8.5	0.13	0.36	0.11
Built land	SSP1-2.6	0.5	0.52	0.95
	SSP2-4.5	0.53	0.52	0.95
	SSP3-7.0	0.51	0.52	0.95
	SSP5-8.5	0.51	0.52	0.95
Unused land	SSP1-2.6	0.01	0.01	0.02
	SSP2-4.5	0.01	0.01	0.02
	SSP3-7.0	0.01	0.01	0.02
	SSP5-8.5	0.01	0.02	0.02